

A417 Missing Link  
TR010056

6.4 Environmental Statement  
Appendix 9.3 Ground Investigation  
Factual Report  
Part 5 of 5

Planning Act 2008

APFP Regulation 5(2)(a)  
Infrastructure Planning (Applications: Prescribed Forms and  
Procedure) Regulations 2009

Volume 6

May 2021

Infrastructure Planning

Planning Act 2008

**The Infrastructure Planning  
(Applications: Prescribed Forms  
and Procedure) Regulations 2009**

**A417 Missing Link**

Development Consent Order 202[x]

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**6.4 Environmental Statement  
Appendix 9.3 Ground Investigation Factual Report  
Part 5 of 5**

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<b>Regulation Number:</b>	5(2)(a)
<b>Planning Inspectorate Scheme Reference</b>	TR010056
<b>Application Document Reference</b>	6.4
<b>Author:</b>	A417 Missing Link

<b>Version</b>	<b>Date</b>	<b>Status of Version</b>
C01	May 2021	Application Submission



Borehole: RC514 Box 1: 2.00-5.00m



Borehole: RC514 Box 2: 5.00-8.00m



Borehole: RC514 Box 3: 8.00-11.00m



Borehole: RC514 Box 4: 11.00-14.00m



Borehole: RC514 Box 5: 14.00-17.00m



Borehole: RC514 Box 6: 17.00-20.00m



Borehole: RC514 Box 7: 20.00-23.00m



Borehole: RC514 Box 8: 23.00-26.00m



Borehole: RC514 Box 9: 26.00-29.00m



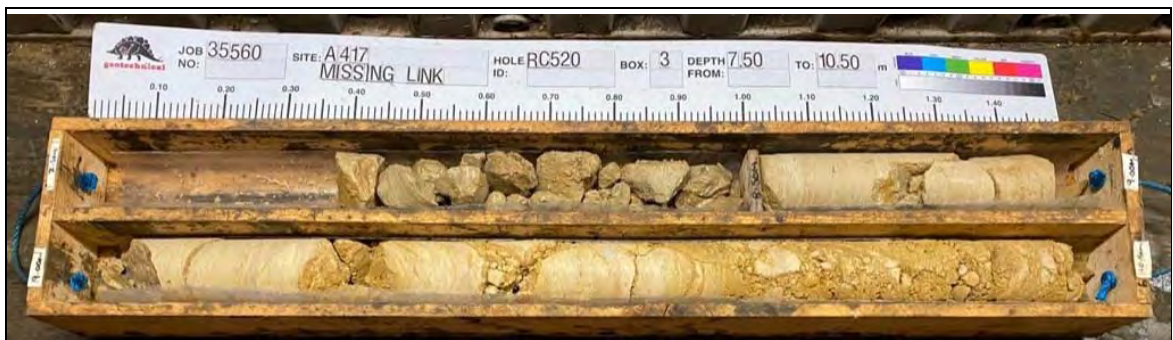
Borehole: RC514 Box 10: 29.00-31.00m



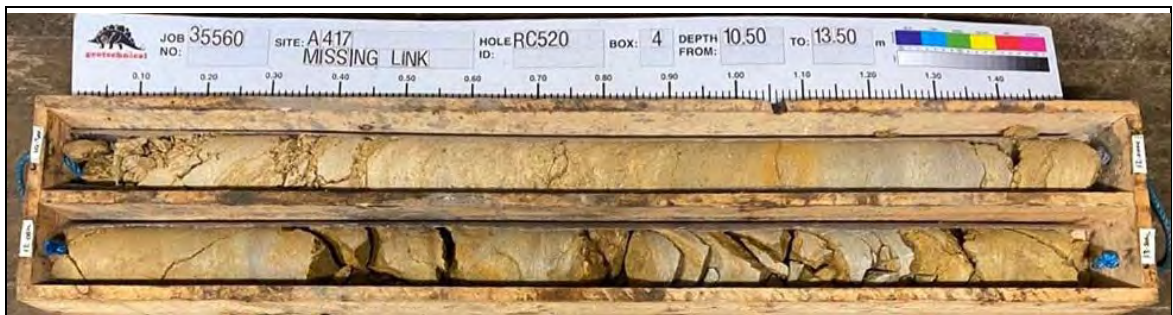
Borehole: RC520 Box 1: 1.50-4.50m



Borehole: RC520 Box 2: 4.50-7.50m



Borehole: RC520 Box 3: 7.50-10.50m



Borehole: RC520 Box 4: 10.50-13.50m



Borehole: RC520 Box 5: 13.50-16.50m



Borehole: RC520 Box 6: 16.50-19.50m



Borehole: RC520 Box 7: 19.50-22.50m



Borehole: RC520 Box 8: 22.50-25.50m



Borehole: TP210 Pit



Borehole: TP210 Pit





Borehole: TP210 Spoil



Borehole: TP603 Pit



Borehole: TP603 Pit



Borehole: TP603 Pit



Borehole: TP603 Spoil



Borehole: TP605 Pit



Borehole: TP605 Pit



Borehole: TP605 Spoil



Borehole: TP618 Pit



Borehole: TP618 Pit



Borehole: TP618 Spoil



Borehole: TP619 Pit



Borehole: TP619 Pit





Borehole: TP619 Pit



Borehole: TP619 Spoil



Borehole: TP634 Pit



Borehole: TP634 Pit



Borehole: TP637 Pit



Borehole: TP637 Pit



Borehole: TP637 Spoil



Borehole: TP638 Pit



Borehole: TP638 Pit



Borehole: TP638 Spoil



Borehole: DSRC319 Box 1: 1.20-3.20m



Borehole: DSRC319 Box 2: 3.20-5.10m



Borehole: DSRC319 Box 3: 5.10-7.70m



Borehole: DSRC319 Box 4: 7.70-10.70m



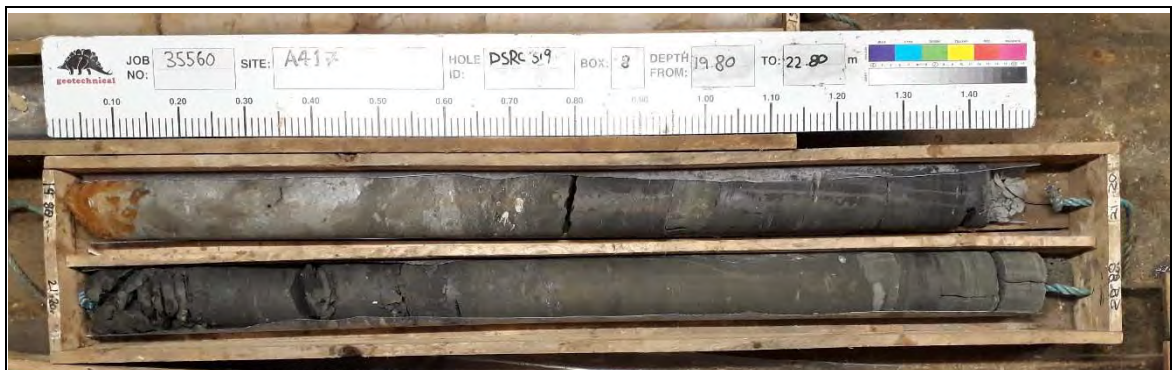
Borehole: DSRC319 Box 5: 10.70-13.50m



Borehole: DSRC319 Box 6: 13.50-16.80m



Borehole: DSRC319 Box 7: 16.80-19.80m



Borehole: DSRC319 Box 8: 19.80-22.80m





Borehole: DSRC319 Box 9: 22.80-25.80m



Borehole: DSRC319 Box 10: 25.80-28.80m



Borehole: DSRC319 Box 11: 28.80-31.80m



Borehole: DSRC319 Box 12: 31.80-34.80m



Borehole: DSRC319 Box 13: 34.80-37.80m



Borehole: DSRC319 Box 14: 37.80-40.80m



Borehole: DSRC319 Box 15: 40.80-42.40m



Borehole: DSRC319 Box 16: 42.40-45.40m



Borehole: DSRC319 Box 17: 45.40-48.40m



Borehole: DSRC319 Box 18: 48.40-51.45m



Borehole: DSRC319 Box 19: 51.45-54.40m



Borehole: DSRC319 Box 20: 54.40-57.30m



Borehole: DSRC319 Box 21: 57.30-60.60m



Borehole: DSRC319 Box 22: 60.60-63.80m



Borehole: DSRC319 Box 23: 63.80-65.20m



Borehole: DSRC325 Box 1: 1.20-3.20m



Borehole: DSRC325 Box 2: 3.20-6.00m



Borehole: DSRC325 Box 3: 6.00-9.00m



Borehole: DSRC325 Box 4: 9.00-11.90m



Borehole: DSRC325 Box 5: 11.90-14.90m



Borehole: DSRC325 Box 6: 14.90-17.90m



Borehole: DSRC325 Box 7: 17.90-20.90m



Borehole: DSRC325 Box 8: 20.90-23.80m



Borehole: DSRC325 Box 9: 23.80-27.00m



Borehole: DSRC325 Box 10: 27.00-30.00m



Borehole: DSRC325 Box 11: 30.00-32.80m



Borehole: DSRC325 Box 12: 32.80-35.80m



Borehole: DSRC325 Box 13: 35.90-39.00m



Borehole: DSRC325 Box 14: 39.00-40.60m





Borehole: DSRCOH304 Box 1: 1.20-3.20m



Borehole: DSRCOH304 Box 2: 3.20-4.20m



Borehole: DSRCOH304 Box 3: 4.50-6.90m



Borehole: DSRCOH304 Box 4: 6.90-8.90m



Borehole: DSRCOH304 Box 5: 8.90-12.10m



Borehole: DSR304 Box 6: 12.10-15.20m



Borehole: DSR304 Box 7: 15.20-17.80m



Borehole: DSR304 Box 8: 17.80-21.00m



Borehole: DSR304 Box 9: 21.00-24.10m



Borehole: DSRCOH304 Box 10: 24.10-27.10m



Borehole: DSRCOH304 Box 11: 27.10-30.20m



Borehole: DSRCOH304 Box 12: 30.20-33.10m



Borehole: DSRCOH304 Box 13: 33.10-36.20m



Borehole: DSR304 Box 14: 36.20-39.20m



Borehole: DSR304 Box 15: 39.20-42.20m



Borehole: DSR304 Box 16: 42.20-45.20m



Borehole: DSR304 Box 17: 45.20-48.20m



Borehole: DSRCOH304 Box 18: 48.20-51.20m



Borehole: DSRCOH304 Box 19: 51.20-54.20m



Borehole: DSRCOH304 Box 20: 54.20-57.20m



Borehole: DSRCOH304 Box 21: 57.20-60.20m



Borehole: DSRC403 Box 1: 1.20-4.20m



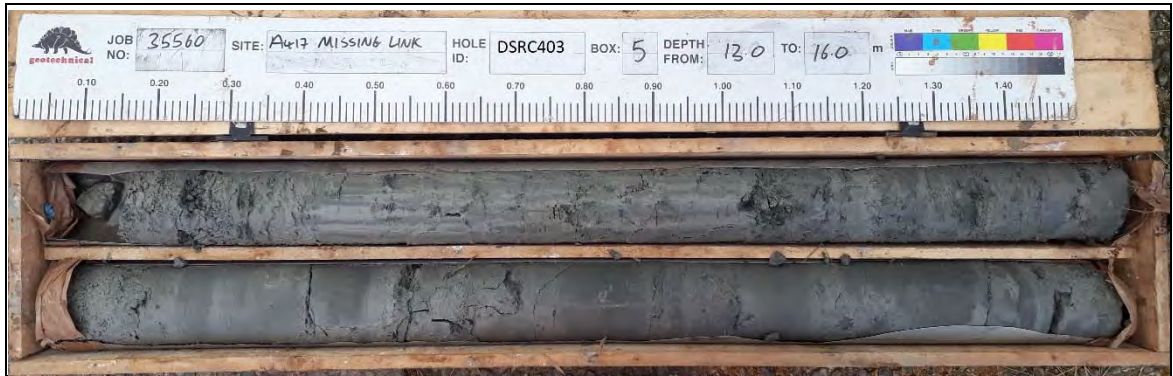
Borehole: DSRC403 Box 2: 4.20-7.10m



Borehole: DSRC403 Box 3: 7.10-10.00m



Borehole: DSRC403 Box 4: 10.00-13.00m



Borehole: DSRC403 Box 5: 13.00-16.00m



Borehole: DSRC403 Box 6: 16.00-19.00m



Borehole: DSRC403 Box 7: 19.00-20.00m



Borehole: DSRC229 Box 1: 1.20-4.20m



Borehole: DSRC229 Box 2: 4.20-6.20m



Borehole: DSRC229 Box 3: 6.20-9.20m



Borehole: DSRC229 Box 4: 9.20-12.20m





Borehole: DSRC229 Box 5: 12.20-15.20m



Borehole: DSRC229 Box 6: 15.20-18.20m



Borehole: DSRC229 Box 7: 18.20-21.20m



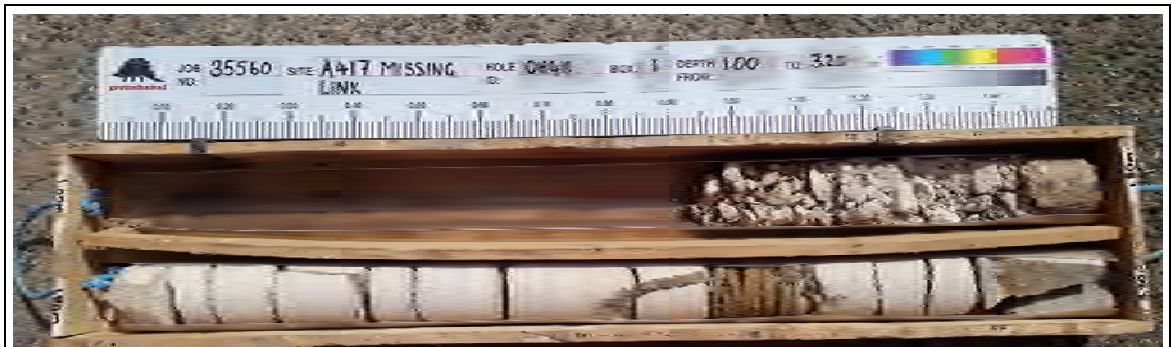
Borehole: DSRC229 Box 8: 21.20-24.20m



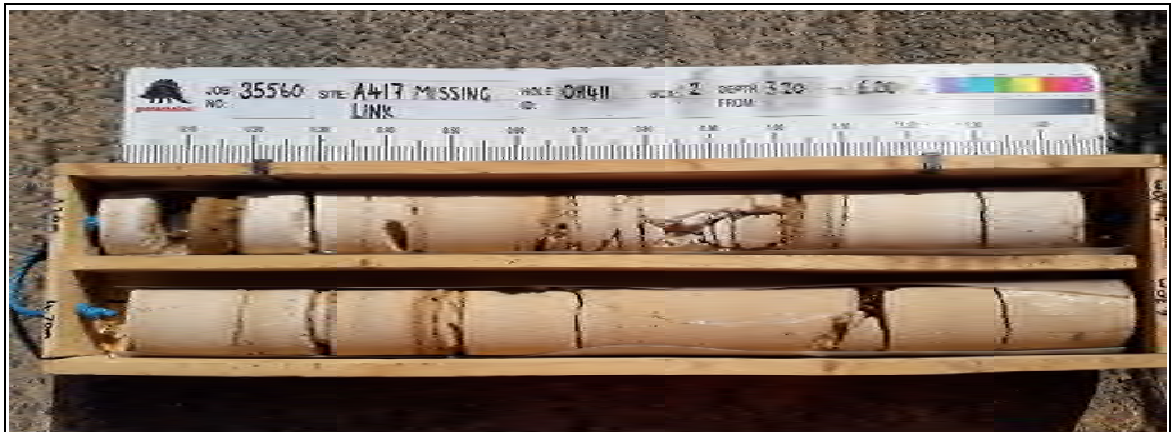
Borehole: DSRC229 Box 9: 24.20-25.00m



Borehole: OH411 IP: 1.00m



Borehole: OH411 Box 1: 1.00-3.20m



Borehole: OH411 Box 2: 3.20-6.20m



Borehole: OH411 Box 3: 6.20-9.20m



Borehole: OH411 Box 4: 9.20-12.20m



Borehole: OH411 Box 5: 12.20-15.20m



Borehole: OH411 Box 6: 15.20-17.90m



Borehole: OH411 Box 7: 17.90-19.70m



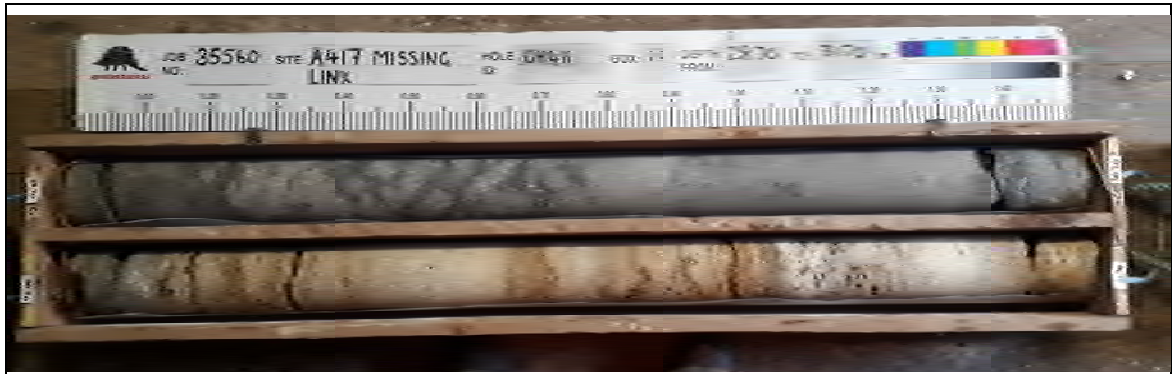
Borehole: OH411 Box 8: 19.70-22.70m



Borehole: OH411 Box 9: 22.70-25.70m



Borehole: OH411 Box 10: 25.70-28.70m



Borehole: OH411 Box 11: 28.70-31.70m



Borehole: OH411 Box 12: 31.70-34.70m



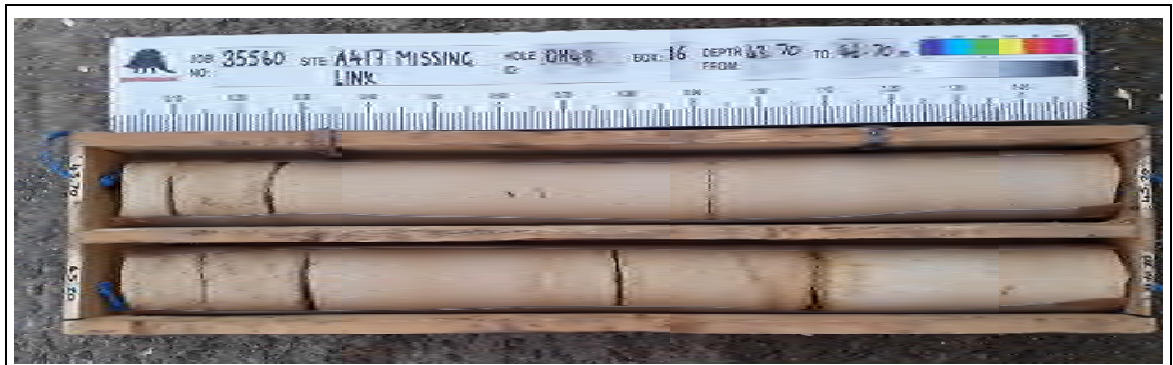
Borehole: OH411 Box 13: 34.70-37.70m



Borehole: OH411 Box 14: 37.70-40.70m



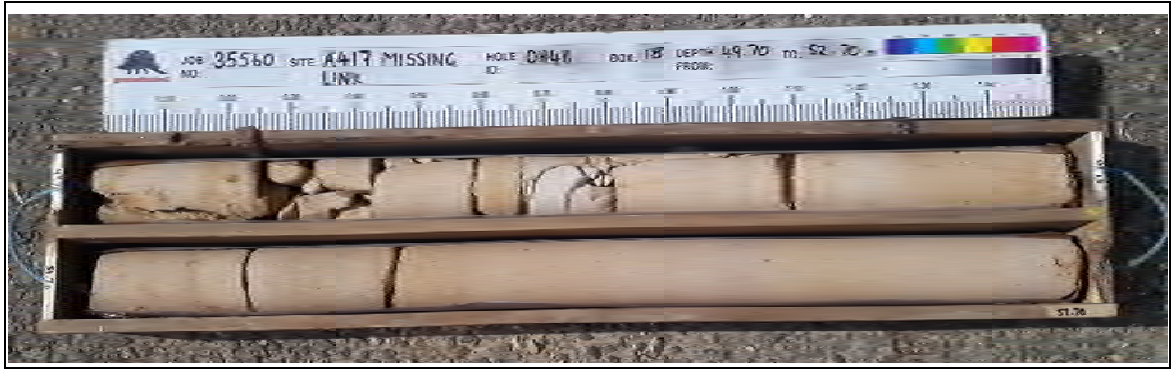
Borehole: OH411 Box 15: 40.70-43.70m



Borehole: OH411 Box 16: 43.70-46.70m



Borehole: OH411 Box 17: 46.70-49.70m



Borehole: OH411 Box 18: 49.70-52.70m



Borehole: OH411 Box 19: 52.70-55.70m



Borehole: OH411 Box 20: 55.70-58.70m



Borehole: OH411 Box 21: 58.70-61.70m





Borehole: OH411 Box 22: 61.70-64.70m



Borehole: OH411 Box 23: 64.70-67.70m



Borehole: OH411 Box 24: 67.70-70.70m



Borehole: OH411 Box 25: 70.70-73.70m



Borehole: OH411 Box 26: 73.70-76.70m



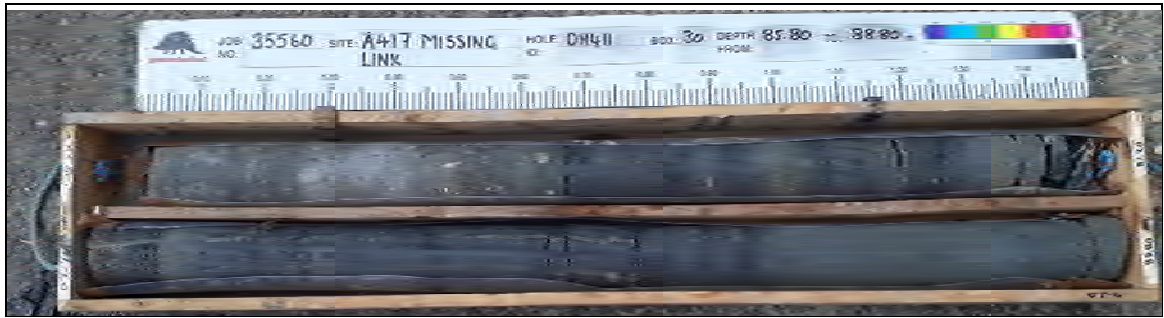
Borehole: OH411 Box 27: 76.70-79.70m



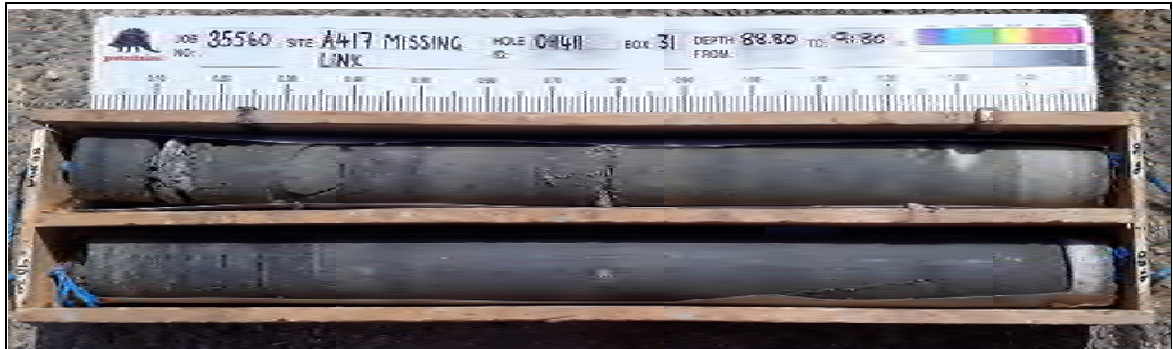
Borehole: OH411 Box 28: 79.70-82.80m



Borehole: OH411 Box 29: 82.80-85.80m



Borehole: OH411 Box 30: 85.80-88.80m



Borehole: OH411 Box 31: 88.80-91.80m



Borehole: OH411 Box 32: 91.80-94.80m



Borehole: OH411 Box 33: 94.80-97.80m



Borehole: OH411 Box 34: 97.80-100.80m



Borehole: RC516 Box 1: 1.20-4.20m



Borehole: RC516 Box 2: 4.20-7.20m



Borehole: RC516 Box 3: 7.20-10.20m



Borehole: RC516 Box 4: 10.20-13.20m



Borehole: RC516 Box 5: 13.20-16.20m



Borehole: RC516 Box 6: 16.20-19.20m



Borehole: RC516 Box 7: 19.20-22.20m



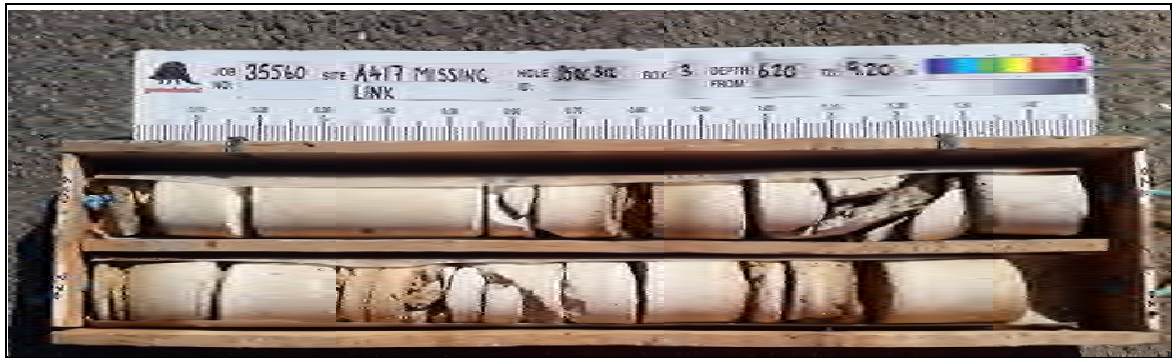
Borehole: DSRC312 IP: 1.05m



Borehole: DSRC312 Box 1: 1.05-3.20m



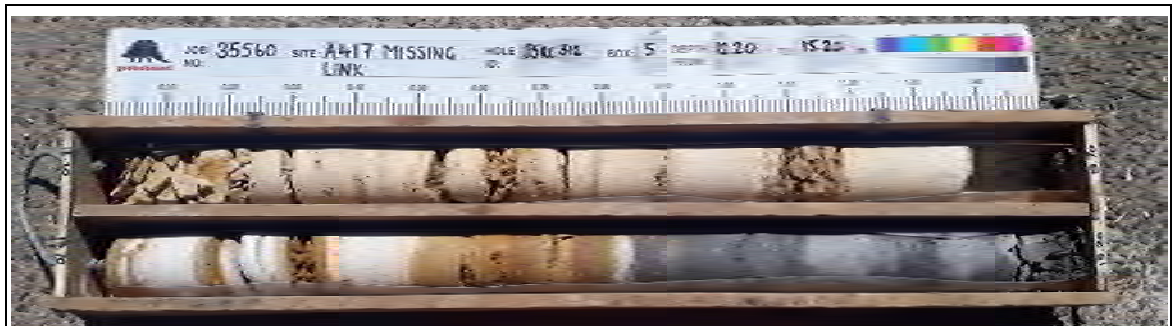
Borehole: DSRC312 Box 2: 3.20-6.20m



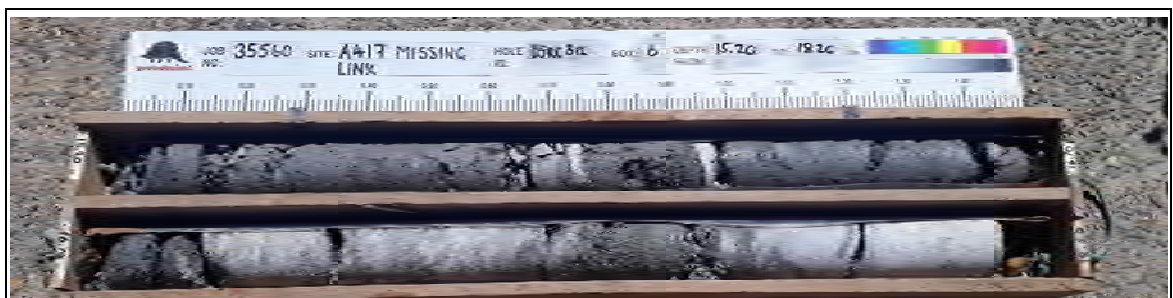
Borehole: DSRC312 Box 3: 6.20-9.20m



Borehole: DSRC312 Box 4: 9.20-12.20m



Borehole: DSRC312 Box 5: 12.20-15.20m



Borehole: DSRC312 Box 6: 15.20-18.20m





Borehole: DSRC312 Box 7: 18.20-21.20m



Borehole: DSRC312 Box 8: 21.20-24.20m



Borehole: DSRC312 Box 9: 24.20-25.10m



Borehole: TP606 1.30m



Borehole: TP606 1.30m



Borehole: TP606 1.30m



Borehole: TP606 Spoil



Borehole: TP635 3.00m



Borehole: TP635 3.00m



Borehole: TP635 2.10m



Borehole: TP635 Spoil



Borehole: TP636 1.70m



Borehole: TP636 1.70m



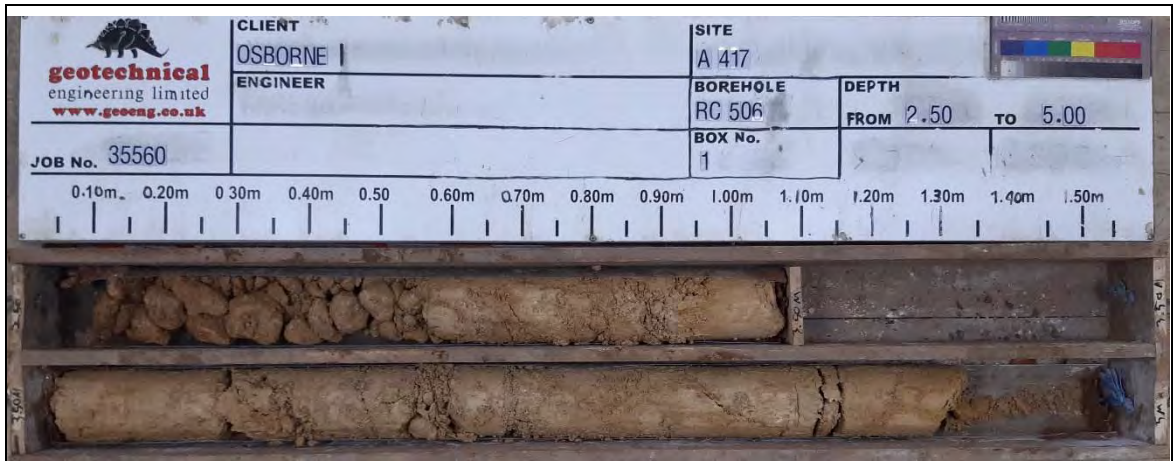
Borehole: TP636 1.70m



Borehole: TP636 Spoil



Borehole: RC506 IP: 0.40m



Borehole: RC506 Box 1: 2.50-5.00m

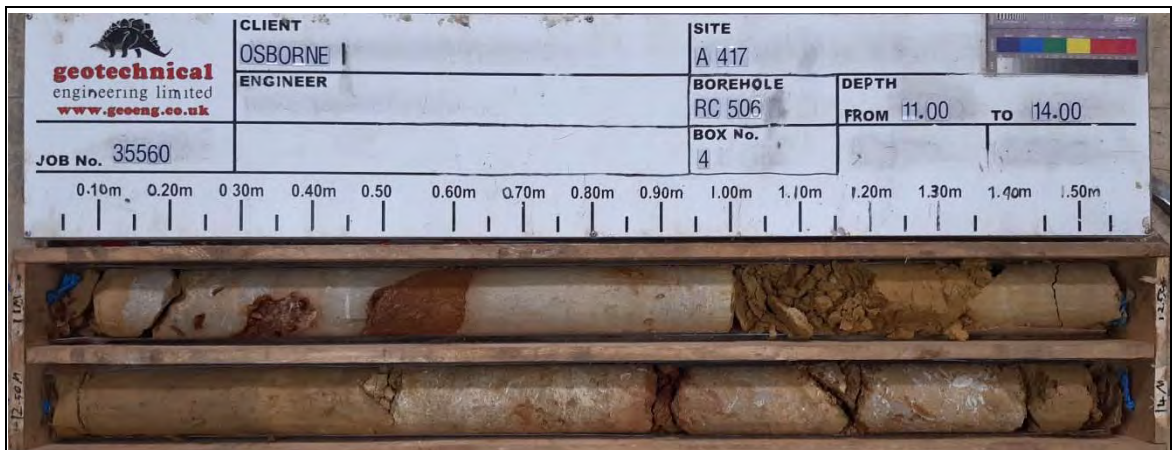




Borehole: RC506 Box 2: 5.00-8.00m



Borehole: RC506 Box 3: 8.00-11.00m



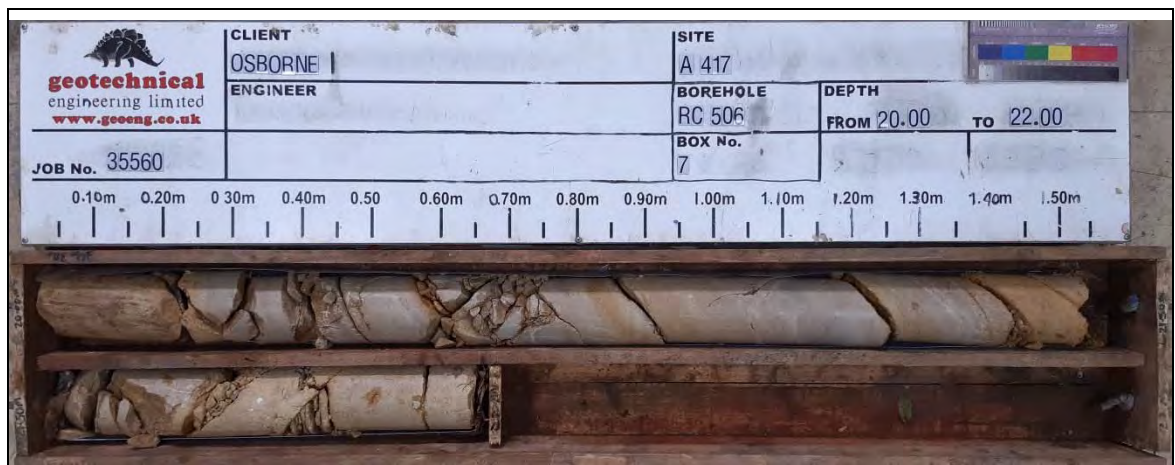
Borehole: RC506 Box 4: 11.00-14.00m



Borehole: RC506 Box 5: 14.00-17.00m



Borehole: RC506 Box 6: 17.00-20.00m



Borehole: RC506 Box 7: 20.00-22.00m



Borehole: TP602 Pit



Borehole: TP602 Pit



Borehole: TP602 Pit



Borehole: TP602 Spoil



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# **APPENDIX D**

## **POST-FIELDWORK MONITORING**



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# **APPENDIX D**

## **D1 GROUNDWATER MONITORING**

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
CP102	6.00	3.00 - 6.00	09/08/2019 12:50	1.53	126.02	5.88		
CP102	6.00	3.00 - 6.00	13/08/2019 08:35	1.67	125.88	5.88		
CP102	6.00	3.00 - 6.00	14/08/2019 08:40	1.34	126.21	5.88		
CP102	6.00	3.00 - 6.00	12/09/2019 09:35	1.69	125.86	5.88		
CP102	6.00	3.00 - 6.00	01/10/2019 09:00	1.30	126.25	5.88		
CP102	6.00	3.00 - 6.00	24/10/2019 09:00	1.04	126.51	5.88		
CP102	6.00	3.00 - 6.00	29/10/2019 12:00	1.00	126.55	5.88		
CP102	6.00	3.00 - 6.00	06/11/2019 10:53	1.03	126.52	5.88		
CP102	6.00	3.00 - 6.00	12/11/2019 16:15	0.98	126.57	5.88		
CP102	6.00	3.00 - 6.00	19/11/2019 14:11	1.07	126.48	5.88		
CP102	6.00	3.00 - 6.00	26/11/2019 15:04	1.02	126.53	5.88		
CP102	6.00	3.00 - 6.00	03/12/2019 14:59	1.03	126.52	5.88		
CP102	6.00	3.00 - 6.00	10/12/2019 15:20	1.06	126.49	5.88		
CP102	6.00	3.00 - 6.00	17/12/2019 14:36	0.96	126.59	5.88		
CP102	6.00	3.00 - 6.00	08/01/2020 12:00	1.14	126.41	5.88		
CP102	6.00	3.00 - 6.00	24/01/2020 12:00	1.18	126.37	5.88		
CP102	6.00	3.00 - 6.00	31/01/2020 12:00	1.18	126.37	5.88		
CP102	6.00	3.00 - 6.00	04/02/2020 12:00	1.20	126.35	5.88		
CP102	6.00	3.00 - 6.00	12/02/2020 12:00	1.13	126.42	5.88		
CP102	6.00	3.00 - 6.00	19/02/2020 12:00	0.91	126.64	5.88		
CP102	6.00	3.00 - 6.00	25/03/2020 11:00	1.15	126.40	5.88		
CP102	6.00	3.00 - 6.00	25/06/2020 00:00	1.40	126.15	5.88		
CP102	6.00	3.00 - 6.00	30/09/2020 15:39	1.54	126.01	5.88		
CP102	6.00	3.00 - 6.00	28/10/2020 14:59	1.22	126.33	5.88		
General Remarks:							CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
CP104A	15.80	14.70 - 16.00	12/09/2019 10:20	11.15	136.85	15.85		
CP104A	15.80	14.70 - 16.00	01/10/2019 09:20	11.50	136.50	15.85		
CP104A	15.80	14.70 - 16.00	24/10/2019 09:20	11.50	136.50	15.85		
CP104A	15.80	14.70 - 16.00	29/10/2019 12:00	11.00	137.00	15.85		
CP104A	15.80	14.70 - 16.00	06/11/2019 10:45	11.32	136.68	15.85		
CP104A	15.80	14.70 - 16.00	19/11/2019 11:30	10.25	137.75	15.85		
CP104A	15.80	14.70 - 16.00	26/11/2019 14:42	9.95	138.05	15.85		
CP104A	15.80	14.70 - 16.00	03/12/2019 14:33	9.81	138.19	15.85		
CP104A	15.80	14.70 - 16.00	10/12/2019 15:05	9.70	138.30	15.85		
CP104A	15.80	14.70 - 16.00	17/12/2019 13:04	9.50	138.50	15.85		
CP104A	15.80	14.70 - 16.00	08/01/2020 12:00	9.41	138.59	15.85		
CP104A	15.80	14.70 - 16.00	24/01/2020 12:00	9.04	138.96	15.85		
CP104A	15.80	14.70 - 16.00	31/01/2020 12:00	9.00	139.00	15.85		
CP104A	15.80	14.70 - 16.00	04/02/2020 12:00	9.15	138.85	15.85		
CP104A	15.80	14.70 - 16.00	12/02/2020 12:00	9.15	138.85	15.85		
CP104A	15.80	14.70 - 16.00	19/02/2020 12:00	8.95	139.05	15.85		
CP104A	15.80	14.70 - 16.00	24/03/2020 12:00	8.64	139.36	15.85		
CP104A	15.80	14.70 - 16.00	18/06/2020 00:00	9.82	138.18	15.85		
CP104A	15.80	14.70 - 16.00	25/06/2020 10:05	10.00	138.00	15.85	Water quality monitoring level	
CP104A	15.80	14.70 - 16.00	25/06/2020 10:06	10.00	138.00	15.85	Water quality monitoring level	
CP104A	15.80	14.70 - 16.00	25/06/2020 10:07	10.00	138.00	15.85	Water quality monitoring level	
CP104A	15.80	14.70 - 16.00	25/06/2020 10:08	10.00	138.00	15.85	Water quality monitoring level	
CP104A	15.80	14.70 - 16.00	25/06/2020 10:09	10.00	138.00	15.85	Water quality monitoring level	
CP104A	15.80	14.70 - 16.00	02/07/2020 00:00	9.97	138.03	15.85		
General Remarks:							CONTRACT 35560	CHECKED EL



**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
CP104A	15.80	14.70 - 16.00	14/07/2020 11:20	10.08	137.92	15.85		
CP104A	15.80	14.70 - 16.00	21/07/2020 10:33	10.18	137.82	15.85		
CP104A	15.80	14.70 - 16.00	21/07/2020 10:33	10.18	137.82		Water quality monitoring level	
CP104A	15.80	14.70 - 16.00	21/07/2020 10:34	10.18	137.82		Water quality monitoring level	
CP104A	15.80	14.70 - 16.00	21/07/2020 10:35	10.18	137.82		Water quality monitoring level	
CP104A	15.80	14.70 - 16.00	21/07/2020 10:36	10.18	137.82		Water quality monitoring level	
CP104A	15.80	14.70 - 16.00	21/07/2020 10:37	10.18	137.82		Water quality monitoring level	
CP104A	15.80	14.70 - 16.00	28/07/2020 14:09	10.25	137.75	15.85		
CP104A	15.80	14.70 - 16.00	26/08/2020 11:35	10.55	137.45	15.85		
CP104A	15.80	14.70 - 16.00	30/09/2020 15:50	10.70	137.30	15.85		
CP104A	15.80	14.70 - 16.00	28/10/2020 15:24	10.61	137.39	15.85		
CP104A	15.80	14.70 - 16.00	24/11/2020 10:31	10.29	137.71	15.65		
CP105	9.50	3.00 - 10.00	17/05/2019 10:57	4.18	165.72	9.50		
CP105	9.50	3.00 - 10.00	20/05/2019 14:19	4.22	165.68	9.50		
CP105	9.50	3.00 - 10.00	21/05/2019 09:15	4.25	165.65	9.50		
CP105	9.50	3.00 - 10.00	22/05/2019 16:39	4.31	165.59	9.50		
CP105	9.50	3.00 - 10.00	23/05/2019 11:09	4.33	165.57	9.50		
CP105	9.50	3.00 - 10.00	24/05/2019 10:20	4.35	165.55	9.50		
CP105	9.50	3.00 - 10.00	29/05/2019 09:15	4.43	165.47	9.50		
CP105	9.50	3.00 - 10.00	03/06/2019 09:35	4.49	165.41	9.50		
CP105	9.50	3.00 - 10.00	05/07/2019 09:10	3.63	166.27	9.50		
CP105	9.50	3.00 - 10.00	01/08/2019 14:15	4.28	165.62	9.50		
CP105	9.50	3.00 - 10.00	08/08/2019 11:00	4.48	165.42	9.50		
CP105	9.50	3.00 - 10.00	13/09/2019 09:24	4.55	165.35	9.50		
General Remarks:							CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
CP105	9.50	3.00 - 10.00	23/10/2019 09:10	2.91	166.99	9.50	
CP105	9.50	3.00 - 10.00	01/11/2019 12:01	2.88	167.02	9.50	
CP105	9.50	3.00 - 10.00	07/11/2019 10:39	2.84	167.06	9.50	
CP105	9.50	3.00 - 10.00	15/11/2019 14:03	2.43	167.47	9.50	
CP105	9.50	3.00 - 10.00	25/11/2019 11:12	2.59	167.31	9.50	
CP105	9.50	3.00 - 10.00	29/11/2019 12:12	2.48	167.42	9.50	
CP105	9.50	3.00 - 10.00	06/12/2019 11:01	3.04	166.86	9.50	
CP105	9.50	3.00 - 10.00	12/12/2019 12:20	2.71	167.19	9.50	
CP105	9.50	3.00 - 10.00	20/12/2019 11:15	1.97	167.93	9.50	
CP105	9.50	3.00 - 10.00	07/01/2020 09:55	3.21	166.69	9.50	
CP105	9.50	3.00 - 10.00	14/01/2020 12:00	2.37	167.53	9.50	
CP105	9.50	3.00 - 10.00	23/01/2020 12:00	2.96	166.94	9.50	
CP105	9.50	3.00 - 10.00	31/01/2020 12:00	2.99	166.91	9.50	
CP105	9.50	3.00 - 10.00	04/02/2020 12:00	3.02	166.88	9.50	
CP105	9.50	3.00 - 10.00	13/02/2020 12:00	2.17	167.73	9.50	
CP105	9.50	3.00 - 10.00	20/02/2020 12:00	2.30	167.60	9.50	
CP105	9.50	3.00 - 10.00	27/02/2020 12:00	2.20	167.70	9.50	
CP105	9.50	3.00 - 10.00	05/03/2020 12:00	2.18	167.72	9.50	
CP105	9.50	3.00 - 10.00	13/03/2020 12:00	2.05	167.85	9.50	
CP105	9.50	3.00 - 10.00	27/03/2020 12:00	3.26	166.64	9.50	
CP105	9.50	3.00 - 10.00	02/04/2020 09:09	7.00	162.90		Water quality monitoring level
CP105	9.50	3.00 - 10.00	02/04/2020 09:10	7.00	162.90		Water quality monitoring level
CP105	9.50	3.00 - 10.00	02/04/2020 09:11	7.00	162.90		Water quality monitoring level
CP105	9.50	3.00 - 10.00	02/04/2020 09:12	7.00	162.90		Water quality monitoring level
General Remarks:						CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
CP105	9.50	3.00 - 10.00	02/04/2020 09:14	7.00	162.90		Water quality monitoring level
CP105	9.50	3.00 - 10.00	02/04/2020 09:15	7.00	162.90		Water quality monitoring level
CP105	9.50	3.00 - 10.00	02/04/2020 09:16	7.00	162.90		Water quality monitoring level
CP105	9.50	3.00 - 10.00	02/04/2020 09:17	7.00	162.90		Water quality monitoring level
CP105	9.50	3.00 - 10.00	02/04/2020 09:18	7.00	162.90		Water quality monitoring level
CP105	9.50	3.00 - 10.00	02/04/2020 09:19	7.00	162.90		Water quality monitoring level
CP105	9.50	3.00 - 10.00	02/04/2020 12:00	3.38	166.52	9.50	
CP105	9.50	3.00 - 10.00	08/04/2020 09:54	5.00	164.90		Water quality monitoring level
CP105	9.50	3.00 - 10.00	08/04/2020 09:55	5.00	164.90		Water quality monitoring level
CP105	9.50	3.00 - 10.00	08/04/2020 09:56	5.00	164.90		Water quality monitoring level
CP105	9.50	3.00 - 10.00	08/04/2020 09:57	5.00	164.90		Water quality monitoring level
CP105	9.50	3.00 - 10.00	08/04/2020 09:58	5.00	164.90		Water quality monitoring level
CP105	9.50	3.00 - 10.00	08/04/2020 12:00	3.62	166.28	9.50	
CP105	9.50	3.00 - 10.00	15/04/2020 12:00	3.82	166.08	9.50	
CP105	9.50	3.00 - 10.00	15/04/2020 13:29	9.50	160.40		Water quality monitoring level
CP105	9.50	3.00 - 10.00	15/04/2020 13:30	9.50	160.40		Water quality monitoring level
CP105	9.50	3.00 - 10.00	15/04/2020 13:31	9.50	160.40		Water quality monitoring level
CP105	9.50	3.00 - 10.00	15/04/2020 13:32	9.50	160.40		Water quality monitoring level
CP105	9.50	3.00 - 10.00	04/05/2020 12:00	4.21	165.69	9.50	
CP105	9.50	3.00 - 10.00	21/05/2020 12:00	4.57	165.33	9.50	
CP105	9.50	3.00 - 10.00	26/05/2020 12:00	4.64	165.26	9.50	
CP105	9.50	3.00 - 10.00	03/06/2020 12:00	4.68	165.22	9.50	
CP105	9.50	3.00 - 10.00	10/06/2020 12:00	4.83	165.07	9.50	
CP105	9.50	3.00 - 10.00	07/07/2020 12:00	4.86	165.04	9.50	
General Remarks:						CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
CP105	9.50	3.00 - 10.00	20/07/2020 13:18	4.99	164.91	9.50	Turf has possibly regrown over the cover.	
CP105	9.50	3.00 - 10.00	28/07/2020 12:20	5.05	164.85	9.50		
CP105	9.50	3.00 - 10.00	25/08/2020 12:40	4.64	165.26	9.50		
CP105	9.50	3.00 - 10.00	24/09/2020 11:35	4.64	165.26	9.50		
CP105	9.50	3.00 - 10.00	28/10/2020 12:45	Dry				
CP106	30.00	20.00 - 30.50	17/05/2019 10:28	15.67	170.58	29.80		
CP106	30.00	20.00 - 30.50	20/05/2019 14:25	15.73	170.52	29.80		
CP106	30.00	20.00 - 30.50	21/05/2019 09:23	15.75	170.50	29.80		
CP106	30.00	20.00 - 30.50	22/05/2019 16:45	15.82	170.43	29.80		
CP106	30.00	20.00 - 30.50	23/05/2019 11:00	15.85	170.40	29.80		
CP106	30.00	20.00 - 30.50	24/05/2019 10:30	15.85	170.40	29.80		
CP106	30.00	20.00 - 30.50	29/05/2019 09:25	15.87	170.38	29.80		
CP106	30.00	20.00 - 30.50	03/06/2019 09:48	15.92	170.33	29.80		
CP106	30.00	20.00 - 30.50	10/06/2019 09:10	15.88	170.37	29.80		
CP106	30.00	20.00 - 30.50	01/08/2019 14:00	16.02	170.23	29.80		
CP106	30.00	20.00 - 30.50	08/08/2019 12:35	16.19	170.06	29.80		
CP106	30.00	20.00 - 30.50	31/01/2020 12:00	16.10	170.15	29.80		
CP106	30.00	20.00 - 30.50	04/02/2020 12:00	16.15	170.10	29.80		
CP106	30.00	20.00 - 30.50	13/02/2020 12:00	14.52	171.73	29.80		
CP106	30.00	20.00 - 30.50	20/02/2020 12:00	15.92	170.33	29.80		
CP106	30.00	20.00 - 30.50	27/02/2020 12:00	15.88	170.37	29.80		
CP106	30.00	20.00 - 30.50	05/03/2020 12:00	15.95	170.30	29.80		
CP106	30.00	20.00 - 30.50	10/03/2020 12:00	15.74	170.51	29.80		
CP106	30.00	20.00 - 30.50	27/03/2020 12:00	15.74	170.51	29.80		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
CP106	30.00	20.00 - 30.50	01/04/2020 11:32	15.74	170.51		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	01/04/2020 11:33	15.74	170.51		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	01/04/2020 11:34	15.74	170.51		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	01/04/2020 11:35	15.74	170.51		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	01/04/2020 11:36	15.74	170.51		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	01/04/2020 11:37	15.74	170.51		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	01/04/2020 11:38	15.74	170.51		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	01/04/2020 11:39	15.74	170.51		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	01/04/2020 11:40	15.74	170.51		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	01/04/2020 11:41	15.74	170.51		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	01/04/2020 11:42	15.74	170.51		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	01/04/2020 11:43	15.74	170.51		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	01/04/2020 11:44	15.74	170.51		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	01/04/2020 11:45	15.74	170.51		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	01/04/2020 11:46	15.74	170.51		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	01/04/2020 11:47	15.74	170.51		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	01/04/2020 11:48	15.74	170.51		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	01/04/2020 11:49	15.74	170.51		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	01/04/2020 11:50	15.74	170.51		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	01/04/2020 12:00	15.37	170.88	29.80		
CP106	30.00	20.00 - 30.50	08/04/2020 09:36	18.00	168.25		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	08/04/2020 09:37	18.00	168.25		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	08/04/2020 09:38	18.00	168.25		Water quality monitoring level	
CP106	30.00	20.00 - 30.50	08/04/2020 09:39	18.00	168.25		Water quality monitoring level	
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
CP106	30.00	20.00 - 30.50	08/04/2020 09:41	18.00	168.25		Water quality monitoring level
CP106	30.00	20.00 - 30.50	08/04/2020 12:00	15.00	171.25	29.80	
CP106	30.00	20.00 - 30.50	15/04/2020 12:00	14.98	171.27	29.80	
CP106	30.00	20.00 - 30.50	15/04/2020 13:09	16.00	170.25		Water quality monitoring level
CP106	30.00	20.00 - 30.50	15/04/2020 13:10	16.00	170.25		Water quality monitoring level
CP106	30.00	20.00 - 30.50	15/04/2020 13:11	16.00	170.25		Water quality monitoring level
CP106	30.00	20.00 - 30.50	15/04/2020 13:12	16.00	170.25		Water quality monitoring level
CP106	30.00	20.00 - 30.50	15/04/2020 13:13	16.00	170.25		Water quality monitoring level
CP106	30.00	20.00 - 30.50	15/04/2020 13:14	16.00	170.25		Water quality monitoring level
CP106	30.00	20.00 - 30.50	29/04/2020 12:00	15.21	171.04	29.80	
CP106	30.00	20.00 - 30.50	07/05/2020 12:00	15.40	170.85	29.80	
CP106	30.00	20.00 - 30.50	21/05/2020 12:00	15.67	170.58	29.80	
CP106	30.00	20.00 - 30.50	26/05/2020 12:00	15.75	170.50	29.80	
CP106	30.00	20.00 - 30.50	03/06/2020 12:00	15.82	170.43	29.80	
CP106	30.00	20.00 - 30.50	10/06/2020 12:00	15.94	170.31	29.80	
CP106	30.00	20.00 - 30.50	30/06/2020 12:00	16.02	170.23	29.80	
CP106	30.00	20.00 - 30.50	07/07/2020 12:00	16.10	170.15	29.80	
CP106	30.00	20.00 - 30.50	14/07/2020 13:12			29.80	
CP106	30.00	20.00 - 30.50	20/07/2020 13:40	16.19	170.06	29.80	
CP106	30.00	20.00 - 30.50	28/07/2020 12:53	16.24	170.01	29.80	
CP106	30.00	20.00 - 30.50	25/08/2020 14:43	16.39	169.86	29.80	
CP106	30.00	20.00 - 30.50	24/09/2020 13:37	16.23	170.02	29.80	
CP106	30.00	20.00 - 30.50	28/10/2020 08:46	16.03	170.22	29.80	
CP106	30.00	20.00 - 30.50	24/11/2020 09:00	15.99	170.26	29.80	
General Remarks:						CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
CP200	11.00	8.50 - 12.00	13/08/2019 08:15	3.07	126.63	11.05	
CP200	11.00	8.50 - 12.00	14/08/2019 08:20	3.06	126.64	11.05	
CP200	11.00	8.50 - 12.00	12/09/2019 10:05	3.15	126.55	11.05	
CP200	11.00	8.50 - 12.00	01/10/2019 09:10	3.00	126.70	11.05	
CP200	11.00	8.50 - 12.00	24/10/2019 09:10	3.76	125.94	11.05	
CP200	11.00	8.50 - 12.00	29/10/2019 12:00	2.83	126.87	11.05	
CP200	11.00	8.50 - 12.00	06/11/2019 10:35	2.84	126.86	11.05	
CP200	11.00	8.50 - 12.00	12/11/2019 15:42	2.68	127.02	11.05	
CP200	11.00	8.50 - 12.00	19/11/2019 09:49	2.73	126.97	11.05	
CP200	11.00	8.50 - 12.00	26/11/2019 14:20	2.64	127.06	11.05	
CP200	11.00	8.50 - 12.00	03/12/2019 14:17	2.75	126.95	11.05	
CP200	11.00	8.50 - 12.00	10/12/2019 14:53	2.73	126.97	11.05	
CP200	11.00	8.50 - 12.00	17/12/2019 12:56	2.65	127.05	11.05	
CP200	11.00	8.50 - 12.00	08/01/2020 12:00	2.77	126.93	11.05	
CP200	11.00	8.50 - 12.00	24/01/2020 12:00	2.66	127.04	11.05	
CP200	11.00	8.50 - 12.00	31/01/2020 12:00	2.67	127.03	11.05	
CP200	11.00	8.50 - 12.00	04/02/2020 12:00	2.68	127.02	11.05	
CP200	11.00	8.50 - 12.00	12/02/2020 12:00	2.66	127.04	11.05	
CP200	11.00	8.50 - 12.00	19/02/2020 12:00	2.58	127.12	11.05	
CP200	11.00	8.50 - 12.00	18/06/2020 12:00	2.95	126.75	11.05	
CP200	11.00	8.50 - 12.00	18/06/2020 13:38	3.00	126.70		Water quality monitoring level
CP200	11.00	8.50 - 12.00	18/06/2020 13:39	3.00	126.70		Water quality monitoring level
CP200	11.00	8.50 - 12.00	18/06/2020 13:40	3.00	126.70		Water quality monitoring level
CP200	11.00	8.50 - 12.00	18/06/2020 13:41	3.00	126.70		Water quality monitoring level
General Remarks:						CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
CP200	11.00	8.50 - 12.00	18/06/2020 13:43	3.00	126.70		Water quality monitoring level
CP200	11.00	8.50 - 12.00	18/06/2020 13:44	3.00	126.70		Water quality monitoring level
CP200	11.00	8.50 - 12.00	18/06/2020 14:09	3.00	126.70		Water quality monitoring level
CP200	11.00	8.50 - 12.00	18/06/2020 14:10	3.00	126.70		Water quality monitoring level
CP200	11.00	8.50 - 12.00	18/06/2020 14:11	3.00	126.70		Water quality monitoring level
CP200	11.00	8.50 - 12.00	02/07/2020 12:00	2.97	126.73	11.05	
CP200	11.00	8.50 - 12.00	08/07/2020 13:48	2.98	126.72	11.05	
CP200	11.00	8.50 - 12.00	15/07/2020 15:33	2.99	126.71	11.05	
CP200	11.00	8.50 - 12.00	21/07/2020 12:49	3.08	126.62	11.05	
CP200	11.00	8.50 - 12.00	26/08/2020 15:01	3.07	126.63	11.05	
CP200	11.00	8.50 - 12.00	30/09/2020 15:20	3.12	126.58	11.05	
CP200	11.00	8.50 - 12.00	28/10/2020 15:36	2.95	126.75	11.05	
CP200	11.00	8.50 - 12.00	24/11/2020 10:05	2.90	126.80	11.05	
CP202	5.70	3.70 - 5.70	09/08/2019 12:40	0.83	134.87	5.69	
CP202	5.70	3.70 - 5.70	13/08/2019 08:25	0.81	134.89	5.69	
CP202	5.70	3.70 - 5.70	14/08/2019 08:30	0.81	134.89	5.69	
CP202	5.70	3.70 - 5.70	12/09/2019 10:15	1.00	134.70	5.69	
CP202	5.70	3.70 - 5.70	01/10/2019 09:15	0.75	134.95	5.69	
CP202	5.70	3.70 - 5.70	24/10/2019 09:15	0.65	135.05	5.69	
CP202	5.70	3.70 - 5.70	29/10/2019 12:00	0.55	135.15	5.69	
CP202	5.70	3.70 - 5.70	06/11/2019 10:39	0.41	135.29	5.69	
CP202	5.70	3.70 - 5.70	12/11/2019 15:48	0.30	135.40	5.69	
CP202	5.70	3.70 - 5.70	19/11/2019 11:21	0.18	135.52	5.69	
CP202	5.70	3.70 - 5.70	26/11/2019 14:31	0.09	135.61	5.69	
General Remarks:						CONTRACT 35560	CHECKED EL



**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
CP202	5.70	3.70 - 5.70	10/12/2019 15:00	0.02	135.68	5.69	
CP202	5.70	3.70 - 5.70	17/12/2019 14:45	0.00	135.70	5.69	
CP202	5.70	3.70 - 5.70	08/01/2020 12:00	0.00	135.70	5.69	
CP202	5.70	3.70 - 5.70	24/01/2020 12:00	0.00	135.70	5.69	
CP202	5.70	3.70 - 5.70	31/01/2020 12:00	0.00	135.70	5.69	
CP202	5.70	3.70 - 5.70	04/02/2020 12:00	0.00	135.70	5.69	
CP202	5.70	3.70 - 5.70	12/02/2020 12:00	0.00	135.70	5.69	
CP202	5.70	3.70 - 5.70	19/02/2020 12:00	0.00	135.70	5.69	
CP202	5.70	3.70 - 5.70	24/03/2020 10:49	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 10:50	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 10:51	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 10:52	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 10:53	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 10:54	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 10:55	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 10:56	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 10:57	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 10:58	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 10:59	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 11:00	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 11:01	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 11:02	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 11:03	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 11:04	0.00	135.70		Water quality monitoring level
General Remarks:						CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
CP202	5.70	3.70 - 5.70	24/03/2020 11:06	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 11:07	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 11:08	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 11:09	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 11:10	0.00	135.70		Water quality monitoring level
CP202	5.70	3.70 - 5.70	24/03/2020 12:00	0.00	135.70	5.69	
CP202	5.70	3.70 - 5.70	18/06/2020 12:00	0.24	135.46	5.69	
CP202	5.70	3.70 - 5.70	25/06/2020 13:27	0.50	135.20		Water quality monitoring level
CP202	5.70	3.70 - 5.70	25/06/2020 13:28	0.50	135.20		Water quality monitoring level
CP202	5.70	3.70 - 5.70	25/06/2020 13:29	0.50	135.20		Water quality monitoring level
CP202	5.70	3.70 - 5.70	25/06/2020 13:30	0.50	135.20		Water quality monitoring level
CP202	5.70	3.70 - 5.70	25/06/2020 13:31	0.50	135.20		Water quality monitoring level
CP202	5.70	3.70 - 5.70	21/07/2020 14:36	0.64	135.06	5.69	
CP202	5.70	3.70 - 5.70	29/07/2020 11:05	0.68	135.02	5.69	
CP202	5.70	3.70 - 5.70	26/08/2020 13:50	0.57	135.13	5.69	
CP202	5.70	3.70 - 5.70	30/09/2020 15:07	0.93	134.77	5.69	
CP202	5.70	3.70 - 5.70	28/10/2020 15:12	0.58	135.12	5.69	
CP202	5.70	3.70 - 5.70	24/11/2020 10:24	0.39	135.31	5.69	
CP204	9.90	8.50 - 10.00	13/08/2019 12:50	Dry		9.90	
CP204	9.90	8.50 - 10.00	12/11/2019 16:06	Dry		9.90	
CP204	9.90	8.50 - 10.00	19/11/2019 11:36	Dry		9.90	
CP204	9.90	8.50 - 10.00	26/11/2019 14:50	Dry		9.90	
CP204	9.90	8.50 - 10.00	03/12/2019 14:48	Dry		9.90	
CP204	9.90	8.50 - 10.00	10/12/2019 15:15	Dry		9.90	
General Remarks:						CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
CP204	9.90	8.50 - 10.00	31/01/2020 12:00	Dry		9.90		
CP204	9.90	8.50 - 10.00	12/02/2020 12:00	Dry		9.90		
CP204	9.90	8.50 - 10.00	19/02/2020 12:00	Dry		9.90		
CP204	9.90	8.50 - 10.00	24/03/2020 12:00	Dry		9.90		
CP204	9.90	8.50 - 10.00	18/06/2020 12:00	Dry		9.90		
CP204	9.90	8.50 - 10.00	02/07/2020 00:00	7.80	171.10	9.90		
CP204	9.90	8.50 - 10.00	08/07/2020 11:26	8.62	170.28	9.90		
CP204	9.90	8.50 - 10.00	14/07/2020 11:13	9.80	169.10	9.90		
CP204	9.90	8.50 - 10.00	21/07/2020 11:00	Dry		9.90		
CP204	9.90	8.50 - 10.00	28/07/2020 11:36	Dry		9.90		
CP204	9.90	8.50 - 10.00	25/08/2020 11:38	Dry		9.90		
CP204	9.90	8.50 - 10.00	24/09/2020 11:38	Dry		9.90		
CP204	9.90	8.50 - 10.00	28/10/2020 10:50	Dry		9.90		
CP204	9.90	8.50 - 10.00	24/11/2020 12:26	Dry		9.90		
CP204	13.90	12.50 - 14.00	09/08/2019 13:30	12.15	166.75	13.91		
CP204	13.90	12.50 - 14.00	13/08/2019 09:25	12.14	166.76	13.91		
CP204	13.90	12.50 - 14.00	12/11/2019 16:06	11.83	167.07	13.91		
CP204	13.90	12.50 - 14.00	19/11/2019 11:38	11.25	167.65	13.91		
CP204	13.90	12.50 - 14.00	26/11/2019 14:51	11.38	167.52	13.91		
CP204	13.90	12.50 - 14.00	03/12/2019 14:49	11.48	167.42	13.91		
CP204	13.90	12.50 - 14.00	10/12/2019 15:16	10.06	168.84	13.91		
CP204	13.90	12.50 - 14.00	17/12/2019 13:52	11.20	167.70	13.91		
CP204	13.90	12.50 - 14.00	08/01/2020 12:00	11.75	167.15	13.91		
CP204	13.90	12.50 - 14.00	19/02/2020 12:00	11.38	167.52	13.91		
General Remarks:							CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
CP204	13.90	12.50 - 14.00	25/06/2020 10:36	11.00	167.90		Water quality monitoring level	
CP204	13.90	12.50 - 14.00	25/06/2020 10:37	11.00	167.90		Water quality monitoring level	
CP204	13.90	12.50 - 14.00	25/06/2020 10:38	11.00	167.90		Water quality monitoring level	
CP204	13.90	12.50 - 14.00	25/06/2020 10:39	11.00	167.90		Water quality monitoring level	
CP204	13.90	12.50 - 14.00	25/06/2020 10:40	11.00	167.90		Water quality monitoring level	
CP204	13.90	12.50 - 14.00	25/06/2020 10:41	11.00	167.90		Water quality monitoring level	
CP204	13.90	12.50 - 14.00	25/06/2020 10:42	11.00	167.90		Water quality monitoring level	
CP204	13.90	12.50 - 14.00	02/07/2020 12:00	12.59	166.31	13.91		
CP204	13.90	12.50 - 14.00	07/07/2020 12:00	12.58	166.32	13.91		
CP204	13.90	12.50 - 14.00	14/07/2020 11:14	12.59	166.31	13.91		
CP204	13.90	12.50 - 14.00	21/07/2020 10:57	12.68	166.22		Water quality monitoring level	
CP204	13.90	12.50 - 14.00	21/07/2020 10:58	12.68	166.22		Water quality monitoring level	
CP204	13.90	12.50 - 14.00	21/07/2020 10:59	12.68	166.22	13.91		
CP204	13.90	12.50 - 14.00	21/07/2020 10:59	12.68	166.22		Water quality monitoring level	
CP204	13.90	12.50 - 14.00	21/07/2020 11:00	12.68	166.22		Water quality monitoring level	
CP204	13.90	12.50 - 14.00	21/07/2020 11:01	12.68	166.22		Water quality monitoring level	
CP204	13.90	12.50 - 14.00	21/07/2020 11:02	12.68	166.22		Water quality monitoring level	
CP204	13.90	12.50 - 14.00	21/07/2020 11:03	12.68	166.22		Water quality monitoring level	
CP204	13.90	12.50 - 14.00	28/07/2020 11:35	12.68	166.22	13.91		
CP204	13.90	12.50 - 14.00	24/09/2020 11:37	12.70	166.20	13.91		
CP204	13.90	12.50 - 14.00	24/11/2020 12:25	11.44	167.46	13.91		
CP206	16.00	9.00 - 16.00	17/05/2019 11:05			15.75		
CP206	16.00	9.00 - 16.00	20/05/2019 14:15	3.98	158.87	15.75		
CP206	16.00	9.00 - 16.00	21/05/2019 09:09	4.12	158.73	15.75		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
CP206	16.00	9.00 - 16.00	23/05/2019 11:14	4.23	158.62	15.75		
CP206	16.00	9.00 - 16.00	24/05/2019 10:10	4.16	158.69	15.75		
CP206	16.00	9.00 - 16.00	29/05/2019 09:09	4.03	158.82	15.75		
CP206	16.00	9.00 - 16.00	03/06/2019 09:28	3.92	158.93	15.75		
CP206	16.00	9.00 - 16.00	10/06/2019 09:30	3.85	159.00	15.75		
CP206	16.00	9.00 - 16.00	05/07/2019 09:05	3.63	159.22	15.75		
CP206	16.00	9.00 - 16.00	01/08/2019 13:00	4.26	158.59	15.75		
CP206	16.00	9.00 - 16.00	08/08/2019 11:25	4.38	158.47	15.75		
CP206	16.00	9.00 - 16.00	13/09/2019 09:34	4.40	158.45	15.75		
CP206	16.00	9.00 - 16.00	20/09/2019 15:30	4.50	158.35	15.75		
CP206	16.00	9.00 - 16.00	26/09/2019 11:04	4.50	158.35	15.75		
CP206	16.00	9.00 - 16.00	23/10/2019 13:40	3.64	159.21	15.75		
CP206	16.00	9.00 - 16.00	01/11/2019 11:55	3.81	159.04	15.75		
CP206	16.00	9.00 - 16.00	07/11/2019 10:34	3.64	159.21	15.75		
CP206	16.00	9.00 - 16.00	25/11/2019 11:08	3.63	159.22	15.75		
CP206	16.00	9.00 - 16.00	29/11/2019 12:07	3.15	159.70	15.75		
CP206	16.00	9.00 - 16.00	06/12/2019 10:55	3.84	159.01	15.75		
CP206	16.00	9.00 - 16.00	12/12/2019 12:15	3.77	159.08	15.75		
CP206	16.00	9.00 - 16.00	20/12/2019 11:25	2.70	160.15	15.75		
CP206	16.00	9.00 - 16.00	31/01/2020 12:00	3.69	159.16	15.75		
CP206	16.00	9.00 - 16.00	04/02/2020 12:00	3.75	159.10	15.75		
CP206	16.00	9.00 - 16.00	27/02/2020 12:00	3.40	159.45	15.75		
CP206	16.00	9.00 - 16.00	02/04/2020 09:20	6.00	156.85		Water quality monitoring level	
CP206	16.00	9.00 - 16.00	02/04/2020 09:21	6.00	156.85		Water quality monitoring level	
General Remarks:							CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
CP206	16.00	9.00 - 16.00	02/04/2020 09:23	6.00	156.85		Water quality monitoring level	
CP206	16.00	9.00 - 16.00	02/04/2020 09:24	6.00	156.85		Water quality monitoring level	
CP206	16.00	9.00 - 16.00	02/04/2020 09:25	6.00	156.85		Water quality monitoring level	
CP206	16.00	9.00 - 16.00	02/04/2020 09:26	6.00	156.85		Water quality monitoring level	
CP206	16.00	9.00 - 16.00	02/04/2020 12:00	3.85	159.00	15.75		
CP206	16.00	9.00 - 16.00	08/04/2020 10:08	5.00	157.85		Water quality monitoring level	
CP206	16.00	9.00 - 16.00	08/04/2020 10:09	5.00	157.85		Water quality monitoring level	
CP206	16.00	9.00 - 16.00	08/04/2020 10:10	5.00	157.85		Water quality monitoring level	
CP206	16.00	9.00 - 16.00	04/05/2020 12:00	4.54	158.31	15.75		
CP206	16.00	9.00 - 16.00	26/05/2020 12:00	4.80	158.05	15.75		
CP206	16.00	9.00 - 16.00	24/09/2020 11:33	4.92	157.93	15.75		
CP206	16.00	9.00 - 16.00	28/10/2020 12:40	3.95	158.90	15.75		
CP206	16.00	9.00 - 16.00	24/11/2020 12:58	4.15	158.70	15.75		
CP210	5.50	2.50 - 6.20	09/10/2019 10:15	Dry		5.50		
CP210	5.50	2.50 - 6.20	10/10/2019 10:15	Dry		5.50		
CP210	5.50	2.50 - 6.20	11/10/2019 10:20	Dry		5.50		
CP210	5.50	2.50 - 6.20	15/10/2019 10:15	Dry		5.50		
CP210	5.50	2.50 - 6.20	16/10/2019 10:15	Dry		5.50		
CP210	5.50	2.50 - 6.20	21/10/2019 12:00	Dry		5.50		
CP210	5.50	2.50 - 6.20	28/10/2019 12:00	Dry		5.50		
CP210	5.50	2.50 - 6.20	03/11/2019 11:11	Dry		5.50		
CP210	5.50	2.50 - 6.20	04/11/2019 09:46	Dry		5.50		
CP210	5.50	2.50 - 6.20	11/11/2019 10:54	Dry		5.50		
CP210	5.50	2.50 - 6.20	18/11/2019 14:51	Dry		5.50		
General Remarks:							CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
CP210	5.50	2.50 - 6.20	13/01/2020 11:38	Dry		5.50	
CP210	5.50	2.50 - 6.20	30/01/2020 12:00	Dry		5.50	
CP210	5.50	2.50 - 6.20	04/02/2020 12:00	Dry		5.50	
CP210	5.50	2.50 - 6.20	12/02/2020 12:00	Dry		5.50	
CP210	5.50	2.50 - 6.20	19/02/2020 12:00	Dry		5.50	
CP210	5.50	2.50 - 6.20	06/03/2020 12:00	Dry		5.50	
CP210	5.50	2.50 - 6.20	12/03/2020 12:00	Dry		5.50	
CP210	5.50	2.50 - 6.20	31/03/2020 12:00	Dry		5.50	
CP210	5.50	2.50 - 6.20	20/04/2020 12:00	Dry		5.50	
CP210	5.50	2.50 - 6.20	29/04/2020 12:00	Dry		5.50	
CP210	5.50	2.50 - 6.20	07/05/2020 12:00	Dry		5.50	
CP210	5.50	2.50 - 6.20	21/05/2020 12:00	Dry		5.50	
CP210	5.50	2.50 - 6.20	26/05/2020 12:00	Dry		5.50	
CP210	5.50	2.50 - 6.20	04/06/2020 12:00	Dry		5.50	
CP210	5.50	2.50 - 6.20	10/06/2020 12:00	Dry		5.50	
CP210	5.50	2.50 - 6.20	17/06/2020 12:00	Dry		5.50	
CP210	5.50	2.50 - 6.20	24/06/2020 12:00	Dry		5.50	
CP210	5.50	2.50 - 6.20	30/06/2020 12:00	Dry		5.50	
CP210	5.50	2.50 - 6.20	08/07/2020 08:43	Dry		5.50	
CP210	5.50	2.50 - 6.20	15/07/2020 08:43	Dry		5.50	
CP210	5.50	2.50 - 6.20	22/07/2020 08:32	Dry		5.50	
CP210	5.50	2.50 - 6.20	29/07/2020 08:59	Dry		5.50	
CP210	5.50	2.50 - 6.20	26/08/2020 11:37	Dry		5.50	
CP210	5.50	2.50 - 6.20	23/09/2020 10:05	Dry		5.50	
General Remarks:						CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
CP210	5.50	2.50 - 6.20	24/11/2020 11:16	Dry		5.50	
CP210	17.00	13.00 - 17.50	09/10/2019 10:20	16.40	157.90	17.00	
CP210	17.00	13.00 - 17.50	10/10/2019 10:15	15.60	158.70	17.00	
CP210	17.00	13.00 - 17.50	11/10/2019 10:20	15.60	158.70	17.00	
CP210	17.00	13.00 - 17.50	15/10/2019 10:15	15.55	158.75	17.00	
CP210	17.00	13.00 - 17.50	16/10/2019 10:15	15.40	158.90	17.00	
CP210	17.00	13.00 - 17.50	21/10/2019 12:00	15.20	159.10	17.00	
CP210	17.00	13.00 - 17.50	28/10/2019 12:00	14.70	159.60	17.00	
CP210	17.00	13.00 - 17.50	03/11/2019 11:10	14.93	159.37	17.00	
CP210	17.00	13.00 - 17.50	04/11/2019 09:45	14.91	159.39	17.00	
CP210	17.00	13.00 - 17.50	11/11/2019 10:53	14.96	159.34	17.00	
CP210	17.00	13.00 - 17.50	18/11/2019 14:52	14.45	159.85	17.00	
CP210	17.00	13.00 - 17.50	06/01/2020 08:50	15.32	158.98	17.00	
CP210	17.00	13.00 - 17.50	13/01/2020 11:39	14.81	159.49	17.00	
CP210	17.00	13.00 - 17.50	30/01/2020 12:00	15.18	159.12	17.00	
CP210	17.00	13.00 - 17.50	04/02/2020 12:00	15.20	159.10	17.00	
CP210	17.00	13.00 - 17.50	12/02/2020 12:00	15.92	158.38	17.00	
CP210	17.00	13.00 - 17.50	19/02/2020 12:00	15.05	159.25	17.00	
CP210	17.00	13.00 - 17.50	06/03/2020 12:00	14.62	159.68	17.00	
CP210	17.00	13.00 - 17.50	12/03/2020 12:00	15.02	159.28	17.00	
CP210	17.00	13.00 - 17.50	31/03/2020 12:00	15.25	159.05	17.00	
CP210	17.00	13.00 - 17.50	20/04/2020 12:00	15.52	158.78	17.00	
CP210	17.00	13.00 - 17.50	29/04/2020 12:00	15.68	158.62	17.00	
CP210	17.00	13.00 - 17.50	07/05/2020 12:00	15.58	158.72	17.00	
General Remarks:						CONTRACT 35560	CHECKED EL





# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
CP210	17.00	13.00 - 17.50	26/05/2020 12:00	15.77	158.53	17.00		
CP210	17.00	13.00 - 17.50	04/06/2020 12:00	15.78	158.52	17.00		
CP210	17.00	13.00 - 17.50	10/06/2020 12:00	15.82	158.48	17.00		
CP210	17.00	13.00 - 17.50	17/06/2020 12:00	15.85	158.45	17.00		
CP210	17.00	13.00 - 17.50	24/06/2020 12:00	15.90	158.40	17.00		
CP210	17.00	13.00 - 17.50	30/06/2020 12:00	15.65	158.65	17.00		
CP210	17.00	13.00 - 17.50	08/07/2020 08:42	15.69	158.61	17.00		
CP210	17.00	13.00 - 17.50	15/07/2020 08:42	15.70	158.60	17.00		
CP210	17.00	13.00 - 17.50	22/07/2020 08:31	15.72	158.58	17.00		
CP210	17.00	13.00 - 17.50	29/07/2020 08:59	15.83	158.47	17.00		
CP210	17.00	13.00 - 17.50	26/08/2020 11:38	13.72	160.58	17.00		
CP210	17.00	13.00 - 17.50	23/09/2020 10:04	13.72	160.58	17.00		
CP210	17.00	13.00 - 17.50	28/10/2020 10:56	15.40	158.90	17.00		
CP210	17.00	13.00 - 17.50	24/11/2020 11:15	15.32	158.98	16.90		
CP211	3.30	1.10 - 3.80	18/10/2019 10:30	Dry		3.30		
CP211	3.30	1.10 - 3.80	21/10/2019 10:35	Dry		3.30		
CP211	3.30	1.10 - 3.80	22/10/2019 10:30	Dry		3.30		
CP211	3.30	1.10 - 3.80	23/10/2019 10:30	Dry		3.30		
CP211	3.30	1.10 - 3.80	24/10/2019 10:30	Dry		3.30		
CP211	3.30	1.10 - 3.80	28/10/2019 12:00	Dry		3.30		
CP211	3.30	1.10 - 3.80	04/11/2019 09:41	Dry		3.30		
CP211	3.30	1.10 - 3.80	11/11/2019 11:10	Dry		3.30		
CP211	3.30	1.10 - 3.80	18/11/2019 14:46	Dry		3.30		
CP211	3.30	1.10 - 3.80	03/12/2019 11:07	Dry		3.30		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
CP211	3.30	1.10 - 3.80	13/01/2020 11:41	Dry		3.30	
CP211	3.30	1.10 - 3.80	30/01/2020 12:00	Dry		3.30	
CP211	3.30	1.10 - 3.80	04/02/2020 12:00	Dry		3.30	
CP211	3.30	1.10 - 3.80	12/02/2020 12:00	Dry		3.30	
CP211	3.30	1.10 - 3.80	20/02/2020 12:00	Dry		3.30	
CP211	3.30	1.10 - 3.80	06/03/2020 12:00	Dry		3.30	
CP211	3.30	1.10 - 3.80	12/03/2020 12:00	Dry		3.30	
CP211	3.30	1.10 - 3.80	31/03/2020 12:00	Dry		3.30	
CP211	3.30	1.10 - 3.80	20/04/2020 12:00	Dry		3.30	
CP211	3.30	1.10 - 3.80	29/04/2020 12:00	Dry		3.30	
CP211	3.30	1.10 - 3.80	07/05/2020 12:00	Dry		3.30	
CP211	3.30	1.10 - 3.80	21/05/2020 12:00	Dry		3.30	
CP211	3.30	1.10 - 3.80	26/05/2020 12:00	Dry		3.30	
CP211	3.30	1.10 - 3.80	04/06/2020 12:00	Dry		3.30	
CP211	3.30	1.10 - 3.80	10/06/2020 12:00	Dry		3.30	
CP211	3.30	1.10 - 3.80	17/06/2020 12:00	Dry		3.30	
CP211	3.30	1.10 - 3.80	24/06/2020 12:00	Dry		3.30	
CP211	3.30	1.10 - 3.80	30/06/2020 12:00	Dry		3.30	
CP211	3.30	1.10 - 3.80	08/07/2020 08:48	Dry		3.30	
CP211	3.30	1.10 - 3.80	15/07/2020 08:35	Dry		3.30	
CP211	3.30	1.10 - 3.80	22/07/2020 08:42	Dry		3.30	
CP211	3.30	1.10 - 3.80	29/07/2020 09:14	Dry		3.30	
CP211	3.30	1.10 - 3.80	26/08/2020 08:51	Dry		3.30	
CP211	3.30	1.10 - 3.80	23/09/2020 09:59	Dry		3.30	
General Remarks:						CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
CP211	3.30	1.10 - 3.80	24/11/2020 11:12	Dry		3.30		
CP212	13.90	8.00 - 14.20	06/06/2019 08:48	8.96	182.64	13.90		
CP212	13.90	8.00 - 14.20	07/06/2019 15:32	8.65	182.95	13.90		
CP212	13.90	8.00 - 14.20	10/06/2019 09:01	8.75	182.85	13.90		
CP212	13.90	8.00 - 14.20	11/06/2019 10:00	8.63	182.97	13.90		
CP212	13.90	8.00 - 14.20	12/06/2019 09:01	8.63	182.97	13.90		
CP212	13.90	8.00 - 14.20	05/07/2019 09:10	8.35	183.25	13.90		
CP212	13.90	8.00 - 14.20	01/08/2019 15:00	8.77	182.83	13.90		
CP212	13.90	8.00 - 14.20	08/08/2019 09:50	8.77	182.83	13.90		
CP212	13.90	8.00 - 14.20	23/10/2019 12:00	7.98	183.62	13.90		
CP212	13.90	8.00 - 14.20	01/11/2019 11:48	7.97	183.63	13.90		
CP212	13.90	8.00 - 14.20	07/11/2019 10:14	8.09	183.51	13.90		
CP212	13.90	8.00 - 14.20	15/11/2019 14:32	7.51	184.09	13.90		
CP212	13.90	8.00 - 14.20	25/11/2019 10:32	8.18	183.42	13.90		
CP212	13.90	8.00 - 14.20	29/11/2019 12:23	8.00	183.60	13.90		
CP212	13.90	8.00 - 14.20	06/12/2019 11:18	8.18	183.42	13.90		
CP212	13.90	8.00 - 14.20	12/12/2019 12:56	8.35	183.25	13.90		
CP212	13.90	8.00 - 14.20	20/12/2019 11:35	7.93	183.67	13.90		
CP212	13.90	8.00 - 14.20	07/01/2020 10:30	8.39	183.21	13.90		
CP212	13.90	8.00 - 14.20	14/01/2020 12:00	8.11	183.49	13.90		
CP212	13.90	8.00 - 14.20	23/01/2020 12:00	8.02	183.58	13.90		
CP212	13.90	8.00 - 14.20	31/01/2020 12:00	8.36	183.24	13.90		
CP212	13.90	8.00 - 14.20	04/02/2020 12:00	8.41	183.19	13.90		
CP212	13.90	8.00 - 14.20	13/02/2020 12:00	8.30	183.30	13.90		
General Remarks:							CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
CP212	13.90	8.00 - 14.20	13/03/2020 12:00	8.25	183.35	13.90		
CP212	13.90	8.00 - 14.20	27/03/2020 12:00	8.20	183.40	13.90		
CP212	13.90	8.00 - 14.20	02/04/2020 12:00	8.28	183.32	13.90		
CP212	13.90	8.00 - 14.20	08/04/2020 12:00	8.53	183.07	13.90		
CP212	13.90	8.00 - 14.20	04/05/2020 12:00	8.62	182.98	13.90		
CP212	13.90	8.00 - 14.20	26/05/2020 12:00	8.62	182.98	13.90		
CP212	13.90	8.00 - 14.20	30/06/2020 12:00	8.65	182.95	13.90		
CP212	13.90	8.00 - 14.20	07/07/2020 12:00	8.62	182.98	13.90		
CP212	13.90	8.00 - 14.20	14/07/2020 08:06	8.62	182.98	13.90		
CP212	13.90	8.00 - 14.20	20/07/2020 12:06	8.63	182.97	13.90		
CP212	13.90	8.00 - 14.20	28/07/2020 12:40	8.63	182.97	13.90		
CP212	13.90	8.00 - 14.20	25/08/2020 13:40	8.68	182.92	13.90		
CP212	13.90	8.00 - 14.20	24/09/2020 13:40	8.64	182.96	13.90		
CP212	13.90	8.00 - 14.20	28/10/2020 11:44	8.48	183.12	13.90		
CP212	13.90	8.00 - 14.20	24/11/2020 12:09	8.30	183.30	13.90		
CP212	24.50	18.50 - 24.50	06/06/2019 08:50	18.04	173.56	24.47		
CP212	24.50	18.50 - 24.50	07/06/2019 15:33	18.03	173.57	24.47		
CP212	24.50	18.50 - 24.50	10/06/2019 09:00	18.51	173.09	24.47		
CP212	24.50	18.50 - 24.50	11/06/2019 10:01	18.85	172.75	24.47		
CP212	24.50	18.50 - 24.50	12/06/2019 09:00	18.85	172.75	24.47		
CP212	24.50	18.50 - 24.50	05/07/2019 09:10	19.00	172.60	24.47		
CP212	24.50	18.50 - 24.50	01/08/2019 15:00	19.00	172.60	24.47		
CP212	24.50	18.50 - 24.50	08/08/2019 09:50	19.24	172.36	24.47		
CP212	24.50	18.50 - 24.50	13/09/2019 15:36	19.47	172.13	24.47		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
CP212	24.50	18.50 - 24.50	01/11/2019 11:48	18.44	173.16	24.47	
CP212	24.50	18.50 - 24.50	07/11/2019 10:14	18.38	173.22	24.47	
CP212	24.50	18.50 - 24.50	15/11/2019 10:32	18.35	173.25	24.47	
CP212	24.50	18.50 - 24.50	25/11/2019 10:32	18.28	173.32	24.47	
CP212	24.50	18.50 - 24.50	29/11/2019 12:23	18.34	173.26	24.47	
CP212	24.50	18.50 - 24.50	06/12/2019 11:18	18.23	173.37	24.47	
CP212	24.50	18.50 - 24.50	20/12/2019 11:35	18.00	173.60	24.47	
CP212	24.50	18.50 - 24.50	08/01/2020 00:00			24.50	
CP212	24.50	18.50 - 24.50	08/01/2020 12:00	18.2	173.40		
CP212	24.50	18.50 - 24.50	14/01/2020 12:00	18.10	173.50	24.47	
CP212	24.50	18.50 - 24.50	23/01/2020 12:00	18.09	173.51	24.47	
CP212	24.50	18.50 - 24.50	31/01/2020 12:00	17.97	173.63	24.47	
CP212	24.50	18.50 - 24.50	04/02/2020 12:00	18.02	173.58	24.47	
CP212	24.50	18.50 - 24.50	13/02/2020 12:00	17.87	173.73	24.47	
CP212	24.50	18.50 - 24.50	27/02/2020 12:00	17.85	173.75	24.47	
CP212	24.50	18.50 - 24.50	13/03/2020 12:00	17.87	173.73	24.47	
CP212	24.50	18.50 - 24.50	27/03/2020 12:00	17.87	173.73	24.47	
CP212	24.50	18.50 - 24.50	02/04/2020 12:00	17.82	173.78	24.47	
CP212	24.50	18.50 - 24.50	02/04/2020 13:38	20.00	171.60		Water quality monitoring level
CP212	24.50	18.50 - 24.50	02/04/2020 13:39	20.00	171.60		Water quality monitoring level
CP212	24.50	18.50 - 24.50	02/04/2020 13:40	20.00	171.60		Water quality monitoring level
CP212	24.50	18.50 - 24.50	02/04/2020 13:41	20.00	171.60		Water quality monitoring level
CP212	24.50	18.50 - 24.50	08/04/2020 12:00	17.88	173.72	24.47	
CP212	24.50	18.50 - 24.50	04/05/2020 12:00	18.11	173.49	24.47	
General Remarks:						CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
CP212	24.50	18.50 - 24.50	30/06/2020 12:00	18.85	172.75	24.47		
CP212	24.50	18.50 - 24.50	07/07/2020 12:00	18.98	172.62	24.47		
CP212	24.50	18.50 - 24.50	14/07/2020 08:08	19.05	172.55	24.47		
CP212	24.50	18.50 - 24.50	20/07/2020 12:05	19.14	172.46	24.47		
CP212	24.50	18.50 - 24.50	28/07/2020 12:43	19.16	172.44	24.47		
CP212	24.50	18.50 - 24.50	25/08/2020 13:39	19.37	172.23	24.47		
CP212	24.50	18.50 - 24.50	24/09/2020 13:39	19.32	172.28	24.47		
CP212	24.50	18.50 - 24.50	28/10/2020 11:43	18.98	172.62	24.47		
CP212	24.50	18.50 - 24.50	24/11/2020 12:11	18.68	172.92	24.47		
CP215	3.00	2.00 - 3.00	13/08/2019 13:35	1.68	184.37	3.00		
CP215	3.00	2.00 - 3.00	12/09/2019 10:48	Dry		3.00		
CP215	3.00	2.00 - 3.00	21/10/2019 12:00	1.75	184.30	3.00		
CP215	3.00	2.00 - 3.00	28/10/2019 12:00	1.74	184.31	3.00		
CP215	3.00	2.00 - 3.00	04/11/2019 10:21	1.78	184.27	3.00		
CP215	3.00	2.00 - 3.00	11/11/2019 11:30	1.72	184.33	3.00		
CP215	3.00	2.00 - 3.00	18/11/2019 15:53	1.72	184.33	3.00		
CP215	3.00	2.00 - 3.00	25/11/2019 16:41	1.78	184.27	3.00		
CP215	3.00	2.00 - 3.00	03/12/2019 11:40	1.73	184.32	3.00		
CP215	3.00	2.00 - 3.00	09/12/2019 11:36	1.84	184.21	3.00		
CP215	3.00	2.00 - 3.00	06/01/2020 10:00	1.96	184.09	3.00		
CP215	3.00	2.00 - 3.00	13/01/2020 12:17	1.93	184.12	3.00		
CP215	3.00	2.00 - 3.00	20/01/2020 12:00	1.65	184.40	3.00		
CP215	3.00	2.00 - 3.00	30/01/2020 12:00	1.78	184.27	3.00		
CP215	3.00	2.00 - 3.00	04/02/2020 12:00	1.82	184.23	3.00		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
CP215	3.00	2.00 - 3.00	27/02/2020 12:00	1.65	184.40	3.00		
CP215	3.00	2.00 - 3.00	06/03/2020 12:00	1.92	184.13	3.00		
CP215	3.00	2.00 - 3.00	10/03/2020 12:00	1.87	184.18	3.00		
CP215	3.00	2.00 - 3.00	12/03/2020 12:00	1.85	184.20	3.00		
CP215	3.00	2.00 - 3.00	19/03/2020 12:00	1.78	184.27	3.00		
CP215	3.00	2.00 - 3.00	24/03/2020 12:00	1.82	184.23	3.00		
CP215	3.00	2.00 - 3.00	31/03/2020 12:00	1.88	184.17	3.00		
CP215	3.00	2.00 - 3.00	14/04/2020 12:00	1.86	184.19	3.00		
CP215	3.00	2.00 - 3.00	21/04/2020 12:00	1.85	184.20	3.00		
CP215	3.00	2.00 - 3.00	29/04/2020 12:00	1.86	184.19	3.00		
CP215	3.00	2.00 - 3.00	07/05/2020 12:00	1.86	184.19	3.00		
CP215	3.00	2.00 - 3.00	21/05/2020 12:00	1.81	184.24	3.00		
CP215	3.00	2.00 - 3.00	26/05/2020 12:00	1.86	184.19	3.00		
CP215	3.00	2.00 - 3.00	04/06/2020 12:00	1.86	184.19	3.00		
CP215	3.00	2.00 - 3.00	10/06/2020 12:00	1.87	184.18	3.00		
CP215	3.00	2.00 - 3.00	17/06/2020 12:00	1.88	184.17	3.00		
CP215	3.00	2.00 - 3.00	24/06/2020 12:00	1.75	184.30	3.00		
CP215	3.00	2.00 - 3.00	30/06/2020 12:00	2.10	183.95	3.00		
CP215	3.00	2.00 - 3.00	08/07/2020 11:26	1.83	184.22	3.00		
CP215	3.00	2.00 - 3.00	15/07/2020 09:31	1.78	184.27	3.00		
CP215	3.00	2.00 - 3.00	22/07/2020 10:42	1.85	184.20	3.00		
CP215	3.00	2.00 - 3.00	29/07/2020 14:58	1.80	184.25	3.00		
CP215	3.00	2.00 - 3.00	26/08/2020 11:38	1.80	184.25	3.00		
CP215	3.00	2.00 - 3.00	23/09/2020 11:38	1.80	184.25	3.00		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
CP215	3.00	2.00 - 3.00	24/11/2020 11:25	1.80	184.25	3.00		
CP215	15.50	14.50 - 15.50	06/08/2019 15:30	15.27	170.78	15.55		
CP215	15.50	14.50 - 15.50	07/08/2019 15:10	15.32	170.73	15.55		
CP215	15.50	14.50 - 15.50	08/08/2019 15:50	15.28	170.77	15.55		
CP215	15.50	14.50 - 15.50	09/08/2019 11:30	15.38	170.67	15.55		
CP215	15.50	14.50 - 15.50	13/08/2019 08:50	15.28	170.77	15.55		
CP215	15.50	14.50 - 15.50	14/08/2019 09:00	15.29	170.76	15.55		
CP215	15.50	14.50 - 15.50	12/09/2019 10:47	15.15	170.90	15.55		
CP215	15.50	14.50 - 15.50	21/10/2019 12:00	15.15	170.90	15.55		
CP215	15.50	14.50 - 15.50	28/10/2019 12:00	15.00	171.05	15.55		
CP215	15.50	14.50 - 15.50	04/11/2019 10:21	15.09	170.96	15.55		
CP215	15.50	14.50 - 15.50	11/11/2019 11:30	14.86	171.19	15.55		
CP215	15.50	14.50 - 15.50	18/11/2019 15:53	14.41	171.64	15.55		
CP215	15.50	14.50 - 15.50	25/11/2019 16:41	14.61	171.44	15.55		
CP215	15.50	14.50 - 15.50	03/12/2019 11:40	14.34	171.71	15.55		
CP215	15.50	14.50 - 15.50	09/12/2019 11:36	14.45	171.60	15.55		
CP215	15.50	14.50 - 15.50	06/01/2020 10:00	13.54	172.51	15.55		
CP215	15.50	14.50 - 15.50	13/01/2020 12:17	13.46	172.59	15.55		
CP215	15.50	14.50 - 15.50	20/01/2020 12:00	13.16	172.89	15.55		
CP215	15.50	14.50 - 15.50	30/01/2020 12:00	13.46	172.59	15.55		
CP215	15.50	14.50 - 15.50	04/02/2020 12:00	13.52	172.53	15.55		
CP215	15.50	14.50 - 15.50	20/02/2020 12:00	12.85	173.20	15.55		
CP215	15.50	14.50 - 15.50	27/02/2020 12:00	13.05	173.00	15.55		
CP215	15.50	14.50 - 15.50	06/03/2020 12:00	13.77	172.28	15.55		
General Remarks:							CONTRACT 35560	CHECKED EL





# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
CP215	15.50	14.50 - 15.50	12/03/2020 12:00	13.91	172.14	15.55		
CP215	15.50	14.50 - 15.50	19/03/2020 12:00	13.86	172.19	15.55		
CP215	15.50	14.50 - 15.50	24/03/2020 12:00	14.23	171.82	15.55		
CP215	15.50	14.50 - 15.50	31/03/2020 12:00	14.30	171.75	15.55		
CP215	15.50	14.50 - 15.50	14/04/2020 12:00	14.05	172.00	15.55		
CP215	15.50	14.50 - 15.50	21/04/2020 12:00	13.65	172.40	15.55		
CP215	15.50	14.50 - 15.50	29/04/2020 12:00	13.66	172.39	15.55		
CP215	15.50	14.50 - 15.50	07/05/2020 12:00	13.65	172.40	15.55		
CP215	15.50	14.50 - 15.50	21/05/2020 12:00	13.66	172.39	15.55		
CP215	15.50	14.50 - 15.50	26/05/2020 12:00	13.63	172.42	15.55		
CP215	15.50	14.50 - 15.50	04/06/2020 12:00	13.64	172.41	15.55		
CP215	15.50	14.50 - 15.50	10/06/2020 12:00	13.68	172.37	15.55		
CP215	15.50	14.50 - 15.50	17/06/2020 12:00	13.74	172.31	15.55		
CP215	15.50	14.50 - 15.50	24/06/2020 12:00	13.57	172.48	15.55		
CP215	15.50	14.50 - 15.50	30/06/2020 12:00	13.93	172.12	15.55		
CP215	15.50	14.50 - 15.50	08/07/2020 11:25	13.60	172.45	15.55		
CP215	15.50	14.50 - 15.50	15/07/2020 09:30	13.58	172.47	15.55		
CP215	15.50	14.50 - 15.50	22/07/2020 10:41	13.56	172.49	15.55		
CP215	15.50	14.50 - 15.50	29/07/2020 14:57	13.69	172.36	15.55		
CP215	15.50	14.50 - 15.50	26/08/2020 11:37	13.72	172.33	15.55		
CP215	15.50	14.50 - 15.50	23/09/2020 11:37	13.72	172.33	15.55		
CP215	15.50	14.50 - 15.50	28/10/2020 11:14	13.70	172.35	15.55		
CP215	15.50	14.50 - 15.50	24/11/2020 11:24	13.64	172.41	15.50		
CP216	7.00	2.00 - 7.50	03/06/2019 09:42	0.64	172.86	7.00		
General Remarks:							CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
CP216	7.00	2.00 - 7.50	05/06/2019 09:14	1.44	172.06	7.00		
CP216	7.00	2.00 - 7.50	06/06/2019 08:55	1.45	172.05	7.00		
CP216	7.00	2.00 - 7.50	07/06/2019 15:44	1.33	172.17	7.00		
CP216	7.00	2.00 - 7.50	10/06/2019 09:40	1.21	172.29	7.00		
CP216	7.00	2.00 - 7.50	05/07/2019 09:20	1.00	172.50	7.00		
CP216	7.00	2.00 - 7.50	01/08/2019 13:05	1.16	172.34	7.00		
CP216	7.00	2.00 - 7.50	08/08/2019 11:10	1.34	172.16	7.00		
CP216	7.00	2.00 - 7.50	13/09/2019 09:16	1.45	172.05	7.00		
CP216	7.00	2.00 - 7.50	20/09/2019 15:24	1.48	172.02	7.00		
CP216	7.00	2.00 - 7.50	24/09/2019 12:00	1.30	172.20	7.00		
CP216	7.00	2.00 - 7.50	23/10/2019 12:00	0.85	172.65	7.00		
CP216	7.00	2.00 - 7.50	01/11/2019 12:04	0.88	172.62	7.00		
CP216	7.00	2.00 - 7.50	07/11/2019 10:43	0.85	172.65	7.00		
CP216	7.00	2.00 - 7.50	15/11/2019 14:00	0.95	172.55	7.00		
CP216	7.00	2.00 - 7.50	25/11/2019 11:15	0.86	172.64	7.00		
CP216	7.00	2.00 - 7.50	29/11/2019 12:16	0.75	172.75	7.00		
CP216	7.00	2.00 - 7.50	06/12/2019 11:08	0.95	172.55	7.00		
CP216	7.00	2.00 - 7.50	20/12/2019 11:10	0.72	172.78	7.00		
CP216	7.00	2.00 - 7.50	23/01/2020 12:00	0.94	172.56	7.00		
CP216	7.00	2.00 - 7.50	31/01/2020 12:00	1.01	172.49	7.00		
CP216	7.00	2.00 - 7.50	04/02/2020 12:00	1.05	172.45	7.00		
CP216	7.00	2.00 - 7.50	27/02/2020 12:00	1.00	172.50	7.00		
CP216	7.00	2.00 - 7.50	23/03/2020 11:44	1.11	172.39		Water quality monitoring level	
CP216	7.00	2.00 - 7.50	23/03/2020 11:45	1.11	172.39		Water quality monitoring level	
General Remarks:							CONTRACT 35560	CHECKED EL

# GROUNDWATER LEVELS



CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
CP216	7.00	2.00 - 7.50	23/03/2020 11:47	1.11	172.39		Water quality monitoring level
CP216	7.00	2.00 - 7.50	23/03/2020 11:48	1.11	172.39		Water quality monitoring level
CP216	7.00	2.00 - 7.50	23/03/2020 11:49	1.11	172.39		Water quality monitoring level
CP216	7.00	2.00 - 7.50	23/03/2020 11:50	1.11	172.39		Water quality monitoring level
CP216	7.00	2.00 - 7.50	23/03/2020 11:51	1.11	172.39		Water quality monitoring level
CP216	7.00	2.00 - 7.50	23/03/2020 11:52	1.11	172.39		Water quality monitoring level
CP216	7.00	2.00 - 7.50	23/03/2020 11:53	1.11	172.39		Water quality monitoring level
CP216	7.00	2.00 - 7.50	23/03/2020 11:54	1.11	172.39		Water quality monitoring level
CP216	7.00	2.00 - 7.50	23/03/2020 11:55	1.11	172.39		Water quality monitoring level
CP216	7.00	2.00 - 7.50	23/03/2020 11:56	1.11	172.39		Water quality monitoring level
CP216	7.00	2.00 - 7.50	23/03/2020 11:57	1.11	172.39		Water quality monitoring level
CP216	7.00	2.00 - 7.50	02/04/2020 08:57	5.00	168.50		Water quality monitoring level
CP216	7.00	2.00 - 7.50	02/04/2020 08:58	5.00	168.50		Water quality monitoring level
CP216	7.00	2.00 - 7.50	02/04/2020 08:59	5.00	168.50		Water quality monitoring level
CP216	7.00	2.00 - 7.50	02/04/2020 09:00	5.00	168.50		Water quality monitoring level
CP216	7.00	2.00 - 7.50	02/04/2020 12:00	1.15	172.35	7.00	
CP216	7.00	2.00 - 7.50	04/05/2020 12:00	1.47	172.03	7.00	
CP216	7.00	2.00 - 7.50	26/05/2020 12:00	1.67	171.83	7.00	
CP216	7.00	2.00 - 7.50	02/07/2020 12:00	1.77	171.73	7.00	
CP216	7.00	2.00 - 7.50	07/07/2020 12:00	1.87	171.63	7.00	
CP216	7.00	2.00 - 7.50	14/07/2020 11:45	1.82	171.68	7.00	
CP216	7.00	2.00 - 7.50	20/07/2020 13:32	1.92	171.58	7.00	
CP216	7.00	2.00 - 7.50	28/07/2020 12:27	1.89	171.61	7.00	
CP216	7.00	2.00 - 7.50	28/10/2020 00:00	Dry			Turf has possibly regrown over the cover.
General Remarks:						CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
CP223	22.60	19.00 - 23.10	21/05/2019 09:46	22.37	157.38	22.67		
CP223	22.60	19.00 - 23.10	22/05/2019 16:25	22.33	157.42	22.67		
CP223	22.60	19.00 - 23.10	23/05/2019 11:20	22.40	157.35	22.67		
CP223	22.60	19.00 - 23.10	24/05/2019 09:55	22.33	157.42	22.67		
CP223	22.60	19.00 - 23.10	29/05/2019 08:47	22.43	157.32	22.67		
CP223	22.60	19.00 - 23.10	03/06/2019 10:24	22.33	157.42	22.67		
CP223	22.60	19.00 - 23.10	10/06/2019 09:15	22.31	157.44	22.67		
CP223	22.60	19.00 - 23.10	05/07/2019 09:40	22.34	157.41	22.67		
CP223	22.60	19.00 - 23.10	01/08/2019 13:10	22.33	157.42	22.67		
CP223	22.60	19.00 - 23.10	08/08/2019 12:25	22.35	157.40	22.67		
CP223	22.60	19.00 - 23.10	13/09/2019 12:35	22.40	157.35	22.67		
CP223	22.60	19.00 - 23.10	20/09/2019 15:47	22.35	157.40	22.67		
CP223	22.60	19.00 - 23.10	24/09/2019 12:00	22.30	157.45	22.67		
CP223	22.60	19.00 - 23.10	23/10/2019 12:00			22.67		
CP223	22.60	19.00 - 23.10	01/11/2019 11:50			22.67		
CP223	22.60	19.00 - 23.10	07/11/2019 10:25	21.02	158.73	22.67		
CP223	22.60	19.00 - 23.10	15/11/2019 15:10	20.81	158.94	22.67		
CP223	22.60	19.00 - 23.10	29/11/2019 12:38			22.67		
CP223	22.60	19.00 - 23.10	06/12/2019 12:00	20.78	158.97	22.67		
CP223	22.60	19.00 - 23.10	12/12/2019 13:15	20.58	159.17	22.67		
CP223	22.60	19.00 - 23.10	20/12/2019 12:11	20.29	159.46	22.67		
CP223	22.60	19.00 - 23.10	07/01/2020 11:30	20.62	159.13	22.67		
CP223	22.60	19.00 - 23.10	14/01/2020 12:00	20.47	159.28	22.67		
CP223	22.60	19.00 - 23.10	23/01/2020 12:00	20.81	158.94	22.67		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
CP223	22.60	19.00 - 23.10	04/02/2020 12:00	20.75	159.00	22.67	
CP223	22.60	19.00 - 23.10	13/02/2020 12:00			22.67	
CP223	22.60	19.00 - 23.10	19/02/2020 12:00	20.90	158.85	22.67	
CP223	22.60	19.00 - 23.10	27/02/2020 12:00	20.66	159.09	22.67	
CP223	22.60	19.00 - 23.10	27/03/2020 12:00	20.22	159.53	22.67	
CP223	22.60	19.00 - 23.10	02/04/2020 09:44	21.00	158.75		Water quality monitoring level
CP223	22.60	19.00 - 23.10	02/04/2020 09:45	21.00	158.75		Water quality monitoring level
CP223	22.60	19.00 - 23.10	02/04/2020 09:46	21.00	158.75		Water quality monitoring level
CP223	22.60	19.00 - 23.10	02/04/2020 09:47	21.00	158.75		Water quality monitoring level
CP223	22.60	19.00 - 23.10	02/04/2020 09:48	21.00	158.75		Water quality monitoring level
CP223	22.60	19.00 - 23.10	02/04/2020 09:49	21.00	158.75		Water quality monitoring level
CP223	22.60	19.00 - 23.10	02/04/2020 09:50	21.00	158.75		Water quality monitoring level
CP223	22.60	19.00 - 23.10	02/04/2020 09:51	21.00	158.75		Water quality monitoring level
CP223	22.60	19.00 - 23.10	02/04/2020 09:52	21.00	158.75		Water quality monitoring level
CP223	22.60	19.00 - 23.10	02/04/2020 09:53	21.00	158.75		Water quality monitoring level
CP223	22.60	19.00 - 23.10	02/04/2020 09:54	21.00	158.75		Water quality monitoring level
CP223	22.60	19.00 - 23.10	02/04/2020 09:55	21.00	158.75		Water quality monitoring level
CP223	22.60	19.00 - 23.10	02/04/2020 09:56	21.00	158.75		Water quality monitoring level
CP223	22.60	19.00 - 23.10	02/04/2020 09:57	21.00	158.75		Water quality monitoring level
CP223	22.60	19.00 - 23.10	02/04/2020 09:58	21.00	158.75		Water quality monitoring level
CP223	22.60	19.00 - 23.10	02/04/2020 09:59	21.00	158.75		Water quality monitoring level
CP223	22.60	19.00 - 23.10	08/04/2020 10:30	22.00	157.75		Water quality monitoring level
CP223	22.60	19.00 - 23.10	08/04/2020 10:31	22.00	157.75		Water quality monitoring level
CP223	22.60	19.00 - 23.10	08/04/2020 10:32	22.00	157.75		Water quality monitoring level
General Remarks:						CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
CP223	22.60	19.00 - 23.10	26/05/2020 12:00			22.67		
CP223	22.60	19.00 - 23.10	02/07/2020 12:00	20.82	158.93	22.67		
CP223	22.60	19.00 - 23.10	07/07/2020 12:00	20.81	158.94	22.67		
CP223	22.60	19.00 - 23.10	14/07/2020 13:01	20.82	158.93	22.67		
CP223	22.60	19.00 - 23.10	20/07/2020 09:21	20.80	158.95	22.67		
CP223	22.60	19.00 - 23.10	28/07/2020 11:09	20.82	158.93	22.67		
CP223	22.60	19.00 - 23.10	25/08/2020 11:21	20.87	158.88	22.67		
CP223	22.60	19.00 - 23.10	24/09/2020 10:04	20.84	158.91	22.67		
CP223	22.60	19.00 - 23.10	28/10/2020 08:57	21.85	157.90	22.67		
CP223	22.60	19.00 - 23.10	24/11/2020 13:09	22.19	157.56	22.59		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC107	5.50	2.00 - 6.00	17/05/2019 10:37	2.07	189.83	5.50		
DSRC107	5.50	2.00 - 6.00	20/05/2019 14:32	2.09	189.81	5.50		
DSRC107	5.50	2.00 - 6.00	21/05/2019 09:28	2.10	189.80	5.50		
DSRC107	5.50	2.00 - 6.00	22/05/2019 16:50	2.10	189.80	5.50		
DSRC107	5.50	2.00 - 6.00	23/05/2019 10:54	2.10	189.80	5.50		
DSRC107	5.50	2.00 - 6.00	24/05/2019 10:35	2.12	189.78	5.50		
DSRC107	5.50	2.00 - 6.00	29/05/2019 09:31	2.14	189.76	5.50		
DSRC107	5.50	2.00 - 6.00	03/06/2019 09:53	2.16	189.74	5.50		
DSRC107	5.50	2.00 - 6.00	10/06/2019 09:45	2.16	189.74	5.50		
DSRC107	5.50	2.00 - 6.00	05/07/2019 09:50	2.07	189.83	5.50		
DSRC107	5.50	2.00 - 6.00	01/08/2019 13:55	2.77	189.13	5.50		
DSRC107	5.50	2.00 - 6.00	08/08/2019 12:50	2.14	189.76	5.50		
DSRC107	5.50	2.00 - 6.00	13/09/2019 13:45	2.19	189.71	5.50		
DSRC107	5.50	2.00 - 6.00	23/10/2019 15:00	2.04	189.86	5.50		
DSRC107	5.50	2.00 - 6.00	01/11/2019 12:20	2.00	189.90	5.50		
DSRC107	5.50	2.00 - 6.00	07/11/2019 12:41	1.99	189.91	5.50		
DSRC107	5.50	2.00 - 6.00	15/11/2019 13:43	1.95	189.95	5.50		
DSRC107	5.50	2.00 - 6.00	25/11/2019 10:20	1.97	189.93	5.50		
DSRC107	5.50	2.00 - 6.00	29/11/2019 11:43	1.97	189.93	5.50		
DSRC107	5.50	2.00 - 6.00	06/12/2019 10:47	1.97	189.93	5.50		
DSRC107	5.50	2.00 - 6.00	12/12/2019 12:10	1.98	189.92	5.50		
DSRC107	5.50	2.00 - 6.00	20/12/2019 10:54	1.95	189.95	5.50		
DSRC107	5.50	2.00 - 6.00	07/01/2020 09:25	1.98	189.92	5.50		
DSRC107	5.50	2.00 - 6.00	14/01/2020 12:00	1.96	189.94	5.50		
General Remarks:							CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC107	5.50	2.00 - 6.00	31/01/2020 12:00	2.03	189.87	5.50		
DSRC107	5.50	2.00 - 6.00	04/02/2020 12:00	2.05	189.85	5.50		
DSRC107	5.50	2.00 - 6.00	13/02/2020 12:00	1.98	189.92	5.50		
DSRC107	5.50	2.00 - 6.00	20/02/2020 12:00	1.97	189.93	5.50		
DSRC107	5.50	2.00 - 6.00	27/02/2020 12:00	2.00	189.90	5.50		
DSRC107	5.50	2.00 - 6.00	05/03/2020 12:00	1.95	189.95	5.50		
DSRC107	5.50	2.00 - 6.00	13/03/2020 12:00	2.05	189.85	5.50		
DSRC107	5.50	2.00 - 6.00	20/03/2020 12:00	2.25	189.65	5.50		
DSRC107	5.50	2.00 - 6.00	02/04/2020 08:34	4.00	187.90		Water quality monitoring level	
DSRC107	5.50	2.00 - 6.00	02/04/2020 08:35	4.00	187.90		Water quality monitoring level	
DSRC107	5.50	2.00 - 6.00	02/04/2020 08:36	4.00	187.90		Water quality monitoring level	
DSRC107	5.50	2.00 - 6.00	02/04/2020 08:37	4.00	187.90		Water quality monitoring level	
DSRC107	5.50	2.00 - 6.00	02/04/2020 08:38	4.00	187.90		Water quality monitoring level	
DSRC107	5.50	2.00 - 6.00	02/04/2020 12:00	1.98	189.92	5.50		
DSRC107	5.50	2.00 - 6.00	07/04/2020 14:03	3.50	188.40		Water quality monitoring level	
DSRC107	5.50	2.00 - 6.00	07/04/2020 14:04	3.50	188.40		Water quality monitoring level	
DSRC107	5.50	2.00 - 6.00	07/04/2020 14:05	3.50	188.40		Water quality monitoring level	
DSRC107	5.50	2.00 - 6.00	07/04/2020 14:06	3.50	188.40		Water quality monitoring level	
DSRC107	5.50	2.00 - 6.00	04/05/2020 12:00	2.06	189.84	5.50		
DSRC107	5.50	2.00 - 6.00	21/05/2020 12:00	2.14	189.76	5.50		
DSRC107	5.50	2.00 - 6.00	26/05/2020 12:00	2.17	189.73	5.50		
DSRC107	5.50	2.00 - 6.00	25/08/2020 14:54	2.14	189.76	5.50		
DSRC107	5.50	2.00 - 6.00	24/09/2020 13:44	2.21	189.69	5.50		
DSRC107	5.50	2.00 - 6.00	28/10/2020 08:38	Dry		5.50		
General Remarks:							CONTRACT 35560	CHECKED EL





# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC108	16.00	8.00 - 16.40	17/05/2019 10:45	2.23	191.37	16.00		
DSRC108	16.00	8.00 - 16.40	20/05/2019 14:38	2.37	191.23	16.00		
DSRC108	16.00	8.00 - 16.40	21/05/2019 09:32	2.40	191.20	16.00		
DSRC108	16.00	8.00 - 16.40	22/05/2019 16:54	2.52	191.08	16.00		
DSRC108	16.00	8.00 - 16.40	23/05/2019 10:50	2.55	191.05	16.00		
DSRC108	16.00	8.00 - 16.40	24/05/2019 10:40	2.64	190.96	16.00		
DSRC108	16.00	8.00 - 16.40	29/05/2019 09:38	2.80	190.80	16.00		
DSRC108	16.00	8.00 - 16.40	03/06/2019 09:58	2.92	190.68	16.00		
DSRC108	16.00	8.00 - 16.40	10/06/2019 09:55	3.00	190.60	16.00		
DSRC108	16.00	8.00 - 16.40	05/07/2019 10:00	2.85	190.75	16.00		
DSRC108	16.00	8.00 - 16.40	01/08/2019 13:58	2.08	191.52	16.00		
DSRC108	16.00	8.00 - 16.40	08/08/2019 12:45	2.91	190.69	16.00		
DSRC108	16.00	8.00 - 16.40	13/09/2019 13:50	3.40	190.20	16.00		
DSRC108	16.00	8.00 - 16.40	23/10/2019 15:20	2.14	191.46	16.00		
DSRC108	16.00	8.00 - 16.40	01/11/2019 12:21	2.11	191.49	16.00		
DSRC108	16.00	8.00 - 16.40	07/11/2019 12:39	2.08	191.52	16.00		
DSRC108	16.00	8.00 - 16.40	15/11/2019 13:45	2.02	191.58	16.00		
DSRC108	16.00	8.00 - 16.40	25/11/2019 10:18	2.00	191.60	16.00		
DSRC108	16.00	8.00 - 16.40	29/11/2019 11:40	1.96	191.64	16.00		
DSRC108	16.00	8.00 - 16.40	06/12/2019 10:44	1.96	191.64	16.00		
DSRC108	16.00	8.00 - 16.40	12/12/2019 12:07	1.97	191.63	16.00		
DSRC108	16.00	8.00 - 16.40	20/12/2019 10:52	1.92	191.68	16.00		
DSRC108	16.00	8.00 - 16.40	07/01/2020 09:20	1.85	191.75	16.00		
DSRC108	16.00	8.00 - 16.40	14/01/2020 12:00	1.91	191.69	16.00		
General Remarks:							CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRC108	16.00	8.00 - 16.40	31/01/2020 12:00	1.97	191.63	16.00	
DSRC108	16.00	8.00 - 16.40	04/02/2020 12:00	1.99	191.61	16.00	
DSRC108	16.00	8.00 - 16.40	13/02/2020 12:00	2.02	191.58	16.00	
DSRC108	16.00	8.00 - 16.40	20/02/2020 12:00	2.02	191.58	16.00	
DSRC108	16.00	8.00 - 16.40	27/02/2020 12:00	1.95	191.65	16.00	
DSRC108	16.00	8.00 - 16.40	05/03/2020 12:00	1.96	191.64	16.00	
DSRC108	16.00	8.00 - 16.40	10/03/2020 12:00	2.06	191.54	16.00	
DSRC108	16.00	8.00 - 16.40	13/03/2020 12:00	2.15	191.45	16.00	
DSRC108	16.00	8.00 - 16.40	20/03/2020 12:00	2.05	191.55	16.00	
DSRC108	16.00	8.00 - 16.40	02/04/2020 08:22	5.00	188.60		Water quality monitoring level
DSRC108	16.00	8.00 - 16.40	02/04/2020 08:23	5.00	188.60		Water quality monitoring level
DSRC108	16.00	8.00 - 16.40	02/04/2020 08:24	5.00	188.60		Water quality monitoring level
DSRC108	16.00	8.00 - 16.40	02/04/2020 08:25	5.00	188.60		Water quality monitoring level
DSRC108	16.00	8.00 - 16.40	02/04/2020 08:26	5.00	188.60		Water quality monitoring level
DSRC108	16.00	8.00 - 16.40	02/04/2020 12:00	2.07	191.53	16.00	
DSRC108	16.00	8.00 - 16.40	07/04/2020 13:50	7.00	186.60		Water quality monitoring level
DSRC108	16.00	8.00 - 16.40	07/04/2020 13:51	7.00	186.60		Water quality monitoring level
DSRC108	16.00	8.00 - 16.40	07/04/2020 13:52	7.00	186.60		Water quality monitoring level
DSRC108	16.00	8.00 - 16.40	07/04/2020 13:53	7.00	186.60		Water quality monitoring level
DSRC108	16.00	8.00 - 16.40	21/04/2020 12:00	2.45	191.15	16.00	
DSRC108	16.00	8.00 - 16.40	04/05/2020 12:00	2.69	190.91	16.00	
DSRC108	16.00	8.00 - 16.40	21/05/2020 12:00	3.16	190.44	16.00	
DSRC108	16.00	8.00 - 16.40	26/05/2020 12:00	3.25	190.35	16.00	
DSRC108	16.00	8.00 - 16.40	30/06/2020 12:00	3.40	190.20	16.00	
General Remarks:						CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRC108	16.00	8.00 - 16.40	14/07/2020 13:17	3.43	190.17	16.00	
DSRC108	16.00	8.00 - 16.40	20/07/2020 08:54	3.48	190.12	16.00	
DSRC108	16.00	8.00 - 16.40	28/07/2020 13:01	3.56	190.04	16.00	
DSRC108	16.00	8.00 - 16.40	25/08/2020 14:57	3.24	190.36	16.00	
DSRC108	16.00	8.00 - 16.40	24/09/2020 12:28	3.79	189.81	16.00	
DSRC108	16.00	8.00 - 16.40	28/10/2020 08:32	2.42	191.18	16.00	
DSRC108	16.00	8.00 - 16.40	24/11/2020 08:50	2.34	191.26	16.00	
DSRC109	20.50	2.50 - 21.00	18/11/2019 13:52	Dry		20.50	
DSRC109	20.50	2.50 - 21.00	19/11/2019 15:28	Dry		20.50	
DSRC109	20.50	2.50 - 21.00	20/11/2019 14:01	Dry		20.50	
DSRC109	20.50	2.50 - 21.00	22/11/2019 15:04	Dry		20.50	
DSRC109	20.50	2.50 - 21.00	03/12/2019 10:05	Dry		20.50	
DSRC109	20.50	2.50 - 21.00	09/12/2019 12:00	Dry		20.50	
DSRC109	20.50	2.50 - 21.00	06/01/2020 15:20	Dry		20.50	
DSRC109	20.50	2.50 - 21.00	14/01/2020 12:00	Dry		20.50	
DSRC109	20.50	2.50 - 21.00	22/01/2020 12:00	Dry		20.50	
DSRC109	20.50	2.50 - 21.00	28/01/2020 12:00	Dry		20.50	
DSRC109	20.50	2.50 - 21.00	03/02/2020 12:00	Dry		20.50	
DSRC109	20.50	2.50 - 21.00	11/02/2020 12:00	Dry		20.50	
DSRC109	20.50	2.50 - 21.00	19/02/2020 12:00	Dry		20.50	
DSRC109	20.50	2.50 - 21.00	27/02/2020 12:00	Dry		20.50	
DSRC109	20.50	2.50 - 21.00	05/03/2020 12:00	Dry		20.50	
DSRC109	20.50	2.50 - 21.00	10/03/2020 12:00	Dry		20.50	
DSRC109	20.50	2.50 - 21.00	19/03/2020 12:00	Dry		20.50	
General Remarks:						CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC109	20.50	2.50 - 21.00	29/04/2020 12:00	Dry		20.50		
DSRC109	20.50	2.50 - 21.00	20/05/2020 12:00	20.25	212.75	20.50		
DSRC109	20.50	2.50 - 21.00	27/05/2020 12:00	20.25	212.75	20.50		
DSRC109	20.50	2.50 - 21.00	03/06/2020 12:00	20.26	212.74	20.50		
DSRC109	20.50	2.50 - 21.00	10/06/2020 12:00	20.10	212.90	20.50		
DSRC109	20.50	2.50 - 21.00	17/06/2020 12:00	20.20	212.80	20.50		
DSRC109	20.50	2.50 - 21.00	24/06/2020 12:00	20.26	212.74	20.50		
DSRC109	20.50	2.50 - 21.00	30/06/2020 12:00	Dry		20.50		
DSRC109	20.50	2.50 - 21.00	07/07/2020 12:00	Dry		20.50		
DSRC109	20.50	2.50 - 21.00	14/07/2020 13:59	Dry		20.50		
DSRC109	20.50	2.50 - 21.00	20/07/2020 12:00	Dry		20.50		
DSRC109	20.50	2.50 - 21.00	28/07/2020 14:40	Dry		20.50		
DSRC109	20.50	2.50 - 21.00	26/08/2020 08:35	Dry		20.50		
DSRC109	20.50	2.50 - 21.00	23/09/2020 14:13	Dry		20.50		
DSRC109	20.50	2.50 - 21.00	28/10/2020 09:08	Dry		20.50		
DSRC109	20.50	2.50 - 21.00	24/11/2020 14:34	Dry		20.50		
DSRC110	34.50	23.00 - 34.70	12/04/2019 09:38	32.03	207.97	34.50		
DSRC110	34.50	23.00 - 34.70	02/05/2019 13:25	32.22	207.78	34.50		
DSRC110	34.50	23.00 - 34.70	01/08/2019 13:00	Dry		34.50		
DSRC110	34.50	23.00 - 34.70	26/09/2019 12:00	33.50	206.50	34.50		
DSRC110	34.50	23.00 - 34.70	23/10/2019 12:00	31.48	208.52	34.50		
DSRC110	34.50	23.00 - 34.70	28/10/2019 12:00	30.07	209.93	34.50		
DSRC110	34.50	23.00 - 34.70	05/11/2019 10:13	30.92	209.08	34.50		
DSRC110	34.50	23.00 - 34.70	11/11/2019 14:02	31.14	208.86	34.50		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC110	34.50	23.00 - 34.70	27/11/2019 10:43	30.72	209.28	34.50		
DSRC110	34.50	23.00 - 34.70	03/12/2019 10:21	30.86	209.14	34.50		
DSRC110	34.50	23.00 - 34.70	09/12/2019 15:25	31.21	208.79	34.50		
DSRC110	34.50	23.00 - 34.70	16/12/2019 16:50	31.24	208.76	34.50		
DSRC110	34.50	23.00 - 34.70	09/01/2020 12:00	31.51	208.49	34.50		
DSRC110	34.50	23.00 - 34.70	14/01/2020 12:00	30.70	209.30	34.50		
DSRC110	34.50	23.00 - 34.70	22/01/2020 12:00	30.99	209.01	34.50		
DSRC110	34.50	23.00 - 34.70	28/01/2020 12:00	30.61	209.39	34.50		
DSRC110	34.50	23.00 - 34.70	03/02/2020 12:00	30.75	209.25	34.50		
DSRC110	34.50	23.00 - 34.70	11/02/2020 12:00	31.73	208.27	34.50		
DSRC110	34.50	23.00 - 34.70	19/02/2020 12:00	30.80	209.20	34.50		
DSRC110	34.50	23.00 - 34.70	28/02/2020 12:00	30.20	209.80	34.50		
DSRC110	34.50	23.00 - 34.70	05/03/2020 12:00	30.40	209.60	34.50		
DSRC110	34.50	23.00 - 34.70	10/03/2020 12:00	30.17	209.83	34.50		
DSRC110	34.50	23.00 - 34.70	11/03/2020 13:01	30.17	209.83	34.50	Water quality monitoring level	
DSRC110	34.50	23.00 - 34.70	11/03/2020 13:02	30.17	209.83	34.50	Water quality monitoring level	
DSRC110	34.50	23.00 - 34.70	11/03/2020 13:03	30.17	209.83	34.50	Water quality monitoring level	
DSRC110	34.50	23.00 - 34.70	11/03/2020 13:04	30.17	209.83	34.50	Water quality monitoring level	
DSRC110	34.50	23.00 - 34.70	11/03/2020 13:05	30.17	209.83	34.50	Water quality monitoring level	
DSRC110	34.50	23.00 - 34.70	11/03/2020 13:06	30.17	209.83	34.50	Water quality monitoring level	
DSRC110	34.50	23.00 - 34.70	11/03/2020 13:07	30.17	209.83	34.50	Water quality monitoring level	
DSRC110	34.50	23.00 - 34.70	01/04/2020 09:24	30.91	209.09	34.50	Water quality monitoring level	
DSRC110	34.50	23.00 - 34.70	01/04/2020 09:25	30.91	209.09	34.50	Water quality monitoring level	
DSRC110	34.50	23.00 - 34.70	01/04/2020 09:26	30.91	209.09	34.50	Water quality monitoring level	
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRC110	34.50	23.00 - 34.70	01/04/2020 09:28	30.91	209.09		Water quality monitoring level
DSRC110	34.50	23.00 - 34.70	01/04/2020 09:29	30.91	209.09		Water quality monitoring level
DSRC110	34.50	23.00 - 34.70	01/04/2020 09:30	30.91	209.09		Water quality monitoring level
DSRC110	34.50	23.00 - 34.70	01/04/2020 09:31	30.91	209.09		Water quality monitoring level
DSRC110	34.50	23.00 - 34.70	01/04/2020 09:32	30.91	209.09		Water quality monitoring level
DSRC110	34.50	23.00 - 34.70	01/04/2020 12:00	30.91	209.09	34.50	
DSRC110	34.50	23.00 - 34.70	23/09/2020 16:02	32.94	207.06	34.50	
DSRC110	34.50	23.00 - 34.70	21/10/2020 14:40	Dry		34.50	
DSRC110	34.50	23.00 - 34.70	24/11/2020 14:05	31.97	208.03	34.50	
DSRC205	11.70	9.50 - 12.00	04/10/2019 10:45	8.90	158.25	11.72	
DSRC205	11.70	9.50 - 12.00	08/10/2019 10:40	8.60	158.55	11.72	
DSRC205	11.70	9.50 - 12.00	09/10/2019 10:50	8.65	158.50	11.72	
DSRC205	11.70	9.50 - 12.00	10/10/2019 10:45	8.60	158.55	11.72	
DSRC205	11.70	9.50 - 12.00	11/10/2019 10:45	8.60	158.55	11.72	
DSRC205	11.70	9.50 - 12.00	15/10/2019 10:45	8.50	158.65	11.72	
DSRC205	11.70	9.50 - 12.00	21/10/2019 12:00	8.15	159.00	11.72	
DSRC205	11.70	9.50 - 12.00	28/10/2019 12:00	7.66	159.49	11.72	
DSRC205	11.70	9.50 - 12.00	04/11/2019 09:50	7.88	159.27	11.72	
DSRC205	11.70	9.50 - 12.00	11/11/2019 10:16	7.85	159.30	11.72	
DSRC205	11.70	9.50 - 12.00	18/11/2019 14:48	7.44	159.71	11.72	
DSRC205	11.70	9.50 - 12.00	03/12/2019 11:00	7.90	159.25	11.72	
DSRC205	11.70	9.50 - 12.00	06/01/2020 08:40	8.29	158.86	11.72	
DSRC205	11.70	9.50 - 12.00	13/01/2020 11:36	7.80	159.35	11.72	
DSRC205	11.70	9.50 - 12.00	20/01/2020 12:00	7.30	159.85	11.72	
General Remarks:						CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC205	11.70	9.50 - 12.00	04/02/2020 12:00	8.25	158.90	11.72		
DSRC205	11.70	9.50 - 12.00	12/02/2020 12:00	8.30	158.85	11.72		
DSRC205	11.70	9.50 - 12.00	20/02/2020 12:00	7.05	160.10	11.72		
DSRC205	11.70	9.50 - 12.00	06/03/2020 12:00	7.65	159.50	11.72		
DSRC205	11.70	9.50 - 12.00	12/03/2020 12:00	8.05	159.10	11.72		
DSRC205	11.70	9.50 - 12.00	31/03/2020 12:00	8.25	158.90	11.72		
DSRC205	11.70	9.50 - 12.00	20/04/2020 12:00	8.56	158.59	11.72		
DSRC205	11.70	9.50 - 12.00	29/04/2020 12:00	8.58	158.57	11.72		
DSRC205	11.70	9.50 - 12.00	07/05/2020 12:00	8.56	158.59	11.72		
DSRC205	11.70	9.50 - 12.00	26/05/2020 12:00	8.70	158.45	11.72		
DSRC205	11.70	9.50 - 12.00	04/06/2020 12:00	8.72	158.43	11.72		
DSRC205	11.70	9.50 - 12.00	10/06/2020 12:00	8.80	158.35	11.72		
DSRC205	11.70	9.50 - 12.00	17/06/2020 12:00	8.82	158.33	11.72		
DSRC205	11.70	9.50 - 12.00	24/06/2020 12:00	8.83	158.32	11.72		
DSRC205	11.70	9.50 - 12.00	30/06/2020 12:00	8.64	158.51	11.72		
DSRC205	11.70	9.50 - 12.00	08/07/2020 08:35	8.85	158.30	11.72		
DSRC205	11.70	9.50 - 12.00	15/07/2020 08:42	8.64	158.51	11.72		
DSRC205	11.70	9.50 - 12.00	22/07/2020 08:27	8.68	158.47	11.72		
DSRC205	11.70	9.50 - 12.00	29/07/2020 08:42	8.75	158.40	11.72		
DSRC205	11.70	9.50 - 12.00	26/08/2020 09:26	8.70	158.45	11.72		
DSRC205	11.70	9.50 - 12.00	23/09/2020 09:54	8.60	158.55	11.72		
DSRC205	11.70	9.50 - 12.00	28/10/2020 11:02	8.40	158.75	11.72		
DSRC205	11.70	9.50 - 12.00	24/11/2020 11:08	8.30	158.85	11.72		
DSRC218	15.00	2.00 - 15.50	03/10/2019 11:20	2.00	283.65	15.08		
General Remarks:							CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC218	15.00	2.00 - 15.50	08/10/2019 11:20	1.80	283.85	15.08		
DSRC218	15.00	2.00 - 15.50	09/10/2019 11:25	1.80	283.85	15.08		
DSRC218	15.00	2.00 - 15.50	10/10/2019 11:20	1.80	283.85	15.08		
DSRC218	15.00	2.00 - 15.50	22/10/2019 11:20	5.05	280.60	15.08		
DSRC218	15.00	2.00 - 15.50	31/10/2019 14:30	4.50	281.15	15.08		
DSRC218	15.00	2.00 - 15.50	05/11/2019 13:11	1.61	284.04	15.08		
DSRC218	15.00	2.00 - 15.50	06/11/2019 15:07	4.50	281.15	15.08		
DSRC218	15.00	2.00 - 15.50	14/11/2019 13:00	4.40	281.25	15.08		
DSRC218	15.00	2.00 - 15.50	22/11/2019 16:25	4.25	281.40	15.08		
DSRC218	15.00	2.00 - 15.50	28/11/2019 12:59	3.96	281.69	15.08		
DSRC218	15.00	2.00 - 15.50	11/12/2019 15:54	5.66	279.99	15.08		
DSRC218	15.00	2.00 - 15.50	18/12/2019 11:03	4.48	281.17	15.08		
DSRC218	15.00	2.00 - 15.50	08/01/2020 12:00	6.17	279.48	15.08		
DSRC218	15.00	2.00 - 15.50	15/01/2020 12:00	5.17	280.48	15.08		
DSRC218	15.00	2.00 - 15.50	22/01/2020 12:00	5.21	280.44	15.08		
DSRC218	15.00	2.00 - 15.50	29/01/2020 12:00	5.55	280.10	15.08		
DSRC218	15.00	2.00 - 15.50	05/02/2020 12:00	5.92	279.73	15.08		
DSRC218	15.00	2.00 - 15.50	10/02/2020 12:00	5.90	279.75	15.08		
DSRC218	15.00	2.00 - 15.50	18/02/2020 12:00	4.85	280.80	15.08		
DSRC218	15.00	2.00 - 15.50	26/02/2020 12:00	4.50	281.15	15.08		
DSRC218	15.00	2.00 - 15.50	06/03/2020 12:00	4.65	281.00	15.08		
DSRC218	15.00	2.00 - 15.50	25/03/2020 12:00	6.00	279.65	15.08		
DSRC218	15.00	2.00 - 15.50	07/04/2020 12:06	10.00	275.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	07/04/2020 12:07	10.00	275.65		Water quality monitoring level	
General Remarks:							CONTRACT 35560	CHECKED EL





# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:07	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:08	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:09	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:10	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:11	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:12	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:13	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:14	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:15	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:16	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:17	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:18	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:19	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:20	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:21	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:22	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:23	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:24	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:25	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 11:26	14.00	271.65		Water quality monitoring level	
DSRC218	15.00	2.00 - 15.50	15/04/2020 12:00	8.88	276.77	15.08		
DSRC218	15.00	2.00 - 15.50	29/04/2020 12:00	8.91	276.74	15.08		
DSRC218	15.00	2.00 - 15.50	14/05/2020 12:00	8.77	276.88	15.08		
DSRC218	15.00	2.00 - 15.50	22/05/2020 12:00	8.82	276.83	15.08		
General Remarks:							CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC218	15.00	2.00 - 15.50	03/06/2020 12:00	8.85	276.80	15.08		
DSRC218	15.00	2.00 - 15.50	10/06/2020 12:00	8.87	276.78	15.08		
DSRC218	15.00	2.00 - 15.50	17/06/2020 12:00	8.84	276.81	15.08		
DSRC218	15.00	2.00 - 15.50	22/06/2020 12:00	8.82	276.83	15.08		
DSRC218	15.00	2.00 - 15.50	01/07/2020 12:00	8.85	276.80	15.08		
DSRC218	15.00	2.00 - 15.50	06/07/2020 12:00	8.89	276.76	15.08		
DSRC218	15.00	2.00 - 15.50	13/07/2020 12:59	8.80	276.85	15.08		
DSRC218	15.00	2.00 - 15.50	21/07/2020 15:20	8.78	276.87	15.08		
DSRC218	15.00	2.00 - 15.50	27/07/2020 13:26	8.90	276.75	15.08		
DSRC218	15.00	2.00 - 15.50	24/08/2020 13:53	8.86	276.79	15.08		
DSRC218	15.00	2.00 - 15.50	30/09/2020 10:21	8.89	276.76	15.08		
DSRC218	15.00	2.00 - 15.50	21/10/2020 09:09	8.38	277.27	15.08		
DSRC218	15.00	2.00 - 15.50	23/11/2020 10:25	6.88	278.77	15.08		
DSRC220	13.20	3.00 - 13.50	03/10/2019 11:30	3.40	275.45	13.21		
DSRC220	13.20	3.00 - 13.50	08/10/2019 11:30	2.40	276.45	13.21		
DSRC220	13.20	3.00 - 13.50	09/10/2019 11:30	2.25	276.60	13.21		
DSRC220	13.20	3.00 - 13.50	10/10/2019 11:35	2.20	276.65	13.21		
DSRC220	13.20	3.00 - 13.50	11/10/2019 11:30	2.00	276.85	13.21		
DSRC220	13.20	3.00 - 13.50	22/10/2019 11:30	1.45	277.40	13.21		
DSRC220	13.20	3.00 - 13.50	31/10/2019 11:20	1.52	277.33	13.21		
DSRC220	13.20	3.00 - 13.50	06/11/2019 14:16	1.43	277.42	13.21		
DSRC220	13.20	3.00 - 13.50	14/11/2019 13:45	1.19	277.66	13.21		
DSRC220	13.20	3.00 - 13.50	22/11/2019 16:20	1.45	277.40	13.21		
DSRC220	13.20	3.00 - 13.50	28/11/2019 12:49	1.34	277.51	13.21		
General Remarks:							CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRC220	13.20	3.00 - 13.50	11/12/2019 15:43	1.62	277.23	13.21	
DSRC220	13.20	3.00 - 13.50	18/12/2019 12:05	1.43	277.42	13.21	
DSRC220	13.20	3.00 - 13.50	08/01/2020 12:00	1.81	277.04	13.21	
DSRC220	13.20	3.00 - 13.50	15/01/2020 12:00	1.42	277.43	13.21	
DSRC220	13.20	3.00 - 13.50	22/01/2020 12:00	1.61	277.24	13.21	
DSRC220	13.20	3.00 - 13.50	29/01/2020 12:00	1.70	277.15	13.21	
DSRC220	13.20	3.00 - 13.50	05/02/2020 12:00	1.75	277.10	13.21	
DSRC220	13.20	3.00 - 13.50	10/02/2020 12:00	1.84	277.01	13.21	
DSRC220	13.20	3.00 - 13.50	26/02/2020 12:00	1.49	277.36	13.21	
DSRC220	13.20	3.00 - 13.50	25/03/2020 12:00	1.76	277.09	13.21	
DSRC220	13.20	3.00 - 13.50	07/04/2020 12:35	3.00	275.85		Water quality monitoring level
DSRC220	13.20	3.00 - 13.50	07/04/2020 12:36	3.00	275.85		Water quality monitoring level
DSRC220	13.20	3.00 - 13.50	07/04/2020 12:37	3.00	275.85		Water quality monitoring level
DSRC220	13.20	3.00 - 13.50	07/04/2020 12:38	3.00	275.85		Water quality monitoring level
DSRC220	13.20	3.00 - 13.50	07/04/2020 12:39	3.00	275.85		Water quality monitoring level
DSRC220	13.20	3.00 - 13.50	07/04/2020 12:40	3.00	275.85		Water quality monitoring level
DSRC220	13.20	3.00 - 13.50	07/04/2020 12:41	3.00	275.85		Water quality monitoring level
DSRC220	13.20	3.00 - 13.50	01/05/2020 12:00	2.95	275.90	13.21	
DSRC220	13.20	3.00 - 13.50	26/05/2020 12:00	3.28	275.57	13.21	
DSRC220	13.20	3.00 - 13.50	06/07/2020 12:00	3.40	275.45	13.21	
DSRC220	13.20	3.00 - 13.50	13/07/2020 12:42	3.53	275.32	13.21	
DSRC220	13.20	3.00 - 13.50	21/07/2020 09:25	3.57	275.28		Water quality monitoring level
DSRC220	13.20	3.00 - 13.50	21/07/2020 09:26	3.57	275.28	13.21	
DSRC220	13.20	3.00 - 13.50	21/07/2020 09:26	3.57	275.28		Water quality monitoring level
General Remarks:						CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRC220	13.20	3.00 - 13.50	21/07/2020 09:28	3.57	275.28		Water quality monitoring level
DSRC220	13.20	3.00 - 13.50	21/07/2020 09:29	3.57	275.28		Water quality monitoring level
DSRC220	13.20	3.00 - 13.50	21/07/2020 09:30	3.57	275.28		Water quality monitoring level
DSRC220	13.20	3.00 - 13.50	27/07/2020 13:15	3.62	275.23	13.21	
DSRC220	13.20	3.00 - 13.50	24/08/2020 13:53	3.71	275.14	13.21	
DSRC220	13.20	3.00 - 13.50	30/09/2020 08:52	3.42	275.43	13.21	
DSRC220	13.20	3.00 - 13.50	21/10/2020 09:30	Dry		13.21	
DSRC220	13.20	3.00 - 13.50	23/11/2020 10:06	1.75	277.10	13.12	
DSRC224	70.00	49.00 - 70.50	28/05/2019 15:44	9.82	217.03	70.00	
DSRC224	70.00	49.00 - 70.50	29/05/2019 09:00	10.01	216.84	70.00	
DSRC224	70.00	49.00 - 70.50	30/05/2019 16:42	11.43	215.42	70.00	
DSRC224	70.00	49.00 - 70.50	31/05/2019 14:54	12.72	214.13	70.00	
DSRC224	70.00	49.00 - 70.50	03/06/2019 10:15	14.67	212.18	70.00	
DSRC224	70.00	49.00 - 70.50	04/06/2019 08:50	15.21	211.64	70.00	
DSRC224	70.00	49.00 - 70.50	10/06/2019 09:20	17.58	209.27	70.00	
DSRC224	70.00	49.00 - 70.50	05/07/2019 10:10	18.52	208.33	70.00	
DSRC224	70.00	49.00 - 70.50	01/08/2019 13:20			70.00	
DSRC224	70.00	49.00 - 70.50	08/08/2019 10:40	19.80	207.05	70.00	
DSRC224	70.00	49.00 - 70.50	13/09/2019 12:08	22.05	204.80	70.00	
DSRC224	70.00	49.00 - 70.50	20/09/2019 15:59	21.87	204.98	70.00	
DSRC224	70.00	49.00 - 70.50	24/09/2019 12:00	21.80	205.05	70.00	
DSRC224	70.00	49.00 - 70.50	23/10/2019 12:00	31.81	195.04	70.00	
DSRC224	70.00	49.00 - 70.50	01/11/2019 11:28	28.46	198.39	70.00	
DSRC224	70.00	49.00 - 70.50	07/11/2019 10:06	27.29	199.56	70.00	
General Remarks:						CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRC224	70.00	49.00 - 70.50	25/11/2019 10:40	25.45	201.40	70.00	
DSRC224	70.00	49.00 - 70.50	29/11/2019 12:30	25.43	201.42	70.00	
DSRC224	70.00	49.00 - 70.50	06/12/2019 11:44	25.18	201.67	70.00	
DSRC224	70.00	49.00 - 70.50	12/12/2019 13:10			70.00	
DSRC224	70.00	49.00 - 70.50	20/12/2019 11:48	25.06	201.79	70.00	
DSRC224	70.00	49.00 - 70.50	07/01/2020 11:00	25.00	201.85	70.00	
DSRC224	70.00	49.00 - 70.50	14/01/2020 12:00			70.00	
DSRC224	70.00	49.00 - 70.50	23/01/2020 12:00			70.00	
DSRC224	70.00	49.00 - 70.50	31/01/2020 12:00	25.27	201.58	70.00	
DSRC224	70.00	49.00 - 70.50	04/02/2020 12:00	25.28	201.57	70.00	
DSRC224	70.00	49.00 - 70.50	13/02/2020 12:00	25.07	201.78	70.00	
DSRC224	70.00	49.00 - 70.50	27/02/2020 12:00	23.51	203.34	70.00	
DSRC224	70.00	49.00 - 70.50	02/04/2020 10:37	30.00	196.85		Water quality monitoring level
DSRC224	70.00	49.00 - 70.50	02/04/2020 10:38	30.00	196.85		Water quality monitoring level
DSRC224	70.00	49.00 - 70.50	02/04/2020 12:00	22.75	204.10	70.00	
DSRC224	70.00	49.00 - 70.50	08/04/2020 11:13	30.00	196.85		Water quality monitoring level
DSRC224	70.00	49.00 - 70.50	08/04/2020 11:14	30.00	196.85		Water quality monitoring level
DSRC224	70.00	49.00 - 70.50	08/04/2020 11:15	30.00	196.85		Water quality monitoring level
DSRC224	70.00	49.00 - 70.50	08/04/2020 11:16	30.00	196.85		Water quality monitoring level
DSRC224	70.00	49.00 - 70.50	08/04/2020 11:17	30.00	196.85		Water quality monitoring level
DSRC224	70.00	49.00 - 70.50	08/04/2020 11:18	30.00	196.85		Water quality monitoring level
DSRC224	70.00	49.00 - 70.50	08/04/2020 11:19	30.00	196.85		Water quality monitoring level
DSRC224	70.00	49.00 - 70.50	08/04/2020 11:20	30.00	196.85		Water quality monitoring level
DSRC224	70.00	49.00 - 70.50	08/04/2020 11:21	30.00	196.85		Water quality monitoring level
General Remarks:						CONTRACT 35560	CHECKED EL

# GROUNDWATER LEVELS



CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC224	70.00	49.00 - 70.50	08/04/2020 11:23	30.00	196.85		Water quality monitoring level	
DSRC224	70.00	49.00 - 70.50	08/04/2020 11:24	30.00	196.85		Water quality monitoring level	
DSRC224	70.00	49.00 - 70.50	08/04/2020 11:25	30.00	196.85		Water quality monitoring level	
DSRC224	70.00	49.00 - 70.50	08/04/2020 11:26	30.00	196.85		Water quality monitoring level	
DSRC224	70.00	49.00 - 70.50	08/04/2020 11:27	30.00	196.85		Water quality monitoring level	
DSRC224	70.00	49.00 - 70.50	08/04/2020 11:28	30.00	196.85		Water quality monitoring level	
DSRC224	70.00	49.00 - 70.50	08/04/2020 11:29	30.00	196.85		Water quality monitoring level	
DSRC224	70.00	49.00 - 70.50	04/05/2020 12:00	25.77	201.08	70.00		
DSRC224	70.00	49.00 - 70.50	26/05/2020 12:00	25.28	201.57	70.00		
DSRC224	70.00	49.00 - 70.50	02/07/2020 12:00	25.30	201.55	70.00		
DSRC224	70.00	49.00 - 70.50	07/07/2020 12:00	25.32	201.53	70.00		
DSRC224	70.00	49.00 - 70.50	20/07/2020 09:10	25.40	201.45	70.00		
DSRC224	70.00	49.00 - 70.50	28/07/2020 10:37	25.44	201.41	70.00		
DSRC224	70.00	49.00 - 70.50	25/08/2020 10:49			70.00		
DSRC224	70.00	49.00 - 70.50	24/09/2020 09:07	25.26	201.59	70.00		
DSRC224	70.00	49.00 - 70.50	28/10/2020 09:02	25.16	201.69	70.00		
DSRC224	70.00	49.00 - 70.50	24/11/2020 13:28	25.21	201.64	70.00		
DSRC229	8.50	8.50 - 1.50	25/03/2020 12:00	5.26	195.19	8.50		
DSRC229	8.50	8.50 - 1.50	26/03/2020 12:00	5.22	195.23	8.50		
DSRC229	8.50	8.50 - 1.50	27/03/2020 12:00	5.20	195.25	8.50		
DSRC229	8.50	8.50 - 1.50	30/03/2020 12:00	5.25	195.20	8.50		
DSRC229	8.50	8.50 - 1.50	31/03/2020 12:00	5.31	195.14	8.50		
DSRC229	8.50	8.50 - 1.50	02/04/2020 12:00	5.33	195.12	8.50		
DSRC229	8.50	8.50 - 1.50	07/04/2020 13:40	6.50	193.95		Water quality monitoring level	
General Remarks:							CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRC229	8.50	8.50 - 1.50	07/04/2020 13:42	6.50	193.95		Water quality monitoring level
DSRC229	8.50	8.50 - 1.50	07/04/2020 13:43	6.50	193.95		Water quality monitoring level
DSRC229	8.50	8.50 - 1.50	07/04/2020 13:44	6.50	193.95		Water quality monitoring level
DSRC229	8.50	8.50 - 1.50	15/04/2020 13:43	6.00	194.45		Water quality monitoring level
DSRC229	8.50	8.50 - 1.50	15/04/2020 13:44	6.00	194.45		Water quality monitoring level
DSRC229	8.50	8.50 - 1.50	15/04/2020 13:45	6.00	194.45		Water quality monitoring level
DSRC229	8.50	8.50 - 1.50	15/04/2020 13:46	6.00	194.45		Water quality monitoring level
DSRC229	8.50	8.50 - 1.50	24/04/2020 12:00	5.40	195.05	8.50	
DSRC229	8.50	8.50 - 1.50	29/04/2020 12:00	5.55	194.90	8.50	
DSRC229	8.50	8.50 - 1.50	07/05/2020 12:00	5.61	194.84	8.50	
DSRC229	8.50	8.50 - 1.50	14/05/2020 12:00	5.62	194.83	8.50	
DSRC229	8.50	8.50 - 1.50	20/05/2020 12:00	5.82	194.63	8.50	
DSRC229	8.50	8.50 - 1.50	27/05/2020 12:00	5.83	194.62	8.50	
DSRC229	8.50	8.50 - 1.50	03/06/2020 12:00	5.85	194.60	8.50	
DSRC229	8.50	8.50 - 1.50	10/06/2020 12:00	5.84	194.61	8.50	
DSRC229	8.50	8.50 - 1.50	15/06/2020 12:00	5.90	194.55	8.50	
DSRC229	8.50	8.50 - 1.50	22/06/2020 12:00	5.84	194.61	8.50	
DSRC229	8.50	8.50 - 1.50	08/07/2020 11:38	5.85	194.60	8.50	
DSRC229	8.50	8.50 - 1.50	15/07/2020 11:07	5.89	194.56	8.50	
DSRC229	8.50	8.50 - 1.50	22/07/2020 10:47	5.89	194.56	8.50	
DSRC229	8.50	8.50 - 1.50	29/07/2020 15:00	5.81	194.64	8.50	
DSRC229	8.50	8.50 - 1.50	26/08/2020 11:47	5.94	194.51	8.50	
DSRC229	8.50	8.50 - 1.50	23/09/2020 11:47	5.8	194.65	8.50	
DSRC229	8.50	8.50 - 1.50	02/11/2020 12:35	5.3	195.15	8.50	
General Remarks:						CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC301	29.00	7.40 - 29.50	18/11/2019 14:00	26.39	207.81	28.80		
DSRC301	29.00	7.40 - 29.50	19/11/2019 15:50	26.47	207.73	28.80		
DSRC301	29.00	7.40 - 29.50	20/11/2019 13:51	26.52	207.68	28.80		
DSRC301	29.00	7.40 - 29.50	22/11/2019 14:59	26.60	207.60	28.80		
DSRC301	29.00	7.40 - 29.50	03/12/2019 10:12	27.75	206.45	28.80		
DSRC301	29.00	7.40 - 29.50	09/12/2019 12:00	26.69	207.51	28.80		
DSRC301	29.00	7.40 - 29.50	06/01/2020 15:10	26.47	207.73	28.80		
DSRC301	29.00	7.40 - 29.50	14/01/2020 12:00	26.35	207.85	28.80		
DSRC301	29.00	7.40 - 29.50	22/01/2020 12:00	26.37	207.83	28.80		
DSRC301	29.00	7.40 - 29.50	28/01/2020 12:00	26.26	207.94	28.80		
DSRC301	29.00	7.40 - 29.50	03/02/2020 12:00	26.33	207.87	28.80		
DSRC301	29.00	7.40 - 29.50	11/02/2020 12:00	26.30	207.90	28.80		
DSRC301	29.00	7.40 - 29.50	19/02/2020 12:00	26.38	207.82	28.80		
DSRC301	29.00	7.40 - 29.50	27/02/2020 12:00	26.35	207.85	28.80		
DSRC301	29.00	7.40 - 29.50	05/03/2020 12:00	26.40	207.80	28.80		
DSRC301	29.00	7.40 - 29.50	10/03/2020 12:00	26.13	208.07	28.80		
DSRC301	29.00	7.40 - 29.50	19/03/2020 12:00	26.25	207.95	28.80		
DSRC301	29.00	7.40 - 29.50	08/04/2020 12:00	26.55	207.65	28.80		
DSRC301	29.00	7.40 - 29.50	29/04/2020 12:00	26.65	207.55	28.80		
DSRC301	29.00	7.40 - 29.50	20/05/2020 12:00	27.43	206.77	28.80		
DSRC301	29.00	7.40 - 29.50	27/05/2020 12:00	27.60	206.60	28.80		
DSRC301	29.00	7.40 - 29.50	03/06/2020 12:00	27.64	206.56	28.80		
DSRC301	29.00	7.40 - 29.50	10/06/2020 12:00	27.91	206.29	28.80		
DSRC301	29.00	7.40 - 29.50	17/06/2020 12:00	28.00	206.20	28.80		
General Remarks:							CONTRACT 35560	CHECKED EL



**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRC301	29.00	7.40 - 29.50	30/06/2020 12:00	Dry		28.80	
DSRC301	29.00	7.40 - 29.50	07/07/2020 12:00	Dry		28.80	
DSRC301	29.00	7.40 - 29.50	14/07/2020 13:55	Dry		28.80	
DSRC301	29.00	7.40 - 29.50	20/07/2020 12:00	Dry		28.80	
DSRC301	29.00	7.40 - 29.50	28/07/2020 14:46	Dry		28.80	
DSRC301	29.00	7.40 - 29.50	26/08/2020 08:21	Dry		28.80	
DSRC301	29.00	7.40 - 29.50	23/09/2020 14:08	Dry		28.80	
DSRC301	29.00	7.40 - 29.50	28/10/2020 09:12	28.72	205.48	28.80	
DSRC301	29.00	7.40 - 29.50	24/11/2020 14:29	19.90	214.30	28.80	
DSRC302	26.00	15.00 - 26.50	12/04/2019 09:32	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	03/05/2019 13:20	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	01/08/2019 13:25	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	12/09/2019 12:40	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	26/09/2019 12:30	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	23/10/2019 13:30	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	28/10/2019 12:00	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	05/11/2019 10:11	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	11/11/2019 14:12	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	19/11/2019 15:45	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	27/11/2019 10:48	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	03/12/2019 10:16	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	09/12/2019 15:33	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	16/12/2019 16:35	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	09/01/2020 12:00	Dry		26.00	
General Remarks:						CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRC302	26.00	15.00 - 26.50	22/01/2020 12:00	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	28/01/2020 12:00	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	03/02/2020 12:00	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	11/02/2020 12:00	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	19/02/2020 12:00	23.95	210.55	26.00	
DSRC302	26.00	15.00 - 26.50	26/02/2020 12:00	25.30	209.20	26.00	
DSRC302	26.00	15.00 - 26.50	05/03/2020 12:00	25.20	209.30	26.00	
DSRC302	26.00	15.00 - 26.50	10/03/2020 12:00	25.74	208.76	26.00	
DSRC302	26.00	15.00 - 26.50	13/03/2020 12:00	25.80	208.70	26.00	
DSRC302	26.00	15.00 - 26.50	01/04/2020 12:00	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	23/09/2020 13:48	Dry		26.00	
DSRC302	26.00	15.00 - 26.50	24/11/2020 14:40	Dry		26.00	
DSRC310	30.00	2.00 - 30.20	07/05/2020 12:00	Dry		30.00	
DSRC310	30.00	2.00 - 30.20	11/05/2020 12:00	Dry		30.00	
DSRC310	30.00	2.00 - 30.20	12/05/2020 12:00	Dry		30.00	
DSRC310	30.00	2.00 - 30.20	13/05/2020 12:00	Dry		30.00	
DSRC310	30.00	2.00 - 30.20	14/05/2020 12:00	Dry		30.00	
DSRC310	30.00	2.00 - 30.20	22/05/2020 12:00	Dry		30.00	
DSRC310	30.00	2.00 - 30.20	27/05/2020 12:00	Dry		30.00	
DSRC310	30.00	2.00 - 30.20	04/06/2020 12:00	Dry		30.00	
DSRC310	30.00	2.00 - 30.20	09/06/2020 12:00	Dry		30.00	
DSRC310	30.00	2.00 - 30.20	15/06/2020 12:00	Dry		30.00	
DSRC310	30.00	2.00 - 30.20	22/06/2020 12:00	Dry		30.00	
DSRC310	30.00	2.00 - 30.20	30/06/2020 12:00	Dry		30.00	
General Remarks:						CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRC310	30.00	2.00 - 30.20	13/07/2020 11:51	Dry		30.00	
DSRC310	30.00	2.00 - 30.20	21/07/2020 13:26	Dry		30.00	
DSRC310	30.00	2.00 - 30.20	28/07/2020 08:55	Dry		30.00	
DSRC310	30.00	2.00 - 30.20	24/08/2020 12:47	Dry		30.00	
DSRC310	30.00	2.00 - 30.20	30/09/2020 11:22	Dry		30.00	
DSRC310	30.00	2.00 - 30.20	21/10/2020 10:24	Dry		30.00	
DSRC310	30.00	2.00 - 30.20	23/11/2020 10:45	Dry		30.00	
DSRC311	39.50	11.50 - 40.00	29/04/2020 12:00	Dry		39.50	
DSRC311	39.50	11.50 - 40.00	30/04/2020 12:00	39.30	215.90	39.50	
DSRC311	39.50	11.50 - 40.00	01/05/2020 12:00	39.30	215.90	39.50	
DSRC311	39.50	11.50 - 40.00	04/05/2020 12:00	39.30	215.90	39.50	
DSRC311	39.50	11.50 - 40.00	05/05/2020 12:00	39.30	215.90	39.50	
DSRC311	39.50	11.50 - 40.00	14/05/2020 12:00	39.30	215.90	39.50	
DSRC311	39.50	11.50 - 40.00	22/05/2020 12:00	39.30	215.90	39.50	
DSRC311	39.50	11.50 - 40.00	27/05/2020 12:00	39.33	215.87	39.50	
DSRC311	39.50	11.50 - 40.00	04/06/2020 12:00	39.32	215.88	39.50	
DSRC311	39.50	11.50 - 40.00	09/06/2020 12:00	39.37	215.83	39.50	
DSRC311	39.50	11.50 - 40.00	15/06/2020 12:00	39.40	215.80	39.50	
DSRC311	39.50	11.50 - 40.00	17/06/2020 12:00	Dry		39.50	
DSRC311	39.50	11.50 - 40.00	22/06/2020 12:00	Dry		39.50	
DSRC311	39.50	11.50 - 40.00	30/06/2020 12:00	Dry		39.50	
DSRC311	39.50	11.50 - 40.00	06/07/2020 12:00	Dry		39.50	
DSRC311	39.50	11.50 - 40.00	13/07/2020 12:02	Dry		39.50	
DSRC311	39.50	11.50 - 40.00	21/07/2020 13:21	Dry		39.50	
General Remarks:						CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC311	39.50	11.50 - 40.00	24/08/2020 13:02	Dry		39.50		
DSRC311	39.50	11.50 - 40.00	30/09/2020 11:34	Dry		39.50		
DSRC311	39.50	11.50 - 40.00	21/10/2020 10:28	39.35	215.85	39.50		
DSRC311	39.50	11.50 - 40.00	23/11/2020 10:50	39.04	216.16	39.93		
DSRC312	14.00	1.00 - 14.50	26/05/2020 12:00	12.73	269.42	14.15		
DSRC312	14.00	1.00 - 14.50	27/05/2020 12:00	12.77	269.38	14.15		
DSRC312	14.00	1.00 - 14.50	28/05/2020 12:00	12.79	269.36	14.15		
DSRC312	14.00	1.00 - 14.50	29/05/2020 12:00	12.80	269.35	14.15		
DSRC312	14.00	1.00 - 14.50	01/06/2020 12:00	12.82	269.33	14.15		
DSRC312	14.00	1.00 - 14.50	02/06/2020 12:00	12.82	269.33	14.15		
DSRC312	14.00	1.00 - 14.50	10/06/2020 12:00	12.85	269.30	14.15		
DSRC312	14.00	1.00 - 14.50	17/06/2020 12:00	12.71	269.44	14.15		
DSRC312	14.00	1.00 - 14.50	18/06/2020 15:09	12.90	269.25		Water quality monitoring level	
DSRC312	14.00	1.00 - 14.50	18/06/2020 15:10	12.90	269.25		Water quality monitoring level	
DSRC312	14.00	1.00 - 14.50	18/06/2020 15:11	12.90	269.25		Water quality monitoring level	
DSRC312	14.00	1.00 - 14.50	18/06/2020 15:12	12.90	269.25		Water quality monitoring level	
DSRC312	14.00	1.00 - 14.50	22/06/2020 12:00	12.93	269.22	14.15		
DSRC312	14.00	1.00 - 14.50	25/06/2020 11:19	13.00	269.15		Water quality monitoring level	
DSRC312	14.00	1.00 - 14.50	25/06/2020 11:20	13.00	269.15		Water quality monitoring level	
DSRC312	14.00	1.00 - 14.50	25/06/2020 11:21	13.00	269.15		Water quality monitoring level	
DSRC312	14.00	1.00 - 14.50	25/06/2020 11:22	13.00	269.15		Water quality monitoring level	
DSRC312	14.00	1.00 - 14.50	25/06/2020 11:23	13.00	269.15		Water quality monitoring level	
DSRC312	14.00	1.00 - 14.50	25/06/2020 11:24	13.00	269.15		Water quality monitoring level	
DSRC312	14.00	1.00 - 14.50	29/06/2020 12:00	12.95	269.20	14.15		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC312	14.00	1.00 - 14.50	14/07/2020 13:12	12.96	269.19	14.15		
DSRC312	14.00	1.00 - 14.50	21/07/2020 13:14	12.96	269.19	14.15		
DSRC312	14.00	1.00 - 14.50	28/07/2020 10:04	12.95	269.20	14.15		
DSRC312	14.00	1.00 - 14.50	28/07/2020 10:06	12.95	269.20		Water quality monitoring level	
DSRC312	14.00	1.00 - 14.50	28/07/2020 10:07	12.95	269.20		Water quality monitoring level	
DSRC312	14.00	1.00 - 14.50	28/07/2020 10:08	12.95	269.20		Water quality monitoring level	
DSRC312	14.00	1.00 - 14.50	28/07/2020 10:09	12.95	269.20		Water quality monitoring level	
DSRC312	14.00	1.00 - 14.50	28/07/2020 10:10	12.95	269.20		Water quality monitoring level	
DSRC312	14.00	1.00 - 14.50	24/08/2020 09:48	12.95	269.20	14.15		
DSRC312	14.00	1.00 - 14.50	30/09/2020 13:42	12.94	269.21	14.15		
DSRC312	14.00	1.00 - 14.50	21/10/2020 13:04	12.90	269.25	14.15		
DSRC312	14.00	1.00 - 14.50	25/11/2020 09:06	12.92	269.23	14.15		
DSRC314	15.00	2.00 - 15.00	26/09/2019 11:40	Dry		15.00		
DSRC314	15.00	2.00 - 15.00	27/09/2019 11:40	Dry		15.00		
DSRC314	15.00	2.00 - 15.00	30/09/2019 11:40	Dry		15.00		
DSRC314	15.00	2.00 - 15.00	01/10/2019 11:45	Dry		15.00		
DSRC314	15.00	2.00 - 15.00	10/10/2019 11:40	Dry		15.00		
DSRC314	15.00	2.00 - 15.00	22/10/2019 11:40	Dry		15.00		
DSRC314	15.00	2.00 - 15.00	31/10/2019 14:20	14.97	278.13	15.00		
DSRC314	15.00	2.00 - 15.00	06/11/2019 15:55	14.90	278.20	15.00		
DSRC314	15.00	2.00 - 15.00	14/11/2019 12:46	14.89	278.21	15.00		
DSRC314	15.00	2.00 - 15.00	22/11/2019 16:40	14.90	278.20	15.00		
DSRC314	15.00	2.00 - 15.00	28/11/2019 13:20	14.90	278.20	15.00		
DSRC314	15.00	2.00 - 15.00	05/12/2019 15:21	14.89	278.21	15.00		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC314	15.00	2.00 - 15.00	18/12/2019 15:55	14.88	278.22	15.00		
DSRC314	15.00	2.00 - 15.00	08/01/2020 12:00	14.87	278.23	15.00		
DSRC314	15.00	2.00 - 15.00	15/01/2020 12:00	14.92	278.18	15.00		
DSRC314	15.00	2.00 - 15.00	22/01/2020 12:00	Dry		15.00		
DSRC314	15.00	2.00 - 15.00	29/01/2020 12:00	Dry		15.00		
DSRC314	15.00	2.00 - 15.00	05/02/2020 12:00	Dry		15.00		
DSRC314	15.00	2.00 - 15.00	10/02/2020 12:00	14.90	278.20	15.00		
DSRC314	15.00	2.00 - 15.00	19/02/2020 12:00	14.88	278.22	15.00		
DSRC314	15.00	2.00 - 15.00	27/02/2020 12:00	14.95	278.15	15.00		
DSRC314	15.00	2.00 - 15.00	06/03/2020 12:00	14.90	278.20	15.00		
DSRC314	15.00	2.00 - 15.00	12/03/2020 12:00	Dry		15.00		
DSRC314	15.00	2.00 - 15.00	25/03/2020 12:00	14.90	278.20	15.00		
DSRC314	15.00	2.00 - 15.00	31/03/2020 12:00	14.93	278.17	15.00		
DSRC314	15.00	2.00 - 15.00	21/04/2020 12:00	14.90	278.20	15.00		
DSRC314	15.00	2.00 - 15.00	01/05/2020 12:00	14.91	278.19	15.00		
DSRC314	15.00	2.00 - 15.00	14/05/2020 12:00	Dry		15.00		
DSRC314	15.00	2.00 - 15.00	22/05/2020 12:00	14.91	278.19	15.00		
DSRC314	15.00	2.00 - 15.00	27/05/2020 12:00	14.89	278.21	15.00		
DSRC314	15.00	2.00 - 15.00	10/06/2020 12:00	14.85	278.25	15.00		
DSRC314	15.00	2.00 - 15.00	17/06/2020 12:00	14.86	278.24	15.00		
DSRC314	15.00	2.00 - 15.00	24/06/2020 12:00	14.90	278.20	15.00		
DSRC314	15.00	2.00 - 15.00	30/06/2020 12:00	Dry		15.00		
DSRC314	15.00	2.00 - 15.00	06/07/2020 12:00	14.92	278.18	15.00		
DSRC314	15.00	2.00 - 15.00	13/07/2020 14:53	Dry		15.00		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC314	15.00	2.00 - 15.00	27/07/2020 09:17	Dry		15.00		
DSRC314	15.00	2.00 - 15.00	26/08/2020 09:17	Dry		15.00		
DSRC314	15.00	2.00 - 15.00	30/09/2020 14:09	Dry		15.00		
DSRC314	15.00	2.00 - 15.00	21/10/2020 08:52	Dry		15.00		
DSRC314	15.00	2.00 - 15.00	23/11/2020 09:24	Dry		14.96		
DSRC315	52.70	4.40 - 53.70	08/10/2019 11:50	48.50	198.40	52.64		
DSRC315	52.70	4.40 - 53.70	09/10/2019 11:50	48.70	198.20	52.64		
DSRC315	52.70	4.40 - 53.70	10/10/2019 11:55	48.50	198.40	52.64		
DSRC315	52.70	4.40 - 53.70	11/10/2019 11:50	48.50	198.40	52.64		
DSRC315	52.70	4.40 - 53.70	22/10/2019 11:50	46.65	200.25	52.64		
DSRC315	52.70	4.40 - 53.70	29/10/2019 16:30	44.66	202.24	52.64		
DSRC315	52.70	4.40 - 53.70	06/11/2019 14:43	44.48	202.42	52.64		
DSRC315	52.70	4.40 - 53.70	14/11/2019 13:30	44.20	202.70	52.64		
DSRC315	52.70	4.40 - 53.70	22/11/2019 15:59	43.21	203.69	52.64		
DSRC315	52.70	4.40 - 53.70	28/11/2019 12:16	43.48	203.42	52.64		
DSRC315	52.70	4.40 - 53.70	05/12/2019 12:37	43.83	203.07	52.64		
DSRC315	52.70	4.40 - 53.70	11/12/2019 15:24	43.75	203.15	52.64		
DSRC315	52.70	4.40 - 53.70	18/12/2019 16:08	44.37	202.53	52.64		
DSRC315	52.70	4.40 - 53.70	08/01/2020 12:00	44.97	201.93	52.64		
DSRC315	52.70	4.40 - 53.70	15/01/2020 12:00	44.55	202.35	52.64		
DSRC315	52.70	4.40 - 53.70	22/01/2020 12:00	44.37	202.53	52.64		
DSRC315	52.70	4.40 - 53.70	31/01/2020 12:00	44.48	202.42	52.64		
DSRC315	52.70	4.40 - 53.70	05/02/2020 12:00	44.58	202.32	52.64		
DSRC315	52.70	4.40 - 53.70	10/02/2020 12:00	45.53	201.37	52.64		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC315	52.70	4.40 - 53.70	06/03/2020 12:00	42.75	204.15	52.64		
DSRC315	52.70	4.40 - 53.70	10/03/2020 12:00	43.20	203.70	52.64		
DSRC315	52.70	4.40 - 53.70	31/03/2020 12:00	43.85	203.05	52.64		
DSRC315	52.70	4.40 - 53.70	06/04/2020 12:00	46.90	200.00	52.64		
DSRC315	52.70	4.40 - 53.70	01/05/2020 12:00	46.95	199.95	52.64		
DSRC315A	52.90	4.40 - 53.40	09/06/2020 12:00	50.64	196.36	53.00		
DSRC315A	52.90	4.40 - 53.40	10/06/2020 12:00	50.64	196.36	53.00		
DSRC315A	52.90	4.40 - 53.40	11/06/2020 12:00	50.70	196.30	53.00		
DSRC315A	52.90	4.40 - 53.40	15/06/2020 12:00	50.65	196.35	53.00		
DSRC315A	52.90	4.40 - 53.40	16/06/2020 12:00	50.65	196.35	53.00		
DSRC315A	52.90	4.40 - 53.40	17/06/2020 12:00	50.70	196.30	53.00		
DSRC315A	52.90	4.40 - 53.40	22/06/2020 12:00	50.68	196.32	53.00		
DSRC315A	52.90	4.40 - 53.40	25/06/2020 11:48	51.00	196.00		Water quality monitoring level	
DSRC315A	52.90	4.40 - 53.40	25/06/2020 11:49	51.00	196.00		Water quality monitoring level	
DSRC315A	52.90	4.40 - 53.40	25/06/2020 11:50	51.00	196.00		Water quality monitoring level	
DSRC315A	52.90	4.40 - 53.40	25/06/2020 11:51	51.00	196.00		Water quality monitoring level	
DSRC315A	52.90	4.40 - 53.40	25/06/2020 11:52	51.00	196.00		Water quality monitoring level	
DSRC315A	52.90	4.40 - 53.40	25/06/2020 11:53	51.00	196.00		Water quality monitoring level	
DSRC315A	52.90	4.40 - 53.40	25/06/2020 11:54	51.00	196.00		Water quality monitoring level	
DSRC315A	52.90	4.40 - 53.40	25/06/2020 11:55	51.00	196.00		Water quality monitoring level	
DSRC315A	52.90	4.40 - 53.40	25/06/2020 11:56	51.00	196.00		Water quality monitoring level	
DSRC315A	52.90	4.40 - 53.40	02/07/2020 12:00	50.94	196.06	53.00		
DSRC315A	52.90	4.40 - 53.40	06/07/2020 12:00	Dry		53.00		
DSRC315A	52.90	4.40 - 53.40	13/07/2020 10:45	51.12	195.88	53.00		
General Remarks:							CONTRACT 35560	CHECKED EL



**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRC315A	52.90	4.40 - 53.40	21/07/2020 09:52	51.24	195.76		Water quality monitoring level
DSRC315A	52.90	4.40 - 53.40	21/07/2020 09:53	51.24	195.76		Water quality monitoring level
DSRC315A	52.90	4.40 - 53.40	21/07/2020 09:54	51.24	195.76		Water quality monitoring level
DSRC315A	52.90	4.40 - 53.40	21/07/2020 09:55	51.24	195.76		Water quality monitoring level
DSRC315A	52.90	4.40 - 53.40	21/07/2020 09:56	51.24	195.76		Water quality monitoring level
DSRC315A	52.90	4.40 - 53.40	21/07/2020 09:57	51.24	195.76		Water quality monitoring level
DSRC315A	52.90	4.40 - 53.40	28/07/2020 08:45	Dry		53.00	
DSRC315A	52.90	4.40 - 53.40	30/09/2020 10:56	Dry		52.64	
DSRC315A	52.90	4.40 - 53.40	21/10/2020 10:34	47.87	199.13	52.64	
DSRC315A	52.90	4.40 - 53.40	23/11/2020 10:56	46.55	200.45	52.64	
DSRC317	4.00	1.00 - 4.30	09/10/2019 12:00	1.90	273.00	4.00	
DSRC317	4.00	1.00 - 4.30	10/10/2019 12:00	2.10	272.80	4.00	
DSRC317	4.00	1.00 - 4.30	11/10/2019 12:00	2.70	272.20	4.00	
DSRC317	4.00	1.00 - 4.30	15/10/2019 12:10	2.10	272.80	4.00	
DSRC317	4.00	1.00 - 4.30	16/10/2019 12:00	2.10	272.80	4.00	
DSRC317	4.00	1.00 - 4.30	21/10/2019 12:00	2.85	272.05	4.00	
DSRC317	4.00	1.00 - 4.30	29/10/2019 15:30	2.70	272.20	4.00	
DSRC317	4.00	1.00 - 4.30	06/11/2019 14:05	3.15	271.75	4.00	
DSRC317	4.00	1.00 - 4.30	11/11/2019 16:10	3.18	271.72	4.00	
DSRC317	4.00	1.00 - 4.30	22/11/2019 15:33	3.44	271.46	4.00	
DSRC317	4.00	1.00 - 4.30	28/11/2019 11:09	3.39	271.51	4.00	
DSRC317	4.00	1.00 - 4.30	05/12/2019 14:00	3.53	271.37	4.00	
DSRC317	4.00	1.00 - 4.30	11/12/2019 11:51	3.56	271.34	4.00	
DSRC317	4.00	1.00 - 4.30	18/12/2019 15:23	3.50	271.40	4.00	
General Remarks:						CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC317	4.00	1.00 - 4.30	29/01/2020 12:00	3.77	271.13	4.00		
DSRC317	4.00	1.00 - 4.30	05/02/2020 12:00	3.80	271.10	4.00		
DSRC317	4.00	1.00 - 4.30	10/02/2020 12:00	3.75	271.15	4.00		
DSRC317	4.00	1.00 - 4.30	26/02/2020 12:00	3.50	271.40	4.00		
DSRC317	4.00	1.00 - 4.30	03/04/2020 12:00	3.75	271.15	4.00		
DSRC317	4.00	1.00 - 4.30	01/05/2020 12:00	Dry		4.00		
DSRC317	4.00	1.00 - 4.30	26/05/2020 12:00	Dry		4.00		
DSRC317	4.00	1.00 - 4.30	13/07/2020 08:51	Dry		4.00		
DSRC317	4.00	1.00 - 4.30	21/07/2020 15:37	Dry		4.00		
DSRC317	4.00	1.00 - 4.30	27/07/2020 11:12	Dry		4.00		
DSRC317	4.00	1.00 - 4.30	24/08/2020 11:02	Dry		4.00		
DSRC317	4.00	1.00 - 4.30	30/09/2020 09:57	Dry		4.00		
DSRC317	4.00	1.00 - 4.30	23/11/2020 11:32	3.08	271.82	4.00		
DSRC319	20.50	2.90 - 20.50	13/03/2020 12:00	19.75	211.85	20.50		
DSRC319	20.50	2.90 - 20.50	16/03/2020 12:00	19.33	212.27	20.50		
DSRC319	20.50	2.90 - 20.50	17/03/2020 12:00	19.32	212.28	20.50		
DSRC319	20.50	2.90 - 20.50	18/03/2020 12:00	19.31	212.29	20.50		
DSRC319	20.50	2.90 - 20.50	23/03/2020 12:00	19.43	212.17	20.50		
DSRC319	20.50	2.90 - 20.50	24/03/2020 12:00	19.45	212.15	20.50		
DSRC319	20.50	2.90 - 20.50	25/03/2020 12:00	19.46	212.14	20.50		
DSRC319	20.50	2.90 - 20.50	26/03/2020 12:00	19.45	212.15	20.50		
DSRC319	20.50	2.90 - 20.50	27/03/2020 12:00	19.42	212.18	20.50		
DSRC319	20.50	2.90 - 20.50	31/03/2020 12:00	20.00	211.60	20.50		
DSRC319	20.50	2.90 - 20.50	06/04/2020 12:00	20.40	211.20	20.50		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC319	20.50	2.90 - 20.50	24/04/2020 12:00	20.40	211.20	20.50		
DSRC319	20.50	2.90 - 20.50	29/04/2020 12:00	Dry		20.50		
DSRC319	20.50	2.90 - 20.50	07/05/2020 12:00	Dry		20.50		
DSRC319	20.50	2.90 - 20.50	14/05/2020 12:00	Dry		20.50		
DSRC319	20.50	2.90 - 20.50	20/05/2020 12:00	Dry		20.50		
DSRC319	20.50	2.90 - 20.50	27/05/2020 12:00	Dry		20.50		
DSRC319	20.50	2.90 - 20.50	04/06/2020 12:00	Dry		20.50		
DSRC319	20.50	2.90 - 20.50	11/06/2020 12:00	Dry		20.50		
DSRC319	20.50	2.90 - 20.50	22/06/2020 12:00	Dry		20.50		
DSRC319	20.50	2.90 - 20.50	01/07/2020 12:00	19.99	211.61	20.50		
DSRC319	20.50	2.90 - 20.50	07/07/2020 13:16	Dry		20.50		
DSRC319	20.50	2.90 - 20.50	15/07/2020 13:29	19.98	211.62	20.50		
DSRC319	20.50	2.90 - 20.50	22/07/2020 11:11	Dry		20.50		
DSRC319	20.50	2.90 - 20.50	29/07/2020 10:27	Dry		20.50		
DSRC319	20.50	2.90 - 20.50	26/08/2020 13:07	Dry		20.50		
DSRC319	20.50	2.90 - 20.50	23/09/2020 12:11	Dry		20.50		
DSRC319	20.50	2.90 - 20.50	22/10/2020 14:26	Dry		20.50		
DSRC319	20.50	2.90 - 20.50	23/11/2020 14:09	Dry		20.50		
DSRC325	25.30	3.80 - 25.80	24/03/2020 12:00	21.85	211.40	25.50		
DSRC325	25.30	3.80 - 25.80	25/03/2020 12:00	21.82	211.43	25.50		
DSRC325	25.30	3.80 - 25.80	26/03/2020 12:00	21.81	211.44	25.50		
DSRC325	25.30	3.80 - 25.80	27/03/2020 12:00	21.81	211.44	25.50		
DSRC325	25.30	3.80 - 25.80	31/03/2020 12:00	22.09	211.16	25.50		
DSRC325	25.30	3.80 - 25.80	06/04/2020 12:00	22.23	211.02	25.50		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRC325	25.30	3.80 - 25.80	08/04/2020 08:43	25.00	208.25		Water quality monitoring level
DSRC325	25.30	3.80 - 25.80	08/04/2020 08:44	25.00	208.25		Water quality monitoring level
DSRC325	25.30	3.80 - 25.80	15/04/2020 12:00	22.50	210.75	25.50	
DSRC325	25.30	3.80 - 25.80	24/04/2020 12:00	22.58	210.67	25.50	
DSRC325	25.30	3.80 - 25.80	29/04/2020 12:00	23.94	209.31	25.50	
DSRC325	25.30	3.80 - 25.80	07/05/2020 12:00	23.98	209.27	25.50	
DSRC325	25.30	3.80 - 25.80	14/05/2020 12:00	24.00	209.25	25.50	
DSRC325	25.30	3.80 - 25.80	20/05/2020 12:00	23.46	209.79	25.50	
DSRC325	25.30	3.80 - 25.80	27/05/2020 12:00	23.39	209.86	25.50	
DSRC325	25.30	3.80 - 25.80	04/06/2020 12:00	23.40	209.85	25.50	
DSRC325	25.30	3.80 - 25.80	11/06/2020 12:00	23.47	209.78	25.50	
DSRC325	25.30	3.80 - 25.80	22/06/2020 12:00	23.37	209.88	25.50	
DSRC325	25.30	3.80 - 25.80	01/07/2020 12:00	23.44	209.81	25.50	
DSRC325	25.30	3.80 - 25.80	07/07/2020 13:25	23.40	209.85	25.50	
DSRC325	25.30	3.80 - 25.80	15/07/2020 13:50	23.42	209.83	25.50	
DSRC325	25.30	3.80 - 25.80	22/07/2020 11:06	24.36	208.89	25.50	
DSRC325	25.30	3.80 - 25.80	27/07/2020 10:10	23.44	209.81	25.50	
DSRC325	25.30	3.80 - 25.80	26/08/2020 12:32	23.59	209.66	25.50	
DSRC325	25.30	3.80 - 25.80	23/09/2020 12:20	23.51	209.74	25.50	
DSRC325	25.30	3.80 - 25.80	22/10/2020 14:14	23.26	209.99	25.50	
DSRC325	25.30	3.80 - 25.80	23/11/2020 14:49	22.63	210.62	25.50	
DSRC401	8.50	4.80 - 8.70	03/12/2019 15:40	6.38	266.72	8.50	
DSRC401	8.50	4.80 - 8.70	04/12/2019 14:00	5.80	267.30	8.50	
DSRC401	8.50	4.80 - 8.70	05/12/2019 14:49	6.35	266.75	8.50	
General Remarks:						CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC401	8.50	4.80 - 8.70	06/01/2020 12:20	6.46	266.64	8.50		
DSRC401	8.50	4.80 - 8.70	29/01/2020 12:00	6.38	266.72	8.50		
DSRC401	8.50	4.80 - 8.70	05/02/2020 12:00	6.42	266.68	8.50		
DSRC401	8.50	4.80 - 8.70	19/02/2020 12:00	6.30	266.80	8.50		
DSRC401	8.50	4.80 - 8.70	26/02/2020 12:00	6.35	266.75	8.50		
DSRC401	8.50	4.80 - 8.70	06/03/2020 12:00	6.32	266.78	8.50		
DSRC401	8.50	4.80 - 8.70	12/03/2020 12:00	6.45	266.65	8.50		
DSRC401	8.50	4.80 - 8.70	25/03/2020 12:00	6.40	266.70	8.50		
DSRC401	8.50	4.80 - 8.70	07/04/2020 12:00	7.86	265.24	8.50		
DSRC401	8.50	4.80 - 8.70	21/04/2020 12:00	7.95	265.15	8.50		
DSRC401	8.50	4.80 - 8.70	29/04/2020 12:00	8.05	265.05	8.50		
DSRC401	8.50	4.80 - 8.70	05/05/2020 12:00	8.26	264.84	8.50		
DSRC401	8.50	4.80 - 8.70	14/05/2020 12:00	8.30	264.80	8.50		
DSRC401	8.50	4.80 - 8.70	22/05/2020 12:00	8.26	264.84	8.50		
DSRC401	8.50	4.80 - 8.70	04/06/2020 12:00	8.28	264.82	8.50		
DSRC401	8.50	4.80 - 8.70	10/06/2020 12:00	8.29	264.81	8.50		
DSRC401	8.50	4.80 - 8.70	17/06/2020 12:00	8.26	264.84	8.50		
DSRC401	8.50	4.80 - 8.70	22/06/2020 12:00	8.28	264.82	8.50		
DSRC401	8.50	4.80 - 8.70	01/07/2020 12:00	Dry		8.50		
DSRC401	8.50	4.80 - 8.70	06/07/2020 12:00	Dry		8.50		
DSRC401	8.50	4.80 - 8.70	13/07/2020 13:55	8.36	264.74	8.50		
DSRC401	8.50	4.80 - 8.70	21/07/2020 14:26	8.32	264.78	8.50		
DSRC401	8.50	4.80 - 8.70	27/07/2020 09:39	8.38	264.72	8.50		
DSRC401	8.50	4.80 - 8.70	24/08/2020 14:09	Dry		8.50		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRC401	8.50	4.80 - 8.70	21/10/2020 11:47	6.79	266.31	8.50	
DSRC401	8.50	4.80 - 8.70	23/11/2020 11:48	6.62	266.48	8.50	
DSRC403	19.60	4.00 - 20.00	13/03/2020 12:00	3.52	244.13	19.50	
DSRC403	19.60	4.00 - 20.00	16/03/2020 12:00	3.47	244.18	19.50	
DSRC403	19.60	4.00 - 20.00	17/03/2020 12:00	3.42	244.23	19.50	
DSRC403	19.60	4.00 - 20.00	18/03/2020 12:00	3.41	244.24	19.50	
DSRC403	19.60	4.00 - 20.00	19/03/2020 12:00	3.40	244.25	19.50	
DSRC403	19.60	4.00 - 20.00	30/03/2020 12:00	3.40	244.25	19.50	
DSRC403	19.60	4.00 - 20.00	01/04/2020 12:00	3.92	243.73	19.50	
DSRC403	19.60	4.00 - 20.00	07/04/2020 12:00	4.52	243.13	19.50	
DSRC403	19.60	4.00 - 20.00	07/04/2020 13:11	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	07/04/2020 13:12	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	07/04/2020 13:13	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	07/04/2020 13:14	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	07/04/2020 13:15	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	07/04/2020 13:16	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	07/04/2020 13:17	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	07/04/2020 13:18	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	07/04/2020 13:19	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	07/04/2020 13:20	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	07/04/2020 13:21	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	07/04/2020 13:22	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	07/04/2020 13:23	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	07/04/2020 13:24	6.00	241.65		Water quality monitoring level
General Remarks:						CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRC403	19.60	4.00 - 20.00	15/04/2020 10:42	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	15/04/2020 10:43	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	15/04/2020 10:44	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	15/04/2020 10:45	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	15/04/2020 10:48	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	15/04/2020 10:49	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	15/04/2020 10:50	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	15/04/2020 10:51	6.00	241.65		Water quality monitoring level
DSRC403	19.60	4.00 - 20.00	15/04/2020 12:00	4.65	243.00	19.50	
DSRC403	19.60	4.00 - 20.00	24/04/2020 12:00	4.73	242.92	19.50	
DSRC403	19.60	4.00 - 20.00	29/04/2020 12:00	4.70	242.95	19.50	
DSRC403	19.60	4.00 - 20.00	05/05/2020 12:00	4.69	242.96	19.50	
DSRC403	19.60	4.00 - 20.00	14/05/2020 12:00	4.85	242.80	19.50	
DSRC403	19.60	4.00 - 20.00	20/05/2020 12:00	5.20	242.45	19.50	
DSRC403	19.60	4.00 - 20.00	27/05/2020 12:00	5.36	242.29	19.50	
DSRC403	19.60	4.00 - 20.00	04/06/2020 12:00	5.32	242.33	19.50	
DSRC403	19.60	4.00 - 20.00	10/06/2020 12:00	5.34	242.31	19.50	
DSRC403	19.60	4.00 - 20.00	16/06/2020 12:00	5.20	242.45	19.50	
DSRC403	19.60	4.00 - 20.00	22/06/2020 12:00	5.03	242.62	19.50	
DSRC403	19.60	4.00 - 20.00	06/07/2020 12:00	5.18	242.47	19.50	
DSRC403	19.60	4.00 - 20.00	13/07/2020 14:03	5.07	242.58	19.50	
DSRC403	19.60	4.00 - 20.00	22/07/2020 15:35	5.15	242.50	19.50	
DSRC403	19.60	4.00 - 20.00	27/07/2020 09:57	5.16	242.49	19.50	
DSRC403	19.60	4.00 - 20.00	24/08/2020 14:23	5.12	242.53	19.50	
General Remarks:						CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC403	19.60	4.00 - 20.00	23/11/2020 12:43	4.56	243.09	19.50		
DSRC404	33.50	23.00 - 34.00	31/01/2019 15:45	Dry		33.40		
DSRC404	33.50	23.00 - 34.00	04/02/2019 14:00	Dry		33.40		
DSRC404	33.50	23.00 - 34.00	05/02/2019 09:15	Dry		33.40		
DSRC404	33.50	23.00 - 34.00	06/02/2019 09:21	Dry		33.40		
DSRC404	33.50	23.00 - 34.00	07/02/2019 08:08	Dry		33.40		
DSRC404	33.50	23.00 - 34.00	08/02/2019 14:10	Dry		33.40		
DSRC404	33.50	23.00 - 34.00	11/02/2019 10:05	Dry		33.40		
DSRC404	33.50	23.00 - 34.00	12/02/2019 08:47	Dry		33.40		
DSRC404	33.50	23.00 - 34.00	14/02/2019 10:20	Dry		33.40		
DSRC404	33.50	23.00 - 34.00	28/02/2019 14:20	Dry		33.40		
DSRC404	33.50	23.00 - 34.00	19/03/2019 12:00	Dry		33.40		
DSRC404	33.50	23.00 - 34.00	21/03/2019 09:15	Dry		33.40		
DSRC404	33.50	23.00 - 34.00	04/04/2019 13:00	Dry				
DSRC404	33.50	23.00 - 34.00	02/05/2019 11:11	Dry		33.40		
DSRC404	33.50	23.00 - 34.00	30/05/2019 12:30	Dry		33.40		
DSRC404	33.50	23.00 - 34.00	12/09/2019 09:10	Dry				
DSRC404	33.50	23.00 - 34.00	20/09/2019 14:05	Dry				
DSRC404	33.50	23.00 - 34.00	29/10/2019 12:00	Dry				
DSRC404	33.50	23.00 - 34.00	05/11/2019 11:14	Dry				
DSRC404	33.50	23.00 - 34.00	12/11/2019 09:36	Dry				
DSRC404	33.50	23.00 - 34.00	19/11/2019 14:40	33.42	235.58			
DSRC404	33.50	23.00 - 34.00	27/11/2019 09:47	33.42	235.58			
DSRC404	33.50	23.00 - 34.00	03/12/2019 10:56	33.41	235.59			
General Remarks:							CONTRACT 35560	CHECKED EL





# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRC404	33.50	23.00 - 34.00	16/12/2019 14:51	33.40	235.60		
DSRC404	33.50	23.00 - 34.00	09/01/2020 12:00	Dry			
DSRC404	33.50	23.00 - 34.00	14/01/2020 12:00	33.28	235.72		
DSRC404	33.50	23.00 - 34.00	22/01/2020 12:00	Dry			
DSRC404	33.50	23.00 - 34.00	28/01/2020 12:00	Dry			
DSRC404	33.50	23.00 - 34.00	03/02/2020 12:00	Dry			
DSRC404	33.50	23.00 - 34.00	11/02/2020 12:00	Dry			
DSRC404	33.50	23.00 - 34.00	18/02/2020 12:00	Dry			
DSRC404	33.50	23.00 - 34.00	28/02/2020 12:00	33.45	235.55		
DSRC404	33.50	23.00 - 34.00	01/04/2020 12:00	Dry			
DSRC404	33.50	23.00 - 34.00	01/05/2020 12:00	Dry			
DSRC404	33.50	23.00 - 34.00	26/05/2020 12:00	Dry			
DSRC404	33.50	23.00 - 34.00	29/06/2020 12:00	Dry			
DSRC404	33.50	23.00 - 34.00	07/07/2020 12:00	Dry			
DSRC404	33.50	23.00 - 34.00	13/07/2020 15:05	Dry			
DSRC404	33.50	23.00 - 34.00	21/07/2020 07:51	Dry			
DSRC404	33.50	23.00 - 34.00	27/07/2020 14:35	Dry			
DSRC404	33.50	23.00 - 34.00	26/08/2020 07:54	Dry			
DSRC404	33.50	23.00 - 34.00	24/09/2020 08:45	Dry		33.40	
DSRC404	33.50	23.00 - 34.00	22/10/2020 14:39	Dry		33.40	
DSRC404	33.50	23.00 - 34.00	23/11/2020 14:07	Dry		33.40	
DSRC406	34.00	20.50 - 35.00	04/02/2019 15:00	31.94	206.71	34.20	
DSRC406	34.00	20.50 - 35.00	05/02/2019 10:02	31.95	206.70	34.20	
DSRC406	34.00	20.50 - 35.00	06/02/2019 10:02	31.94	206.71	34.20	
General Remarks:						CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC406	34.00	20.50 - 35.00	08/02/2019 14:34	31.95	206.70	34.20		
DSRC406	34.00	20.50 - 35.00	11/02/2019 09:08	31.96	206.69	34.20		
DSRC406	34.00	20.50 - 35.00	12/02/2019 09:17	31.96	206.69	34.20		
DSRC406	34.00	20.50 - 35.00	14/02/2019 08:25	31.98	206.67	34.20		
DSRC406	34.00	20.50 - 35.00	28/02/2019 13:30	31.96	206.69	34.20		
DSRC406	34.00	20.50 - 35.00	04/04/2019 13:45	31.40	207.25			
DSRC406	34.00	20.50 - 35.00	02/05/2019 13:00	31.52	207.13	34.20		
DSRC406	34.00	20.50 - 35.00	30/05/2019 13:00	31.90	206.75	34.20		
DSRC406	34.00	20.50 - 35.00	12/09/2019 12:16	31.95	206.70			
DSRC406	34.00	20.50 - 35.00	20/09/2019 14:52	31.90	206.75			
DSRC406	34.00	20.50 - 35.00	24/09/2019 09:23	31.87	206.78			
DSRC406	34.00	20.50 - 35.00	22/10/2019 16:10	30.50	208.15			
DSRC406	34.00	20.50 - 35.00	29/10/2019 12:00	28.92	209.73			
DSRC406	34.00	20.50 - 35.00	05/11/2019 09:57	29.91	208.74			
DSRC406	34.00	20.50 - 35.00	12/11/2019 10:40	30.06	208.59			
DSRC406	34.00	20.50 - 35.00	27/11/2019 12:54	29.67	208.98			
DSRC406	34.00	20.50 - 35.00	03/12/2019 09:50	29.86	208.79			
DSRC406	34.00	20.50 - 35.00	09/12/2019 15:05	30.29	208.36			
DSRC406	34.00	20.50 - 35.00	16/12/2019 15:34	30.32	208.33			
DSRC406	34.00	20.50 - 35.00	09/01/2020 12:00	30.73	207.92			
DSRC406	34.00	20.50 - 35.00	14/01/2020 12:00	29.66	208.99			
DSRC406	34.00	20.50 - 35.00	22/01/2020 12:00	28.23	210.42			
DSRC406	34.00	20.50 - 35.00	28/01/2020 12:00	29.62	209.03			
DSRC406	34.00	20.50 - 35.00	03/02/2020 12:00	30.62	208.03			
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRC406	34.00	20.50 - 35.00	19/02/2020 12:00	27.86	210.79		
DSRC406	34.00	20.50 - 35.00	28/02/2020 12:00	29.17	209.48		
DSRC406	34.00	20.50 - 35.00	01/04/2020 12:00	30.91	207.74		
DSRC406	34.00	20.50 - 35.00	26/05/2020 12:00	31.91	206.74		
DSRC406	34.00	20.50 - 35.00	02/07/2020 12:00	31.88	206.77		
DSRC406	34.00	20.50 - 35.00	07/07/2020 12:00	31.90	206.75		
DSRC406	34.00	20.50 - 35.00	14/07/2020 15:05	31.89	206.76		
DSRC406	34.00	20.50 - 35.00	20/07/2020 13:59	31.89	206.76		
DSRC406	34.00	20.50 - 35.00	24/08/2020 15:39	31.99	206.66		
DSRC406	34.00	20.50 - 35.00	23/09/2020 13:54	31.92	206.73	34.20	
DSRC406	34.00	20.50 - 35.00	21/10/2020 14:27	31.90	206.75	34.20	
DSRC406	34.00	20.50 - 35.00	24/11/2020 14:11	31.32	207.33	34.20	
DSRC408	23.50	20.00 - 24.00	19/03/2019 12:30	22.12	210.38	23.57	
DSRC408	23.50	20.00 - 24.00	21/03/2019 10:00	22.10	210.40	23.57	
DSRC408	23.50	20.00 - 24.00	04/04/2019 14:10	22.08	210.42		
DSRC408	23.50	20.00 - 24.00	02/05/2019 13:44	22.08	210.42	23.57	
DSRC408	23.50	20.00 - 24.00	31/05/2019 10:30	22.10	210.40	23.57	
DSRC408	23.50	20.00 - 24.00	12/09/2019 14:21	22.20	210.30		
DSRC408	23.50	20.00 - 24.00	20/09/2019 15:08	22.15	210.35		
DSRC408	23.50	20.00 - 24.00	24/09/2019 10:40	22.10	210.40		
DSRC408	23.50	20.00 - 24.00	29/10/2019 12:00	22.08	210.42		
DSRC408	23.50	20.00 - 24.00	05/11/2019 10:28	21.99	210.51		
DSRC408	23.50	20.00 - 24.00	12/11/2019 10:53	21.93	210.57		
DSRC408	23.50	20.00 - 24.00	19/11/2019 14:03	21.89	210.61		
General Remarks:						CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRC408	23.50	20.00 - 24.00	03/12/2019 10:40	21.79	210.71		
DSRC408	23.50	20.00 - 24.00	09/12/2019 15:53	21.79	210.71		
DSRC408	23.50	20.00 - 24.00	16/12/2019 15:52	21.74	210.76		
DSRC408	23.50	20.00 - 24.00	09/01/2020 12:00	21.63	210.87		
DSRC408	23.50	20.00 - 24.00	22/01/2020 12:00	21.55	210.95		
DSRC408	23.50	20.00 - 24.00	28/01/2020 12:00	21.50	211.00		
DSRC408	23.50	20.00 - 24.00	03/02/2020 12:00	21.58	210.92		
DSRC408	23.50	20.00 - 24.00	11/02/2020 12:00	21.45	211.05		
DSRC408	23.50	20.00 - 24.00	19/02/2020 12:00	21.43	211.07		
DSRC408	23.50	20.00 - 24.00	28/02/2020 12:00	21.34	211.16		
DSRC408	23.50	20.00 - 24.00	01/04/2020 12:00	21.28	211.22		
DSRC408	23.50	20.00 - 24.00	01/05/2020 12:00	21.36	211.14		
DSRC408	23.50	20.00 - 24.00	26/05/2020 12:00	21.54	210.96		
DSRC408	23.50	20.00 - 24.00	08/07/2020 12:31	21.78	210.72		
DSRC408	23.50	20.00 - 24.00	15/07/2020 14:06	21.82	210.68		
DSRC408	23.50	20.00 - 24.00	22/07/2020 13:11	21.87	210.63		
DSRC408	23.50	20.00 - 24.00	26/08/2020 12:12	22.03	210.47		
DSRC408	23.50	20.00 - 24.00	30/09/2020 14:47	22.11	210.39	23.57	
DSRC408	23.50	20.00 - 24.00	22/10/2020 14:40	22.08	210.42	23.57	
DSRC408	23.50	20.00 - 24.00	23/11/2020 14:33	22.02	210.48	23.57	
DSRC415	49.00	25.50 - 50.00	05/02/2019 09:30	Dry		49.40	
DSRC415	49.00	25.50 - 50.00	06/02/2019 09:50	Dry		49.40	
DSRC415	49.00	25.50 - 50.00	07/02/2019 08:58	Dry		49.40	
DSRC415	49.00	25.50 - 50.00	08/02/2019 14:20	Dry		49.40	
General Remarks:						CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC415	49.00	25.50 - 50.00	12/02/2019 09:01	Dry		49.40		
DSRC415	49.00	25.50 - 50.00	28/02/2019 14:05	Dry		49.40		
DSRC415	49.00	25.50 - 50.00	19/03/2019 13:35	Dry		49.40		
DSRC415	49.00	25.50 - 50.00	21/03/2019 09:30	Dry		49.40		
DSRC415	49.00	25.50 - 50.00	04/04/2019 13:00	Dry				
DSRC415	49.00	25.50 - 50.00	02/05/2019 12:07	Dry		49.40		
DSRC415	49.00	25.50 - 50.00	30/05/2019 15:00	Dry		49.40		
DSRC415	49.00	25.50 - 50.00	12/09/2019 11:45	Dry				
DSRC415	49.00	25.50 - 50.00	20/09/2019 14:30	Dry				
DSRC415	49.00	25.50 - 50.00	24/09/2019 10:19	Dry				
DSRC415	49.00	25.50 - 50.00	22/10/2019 15:37	Dry				
DSRC415	49.00	25.50 - 50.00	29/10/2019 12:00	Dry				
DSRC415	49.00	25.50 - 50.00	05/11/2019 09:35	Dry				
DSRC415	49.00	25.50 - 50.00	12/11/2019 09:58	Dry				
DSRC415	49.00	25.50 - 50.00	19/11/2019 15:30	Dry				
DSRC415	49.00	25.50 - 50.00	27/11/2019 10:20	Dry				
DSRC415	49.00	25.50 - 50.00	03/12/2019 16:17	Dry				
DSRC415	49.00	25.50 - 50.00	09/12/2019 14:00	Dry				
DSRC415	49.00	25.50 - 50.00	16/12/2019 14:28	Dry				
DSRC415	49.00	25.50 - 50.00	09/01/2020 12:00	Dry				
DSRC415	49.00	25.50 - 50.00	14/01/2020 12:00	Dry				
DSRC415	49.00	25.50 - 50.00	22/01/2020 12:00	Dry				
DSRC415	49.00	25.50 - 50.00	28/01/2020 12:00	Dry				
DSRC415	49.00	25.50 - 50.00	03/02/2020 12:00	Dry				
General Remarks:							CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRC415	49.00	25.50 - 50.00	28/02/2020 12:00	Dry			
DSRC415	49.00	25.50 - 50.00	01/04/2020 12:00	Dry			
DSRC415	49.00	25.50 - 50.00	01/05/2020 12:00	Dry			
DSRC415	49.00	25.50 - 50.00	26/05/2020 12:00	Dry			
DSRC415	49.00	25.50 - 50.00	02/07/2020 12:00	Dry			
DSRC415	49.00	25.50 - 50.00	07/07/2020 15:59	Dry			
DSRC415	49.00	25.50 - 50.00	13/07/2020 14:21	Dry			
DSRC415	49.00	25.50 - 50.00	20/07/2020 15:07	Dry			
DSRC415	49.00	25.50 - 50.00	27/07/2020 15:19	Dry			
DSRC415	49.00	25.50 - 50.00	24/08/2020 15:08	Dry			
DSRC415	49.00	25.50 - 50.00	23/09/2020 11:16	Dry		49.40	
DSRC415	49.00	25.50 - 50.00	21/10/2020 13:59	Dry		49.40	
DSRC415	49.00	25.50 - 50.00	23/11/2020 13:43	Dry		49.40	
DSRC418	58.00	27.00 - 59.00	30/01/2020 12:00	55.96	216.29	58.30	
DSRC418	58.00	27.00 - 59.00	05/02/2020 12:00	56.06	216.19	58.30	
DSRC418	58.00	27.00 - 59.00	11/02/2020 12:00	56.07	216.18	58.30	
DSRC418	58.00	27.00 - 59.00	19/02/2020 12:00	56.00	216.25	58.30	
DSRC418	58.00	27.00 - 59.00	26/02/2020 12:00	56.02	216.23	58.30	
DSRC418	58.00	27.00 - 59.00	06/03/2020 12:00	56.00	216.25	58.30	
DSRC418	58.00	27.00 - 59.00	13/03/2020 12:00	56.01	216.24	58.30	
DSRC418	58.00	27.00 - 59.00	26/03/2020 12:00	56.05	216.20	58.30	
DSRC418	58.00	27.00 - 59.00	31/03/2020 12:00	56.12	216.13	58.30	
DSRC418	58.00	27.00 - 59.00	09/04/2020 12:00	56.26	215.99	58.30	
DSRC418	58.00	27.00 - 59.00	20/04/2020 12:00	56.31	215.94	58.30	
General Remarks:						CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC418	58.00	27.00 - 59.00	06/05/2020 12:00	56.63	215.62	58.30		
DSRC418	58.00	27.00 - 59.00	14/05/2020 12:00	56.68	215.57	58.30		
DSRC418	58.00	27.00 - 59.00	21/05/2020 12:00	Dry		58.30		
DSRC418	58.00	27.00 - 59.00	27/05/2020 12:00	Dry		58.30		
DSRC418	58.00	27.00 - 59.00	04/06/2020 12:00	Dry		58.30		
DSRC418	58.00	27.00 - 59.00	10/06/2020 12:00	57.05	215.20	58.30		
DSRC418	58.00	27.00 - 59.00	17/06/2020 12:00	57.10	215.15	58.30		
DSRC418	58.00	27.00 - 59.00	24/06/2020 12:00	57.40	214.85	58.30		
DSRC418	58.00	27.00 - 59.00	01/07/2020 00:00	57.09	215.16	58.30		
DSRC418	58.00	27.00 - 59.00	06/07/2020 13:33	Dry		58.30		
DSRC418	58.00	27.00 - 59.00	15/07/2020 11:31	57.48	214.77	58.30		
DSRC418	58.00	27.00 - 59.00	22/07/2020 11:31	Dry		58.30		
DSRC418	58.00	27.00 - 59.00	30/09/2020 14:38	57.38	214.87	58.30		
DSRC418	58.00	27.00 - 59.00	22/10/2020 15:11	57.09	215.16	58.30		
DSRC418	58.00	27.00 - 59.00	23/11/2020 15:12	56.82	215.43	58.30		
DSRC419	41.50	36.00 - 42.00	31/01/2019 15:40	39.09	229.81	41.25		
DSRC419	41.50	36.00 - 42.00	04/02/2019 14:10	39.24	229.66	41.25		
DSRC419	41.50	36.00 - 42.00	05/02/2019 09:08	39.17	229.73	41.25		
DSRC419	41.50	36.00 - 42.00	06/02/2019 09:26	39.12	229.78	41.25		
DSRC419	41.50	36.00 - 42.00	07/02/2019 08:10	38.95	229.95	41.25		
DSRC419	41.50	36.00 - 42.00	08/02/2019 14:12	38.70	230.20	41.25		
DSRC419	41.50	36.00 - 42.00	11/02/2019 10:09	38.12	230.78	41.25		
DSRC419	41.50	36.00 - 42.00	12/02/2019 08:52	38.07	230.83	41.25		
DSRC419	41.50	36.00 - 42.00	14/02/2019 09:44	38.00	230.90	41.25		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC419	41.50	36.00 - 42.00	19/03/2019 12:05	37.37	231.53	41.25		
DSRC419	41.50	36.00 - 42.00	21/03/2019 09:00	37.38	231.52	41.25		
DSRC419	41.50	36.00 - 42.00	04/04/2019 13:15	38.03	230.87			
DSRC419	41.50	36.00 - 42.00	02/05/2019 11:52	38.50	230.40	41.25		
DSRC419	41.50	36.00 - 42.00	30/05/2019 08:45	39.32	229.58	41.25		
DSRC419	41.50	36.00 - 42.00	12/09/2019 09:30	39.68	229.22			
DSRC419	41.50	36.00 - 42.00	20/09/2019 13:55	40.00	228.90			
DSRC419	41.50	36.00 - 42.00	29/10/2019 12:00	36.40	232.50			
DSRC419	41.50	36.00 - 42.00	05/11/2019 11:14	36.67	232.23			
DSRC419	41.50	36.00 - 42.00	12/11/2019 09:42	36.38	232.52			
DSRC419	41.50	36.00 - 42.00	19/11/2019 14:40	36.20	232.70			
DSRC419	41.50	36.00 - 42.00	27/11/2019 09:57	36.32	232.58			
DSRC419	41.50	36.00 - 42.00	03/12/2019 11:03	36.57	232.33			
DSRC419	41.50	36.00 - 42.00	09/12/2019 14:34	36.81	232.09			
DSRC419	41.50	36.00 - 42.00	16/12/2019 14:47	36.47	232.43			
DSRC419	41.50	36.00 - 42.00	14/01/2020 12:00	36.35	232.55			
DSRC419	41.50	36.00 - 42.00	22/01/2020 12:00	36.31	232.59			
DSRC419	41.50	36.00 - 42.00	28/01/2020 12:00	36.53	232.37			
DSRC419	41.50	36.00 - 42.00	11/02/2020 12:00	36.93	231.97			
DSRC419	41.50	36.00 - 42.00	18/02/2020 12:00	35.75	233.15			
DSRC419	41.50	36.00 - 42.00	28/02/2020 12:00	36.40	232.50			
DSRC419	41.50	36.00 - 42.00	01/04/2020 10:35	37.30	231.60		Water quality monitoring level	
DSRC419	41.50	36.00 - 42.00	01/04/2020 10:36	37.30	231.60		Water quality monitoring level	
DSRC419	41.50	36.00 - 42.00	01/04/2020 10:37	37.30	231.60		Water quality monitoring level	
General Remarks:							CONTRACT 35560	CHECKED EL





# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRC419	41.50	36.00 - 42.00	01/04/2020 10:39	37.30	231.60		Water quality monitoring level
DSRC419	41.50	36.00 - 42.00	01/04/2020 10:40	37.30	231.60		Water quality monitoring level
DSRC419	41.50	36.00 - 42.00	01/04/2020 10:41	37.30	231.60		Water quality monitoring level
DSRC419	41.50	36.00 - 42.00	01/04/2020 10:42	37.30	231.60		Water quality monitoring level
DSRC419	41.50	36.00 - 42.00	01/04/2020 10:43	37.30	231.60		Water quality monitoring level
DSRC419	41.50	36.00 - 42.00	01/04/2020 12:00	37.23	231.67		
DSRC419	41.50	36.00 - 42.00	01/05/2020 12:00	38.52	230.38		
DSRC419	41.50	36.00 - 42.00	29/06/2020 12:00	39.09	229.81		
DSRC419	41.50	36.00 - 42.00	13/07/2020 14:51	39.65	229.25		
DSRC419	41.50	36.00 - 42.00	21/07/2020 07:55	40.00	228.90		
DSRC419	41.50	36.00 - 42.00	27/07/2020 14:30	40.11	228.79		
DSRC419	41.50	36.00 - 42.00	25/08/2020 07:45	39.07	229.83		
DSRC419	41.50	36.00 - 42.00	24/09/2020 08:20	40.17	228.73	41.25	
DSRC419	41.50	36.00 - 42.00	22/10/2020 13:50	38.77	230.13	41.25	
DSRC419	41.50	36.00 - 42.00	23/11/2020 14:16	37.48	231.42	41.25	
DSRC420	3.50	0.80 - 3.70	09/10/2019 11:10	2.00	275.10	3.50	
DSRC420	3.50	0.80 - 3.70	10/10/2019 11:15	2.05	275.05	3.50	
DSRC420	3.50	0.80 - 3.70	11/10/2019 11:10	2.05	275.05	3.50	
DSRC420	3.50	0.80 - 3.70	15/10/2019 11:15	1.85	275.25	3.50	
DSRC420	3.50	0.80 - 3.70	16/10/2019 11:10	1.85	275.25	3.50	
DSRC420	3.50	0.80 - 3.70	21/10/2019 11:10	1.80	275.30	3.50	
DSRC420	3.50	0.80 - 3.70	31/10/2019 11:30	1.95	275.15	3.50	
DSRC420	3.50	0.80 - 3.70	06/11/2019 12:00	1.86	275.24	3.50	
DSRC420	3.50	0.80 - 3.70	14/11/2019 13:56	1.74	275.36	3.50	
General Remarks:						CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRC420	3.50	0.80 - 3.70	28/11/2019 10:56	1.77	275.33	3.50		
DSRC420	3.50	0.80 - 3.70	05/12/2019 14:32	2.16	274.94	3.50		
DSRC420	3.50	0.80 - 3.70	11/12/2019 11:45	2.04	275.06	3.50		
DSRC420	3.50	0.80 - 3.70	18/12/2019 10:10	1.90	275.20	3.50		
DSRC420	3.50	0.80 - 3.70	08/01/2020 12:00	2.38	274.72	3.50		
DSRC420	3.50	0.80 - 3.70	15/01/2020 12:00	1.79	275.31	3.50		
DSRC420	3.50	0.80 - 3.70	30/01/2020 12:00	1.99	275.11	3.50		
DSRC420	3.50	0.80 - 3.70	10/02/2020 12:00	2.05	275.05	3.50		
DSRC420	3.50	0.80 - 3.70	26/02/2020 12:00	1.88	275.22	3.50		
DSRC420	3.50	0.80 - 3.70	26/03/2020 12:00	2.51	274.59	3.50		
DSRC420	3.50	0.80 - 3.70	01/05/2020 12:00	2.84	274.26	3.50		
DSRC420	3.50	0.80 - 3.70	27/05/2020 12:00	Dry		3.50		
DSRC420	3.50	0.80 - 3.70	06/07/2020 12:00	3.24	273.86	3.50		
DSRC420	3.50	0.80 - 3.70	13/07/2020 08:30	3.51	273.59	3.50		
DSRC420	3.50	0.80 - 3.70	21/07/2020 14:17	3.48	273.62	3.50		
DSRC420	3.50	0.80 - 3.70	27/07/2020 10:21	Dry		3.50		
DSRC420	3.50	0.80 - 3.70	24/08/2020 10:03	Dry		3.50		
DSRC420	3.50	0.80 - 3.70	30/09/2020 08:35	Dry		3.50		
DSRC420	3.50	0.80 - 3.70	21/10/2020 11:25	2.35	274.75	3.50		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRCHO304	54.20	26.10 - 60.20	23/03/2020 12:00	22.65	209.20	54.25	
DSRCHO304	54.20	26.10 - 60.20	24/03/2020 12:00	22.58	209.27	54.25	
DSRCHO304	54.20	26.10 - 60.20	25/03/2020 12:00	22.56	209.29	54.25	
DSRCHO304	54.20	26.10 - 60.20	26/03/2020 12:00	22.56	209.29	54.25	
DSRCHO304	54.20	26.10 - 60.20	27/03/2020 12:00	21.50	210.35	54.25	
DSRCHO304	54.20	26.10 - 60.20	31/03/2020 12:00	22.25	209.60	54.25	
DSRCHO304	54.20	26.10 - 60.20	06/04/2020 12:00	22.30	209.55	54.25	
DSRCHO304	54.20	26.10 - 60.20	08/04/2020 08:56	25.00	206.85		Water quality monitoring level
DSRCHO304	54.20	26.10 - 60.20	08/04/2020 08:57	25.00	206.85		Water quality monitoring level
DSRCHO304	54.20	26.10 - 60.20	08/04/2020 08:58	25.00	206.85		Water quality monitoring level
DSRCHO304	54.20	26.10 - 60.20	08/04/2020 08:59	25.00	206.85		Water quality monitoring level
DSRCHO304	54.20	26.10 - 60.20	08/04/2020 09:00	25.00	206.85		Water quality monitoring level
DSRCHO304	54.20	26.10 - 60.20	08/04/2020 09:01	25.00	206.85		Water quality monitoring level
DSRCHO304	54.20	26.10 - 60.20	15/04/2020 12:48	25.00	206.85		Water quality monitoring level
DSRCHO304	54.20	26.10 - 60.20	15/04/2020 12:49	25.00	206.85		Water quality monitoring level
DSRCHO304	54.20	26.10 - 60.20	15/04/2020 12:50	25.00	206.85		Water quality monitoring level
DSRCHO304	54.20	26.10 - 60.20	15/04/2020 12:51	25.00	206.85		Water quality monitoring level
DSRCHO304	54.20	26.10 - 60.20	24/04/2020 12:00	22.55	209.30	54.25	
DSRCHO304	54.20	26.10 - 60.20	29/04/2020 11:11	25.00	206.85		Water quality monitoring level
DSRCHO304	54.20	26.10 - 60.20	29/04/2020 11:12	25.00	206.85		Water quality monitoring level
DSRCHO304	54.20	26.10 - 60.20	29/04/2020 11:13	25.00	206.85		Water quality monitoring level
DSRCHO304	54.20	26.10 - 60.20	29/04/2020 11:14	25.00	206.85		Water quality monitoring level
DSRCHO304	54.20	26.10 - 60.20	29/04/2020 12:00	22.75	209.10	54.25	
DSRCHO304	54.20	26.10 - 60.20	07/05/2020 12:00	22.81	209.04	54.25	
General Remarks:						CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRCHO304	54.20	26.10 - 60.20	15/05/2020 12:00	22.50	209.35	54.25		
DSRCHO304	54.20	26.10 - 60.20	20/05/2020 12:00	23.29	208.56	54.25		
DSRCHO304	54.20	26.10 - 60.20	27/05/2020 12:00	23.29	208.56	54.25		
DSRCHO304	54.20	26.10 - 60.20	04/06/2020 12:00	23.30	208.55	54.25		
DSRCHO304	54.20	26.10 - 60.20	11/06/2020 12:00	23.75	208.10	54.25		
DSRCHO304	54.20	26.10 - 60.20	22/06/2020 12:00	24.02	207.83	54.25		
DSRCHO304	54.20	26.10 - 60.20	01/07/2020 12:00	24.07	207.78	54.25		
DSRCHO304	54.20	26.10 - 60.20	07/07/2020 13:20	24.19	207.66	54.25		
DSRCHO304	54.20	26.10 - 60.20	15/07/2020 13:34	24.24	207.61	54.25		
DSRCHO304	54.20	26.10 - 60.20	22/07/2020 11:06	24.36	207.49	54.25		
DSRCHO304	54.20	26.10 - 60.20	29/07/2020 10:18	24.43	207.42	54.25		
DSRCHO304	54.20	26.10 - 60.20	26/08/2020 12:47	24.64	207.21	54.25		
DSRCHO304	54.20	26.10 - 60.20	23/09/2020 12:16	24.59	207.26	54.25		
DSRCHO304	54.20	26.10 - 60.20	22/10/2020 14:21	24.45	207.40	54.25		
DSRCHO304	54.20	26.10 - 60.20	23/11/2020 14:53	23.77	208.08	54.25		
DSRCHO308	58.50	1.50 - 59.50	19/02/2020 12:00	57.45	213.90	58.50		
DSRCHO308	58.50	1.50 - 59.50	26/02/2020 12:00	Dry		58.50		
DSRCHO308	58.50	1.50 - 59.50	06/03/2020 12:00	Dry		58.50		
DSRCHO308	58.50	1.50 - 59.50	12/03/2020 12:00	54.25	217.10	58.50		
DSRCHO308	58.50	1.50 - 59.50	19/03/2020 12:00	Dry		58.50		
DSRCHO308	58.50	1.50 - 59.50	25/03/2020 12:00	Dry		58.50		
DSRCHO308	58.50	1.50 - 59.50	31/03/2020 12:00	Dry		58.50		
DSRCHO308	58.50	1.50 - 59.50	09/04/2020 12:00	Dry		58.50		
DSRCHO308	58.50	1.50 - 59.50	15/04/2020 12:00	Dry		58.50		
General Remarks:							CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRCOH308	58.50	1.50 - 59.50	29/04/2020 12:00	Dry		58.50		
DSRCOH308	58.50	1.50 - 59.50	06/05/2020 12:00	Dry		58.50		
DSRCOH308	58.50	1.50 - 59.50	22/05/2020 12:00	Dry		58.50		
DSRCOH308	58.50	1.50 - 59.50	27/05/2020 12:00	Dry		58.50		
DSRCOH308	58.50	1.50 - 59.50	04/06/2020 12:00	Dry		58.50		
DSRCOH308	58.50	1.50 - 59.50	10/06/2020 12:00	Dry		58.50		
DSRCOH308	58.50	1.50 - 59.50	30/06/2020 12:00	Dry		58.50		
DSRCOH308	58.50	1.50 - 59.50	07/07/2020 12:00	Dry		58.50		
DSRCOH308	58.50	1.50 - 59.50	13/07/2020 16:05	Dry		58.50		
DSRCOH308	58.50	1.50 - 59.50	22/07/2020 10:59	Dry		58.50		
DSRCOH308	58.50	1.50 - 59.50	27/07/2020 08:45	Dry		58.50		
DSRCOH308	58.50	1.50 - 59.50	26/08/2020 15:09	Dry		58.50		
DSRCOH308	58.50	1.50 - 59.50	30/09/2020 12:06	Dry		58.50		
DSRCOH308	58.50	1.50 - 59.50	21/10/2020 13:39	Dry		58.50		
DSRCOH308	58.50	1.50 - 59.50	23/11/2020 09:46	Dry		58.50		
DSRCOH400	76.50	13.30 - 77.00	16/10/2019 14:00	70.85	197.10	76.00		
DSRCOH400	76.50	13.30 - 77.00	29/10/2019 15:00	70.80	197.15	76.00		
DSRCOH400	76.50	13.30 - 77.00	13/11/2019 10:10	70.81	197.14	76.00		
DSRCOH400	76.50	13.30 - 77.00	22/11/2019 15:25	70.86	197.09	76.00		
DSRCOH400	76.50	13.30 - 77.00	28/11/2019 11:22	70.81	197.14	76.00		
DSRCOH400	76.50	13.30 - 77.00	05/12/2019 14:10	70.81	197.14	76.00		
DSRCOH400	76.50	13.30 - 77.00	11/12/2019 12:03	71.63	196.32	76.00		
DSRCOH400	76.50	13.30 - 77.00	18/12/2019 15:35	70.83	197.12	76.00		
DSRCOH400	76.50	13.30 - 77.00	08/01/2020 12:00	71.59	196.36	76.00		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRCOH400	76.50	13.30 - 77.00	22/01/2020 12:00	70.97	196.98	76.00		
DSRCOH400	76.50	13.30 - 77.00	29/01/2020 12:00	71.68	196.27	76.00		
DSRCOH400	76.50	13.30 - 77.00	05/02/2020 12:00	71.75	196.20	76.00		
DSRCOH400	76.50	13.30 - 77.00	10/02/2020 12:00	71.80	196.15	76.00		
DSRCOH400	76.50	13.30 - 77.00	20/02/2020 12:00	70.81	197.14	76.00		
DSRCOH400	76.50	13.30 - 77.00	26/02/2020 12:00	70.75	197.20	76.00		
DSRCOH400	76.50	13.30 - 77.00	06/03/2020 12:00	70.72	197.23	76.00		
DSRCOH400	76.50	13.30 - 77.00	13/03/2020 12:00	71.21	196.74	76.00		
DSRCOH400	76.50	13.30 - 77.00	31/03/2020 12:00	71.68	196.27	76.00		
DSRCOH400	76.50	13.30 - 77.00	07/04/2020 12:00	71.85	196.10	76.00		
DSRCOH400	76.50	13.30 - 77.00	21/04/2020 12:00	71.88	196.07	76.00		
DSRCOH400	76.50	13.30 - 77.00	01/05/2020 12:00	71.89	196.06	76.00		
DSRCOH400	76.50	13.30 - 77.00	14/05/2020 12:00	71.65	196.30	76.00		
DSRCOH400	76.50	13.30 - 77.00	22/05/2020 12:00	71.52	196.43	76.00		
DSRCOH400	76.50	13.30 - 77.00	04/06/2020 12:00	71.60	196.35	76.00		
DSRCOH400	76.50	13.30 - 77.00	10/06/2020 12:00	71.80	196.15	76.00		
DSRCOH400	76.50	13.30 - 77.00	17/06/2020 12:00	71.82	196.13	76.00		
DSRCOH400	76.50	13.30 - 77.00	24/06/2020 12:00	71.85	196.10	76.00		
DSRCOH400	76.50	13.30 - 77.00	06/07/2020 12:00	Dry		76.00		
DSRCOH400	76.50	13.30 - 77.00	13/07/2020 09:16	Dry		76.00		
DSRCOH400	76.50	13.30 - 77.00	21/07/2020 13:56	Dry		76.00		
DSRCOH400	76.50	13.30 - 77.00	27/07/2020 10:42	Dry		76.00		
DSRCOH400	76.50	13.30 - 77.00	30/09/2020 09:33	Dry		76.00		
DSRCOH400	76.50	13.30 - 77.00	21/10/2020 11:16	Dry		76.00		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRCHO412	30.00	13.20 - 30.00	30/10/2019 12:00	28.80	221.50	30.25		
DSRCHO412	30.00	13.20 - 30.00	31/10/2019 16:30	28.82	221.48	30.25		
DSRCHO412	30.00	13.20 - 30.00	01/11/2019 09:10	28.82	221.48	30.25		
DSRCHO412	30.00	13.20 - 30.00	06/11/2019 14:37	28.82	221.48	30.25		
DSRCHO412	30.00	13.20 - 30.00	14/11/2019 13:28	28.82	221.48	30.25		
DSRCHO412	30.00	13.20 - 30.00	22/11/2019 16:04	28.83	221.47	30.25		
DSRCHO412	30.00	13.20 - 30.00	28/11/2019 12:12	28.86	221.44	30.25		
DSRCHO412	30.00	13.20 - 30.00	05/12/2019 12:30	28.81	221.49	30.25		
DSRCHO412	30.00	13.20 - 30.00	11/12/2019 15:17	28.86	221.44	30.25		
DSRCHO412	30.00	13.20 - 30.00	08/01/2020 12:00	28.85	221.45	30.25		
DSRCHO412	30.00	13.20 - 30.00	15/01/2020 12:00	28.87	221.43	30.25		
DSRCHO412	30.00	13.20 - 30.00	22/01/2020 12:00	28.85	221.45	30.25		
DSRCHO412	30.00	13.20 - 30.00	29/01/2020 12:00	28.88	221.42	30.25		
DSRCHO412	30.00	13.20 - 30.00	05/02/2020 12:00	28.95	221.35	30.25		
DSRCHO412	30.00	13.20 - 30.00	10/02/2020 12:00	28.80	221.50	30.25		
DSRCHO412	30.00	13.20 - 30.00	19/02/2020 12:00	28.90	221.40	30.25		
DSRCHO412	30.00	13.20 - 30.00	26/02/2020 12:00	28.83	221.47	30.25		
DSRCHO412	30.00	13.20 - 30.00	06/03/2020 12:00	28.80	221.50	30.25		
DSRCHO412	30.00	13.20 - 30.00	25/03/2020 12:00	28.76	221.54	30.25		
DSRCHO412	30.00	13.20 - 30.00	06/04/2020 12:00	28.82	221.48	30.25		
DSRCHO412	30.00	13.20 - 30.00	21/04/2020 12:00	28.81	221.49	30.25		
DSRCHO412	30.00	13.20 - 30.00	29/04/2020 12:00	28.91	221.39	30.25		
DSRCHO412	30.00	13.20 - 30.00	05/05/2020 12:00	28.85	221.45	30.25		
DSRCHO412	30.00	13.20 - 30.00	14/05/2020 12:00	Dry		30.25		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRCH0412	30.00	13.20 - 30.00	27/05/2020 12:00	28.80	221.50	30.25		
DSRCH0412	30.00	13.20 - 30.00	04/06/2020 12:00	28.82	221.48	30.25		
DSRCH0412	30.00	13.20 - 30.00	10/06/2020 12:00	28.20	222.10	30.25		
DSRCH0412	30.00	13.20 - 30.00	17/06/2020 12:00	28.50	221.80	30.25		
DSRCH0412	30.00	13.20 - 30.00	22/06/2020 12:00	28.80	221.50	30.25		
DSRCH0412	30.00	13.20 - 30.00	01/07/2020 12:00	28.80	221.50	30.25		
DSRCH0412	30.00	13.20 - 30.00	06/07/2020 12:00	28.86	221.44	30.25		
DSRCH0412	30.00	13.20 - 30.00	13/07/2020 11:27	Dry		30.25		
DSRCH0412	30.00	13.20 - 30.00	21/07/2020 09:32	Dry		30.25		
DSRCH0412	30.00	13.20 - 30.00	27/07/2020 14:09	Dry		30.25		
DSRCH0412	30.00	13.20 - 30.00	24/08/2020 12:07	Dry		30.25		
DSRCH0412	30.00	13.20 - 30.00	30/09/2020 10:45	Dry		30.25		
DSRCH0412	30.00	13.20 - 30.00	21/10/2020 10:40	28.86	221.44	30.25		
DSRCH0412	30.00	13.20 - 30.00	23/11/2020 11:02	28.82	221.48	30.25		
DSRCH0414	59.80	28.30 - 60.30	04/10/2019 11:10	57.43	217.17	60.00		
DSRCH0414	59.80	28.30 - 60.30	08/10/2019 11:00	57.50	217.10	60.00		
DSRCH0414	59.80	28.30 - 60.30	09/10/2019 11:05	57.50	217.10	60.00		
DSRCH0414	59.80	28.30 - 60.30	10/10/2019 11:00	57.50	217.10	60.00		
DSRCH0414	59.80	28.30 - 60.30	22/10/2019 11:00	56.50	218.10	60.00		
DSRCH0414	59.80	28.30 - 60.30	31/10/2019 14:10	56.81	217.79	60.00		
DSRCH0414	59.80	28.30 - 60.30	06/11/2019 15:47	56.95	217.65	60.00		
DSRCH0414	59.80	28.30 - 60.30	14/11/2019 12:39	56.19	218.41	60.00		
DSRCH0414	59.80	28.30 - 60.30	22/11/2019 16:40	57.17	217.43	60.00		
DSRCH0414	59.80	28.30 - 60.30	28/11/2019 13:12	56.20	218.40	60.00		
General Remarks:							CONTRACT 35560	CHECKED EL





# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
DSRCH0414	59.80	28.30 - 60.30	11/12/2019 11:10	58.05	216.55	60.00		
DSRCH0414	59.80	28.30 - 60.30	18/12/2019 15:50	56.16	218.44	60.00		
DSRCH0414	59.80	28.30 - 60.30	08/01/2020 12:00	58.90	215.70	60.00		
DSRCH0414	59.80	28.30 - 60.30	15/01/2020 12:00	55.03	219.57	60.00		
DSRCH0414	59.80	28.30 - 60.30	22/01/2020 12:00	56.87	217.73	60.00		
DSRCH0414	59.80	28.30 - 60.30	29/01/2020 12:00	57.50	217.10	60.00		
DSRCH0414	59.80	28.30 - 60.30	05/02/2020 12:00	57.59	217.01	60.00		
DSRCH0414	59.80	28.30 - 60.30	10/02/2020 12:00	57.10	217.50	60.00		
DSRCH0414	59.80	28.30 - 60.30	19/02/2020 12:00	55.63	218.97	60.00		
DSRCH0414	59.80	28.30 - 60.30	27/02/2020 12:00	56.05	218.55	60.00		
DSRCH0414	59.80	28.30 - 60.30	06/03/2020 12:00	56.75	217.85	60.00		
DSRCH0414	59.80	28.30 - 60.30	10/03/2020 12:00	57.48	217.12	60.00		
DSRCH0414	59.80	28.30 - 60.30	31/03/2020 12:00	58.40	216.20	60.00		
DSRCH0414	59.80	28.30 - 60.30	21/04/2020 12:00	58.84	215.76	60.00		
DSRCH0414	59.80	28.30 - 60.30	01/05/2020 12:00	58.90	215.70	60.00		
DSRCH0414	59.80	28.30 - 60.30	14/05/2020 12:00	Dry		60.00		
DSRCH0414	59.80	28.30 - 60.30	22/05/2020 12:00	58.92	215.68	60.00		
DSRCH0414	59.80	28.30 - 60.30	27/05/2020 12:00	58.88	215.72	60.00		
DSRCH0414	59.80	28.30 - 60.30	10/06/2020 12:00	58.90	215.70	60.00		
DSRCH0414	59.80	28.30 - 60.30	17/06/2020 12:00	58.85	215.75	60.00		
DSRCH0414	59.80	28.30 - 60.30	24/06/2020 12:00	58.94	215.66	60.00		
DSRCH0414	59.80	28.30 - 60.30	30/06/2020 12:00	57.95	216.65	60.00		
DSRCH0414	59.80	28.30 - 60.30	07/07/2020 12:00	Dry		60.00		
DSRCH0414	59.80	28.30 - 60.30	13/07/2020 15:42	Dry		60.00		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole / trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
DSRCOH414	59.80	28.30 - 60.30	27/07/2020 09:01	Dry		60.00	
DSRCOH414	59.80	28.30 - 60.30	30/09/2020 12:33	Dry		60.00	
DSRCOH414	59.80	28.30 - 60.30	21/10/2020 13:28	56.85	217.75	60.00	
DSRCOH414	59.80	28.30 - 60.30	23/11/2020 09:34	57.87	216.73	60.00	
OH405	17.00	11.00 - 18.00	06/02/2019 10:05	Dry		17.10	
OH405	17.00	11.00 - 18.00	07/02/2019 08:42	Dry		17.10	
OH405	17.00	11.00 - 18.00	08/02/2019 14:38	Dry		17.10	
OH405	17.00	11.00 - 18.00	11/02/2019 09:13	Dry		17.10	
OH405	17.00	11.00 - 18.00	12/02/2019 09:20	Dry		17.10	
OH405	17.00	11.00 - 18.00	28/02/2019 13:35	Dry		17.10	
OH405	17.00	11.00 - 18.00	19/03/2019 12:56	Dry		17.10	
OH405	17.00	11.00 - 18.00	21/03/2019 09:45	Dry		17.10	
OH405	17.00	11.00 - 18.00	04/04/2019 12:30	Dry			
OH405	17.00	11.00 - 18.00	02/05/2019 12:56	Dry		17.10	
OH405	17.00	11.00 - 18.00	30/05/2019 13:20	Dry		17.10	
OH405	17.00	11.00 - 18.00	12/09/2019 12:13	Dry			
OH405	17.00	11.00 - 18.00	20/09/2019 14:48	Dry			
OH405	17.00	11.00 - 18.00	24/09/2019 12:00	Dry			
OH405	17.00	11.00 - 18.00	22/10/2019 12:00	Dry			
OH405	17.00	11.00 - 18.00	29/10/2019 12:00	Dry			
OH405	17.00	11.00 - 18.00	05/11/2019 09:54	Dry			
OH405	17.00	11.00 - 18.00	12/11/2019 10:30	Dry			
OH405	17.00	11.00 - 18.00	19/11/2019 15:50	Dry			
OH405	17.00	11.00 - 18.00	27/11/2019 12:59	Dry			
General Remarks:						CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
OH405	17.00	11.00 - 18.00	09/12/2019 15:00	Dry			
OH405	17.00	11.00 - 18.00	16/12/2019 15:39	Dry			
OH405	17.00	11.00 - 18.00	09/01/2020 12:00	Dry			
OH405	17.00	11.00 - 18.00	14/01/2020 12:00	Dry			
OH405	17.00	11.00 - 18.00	22/01/2020 12:00	Dry			
OH405	17.00	11.00 - 18.00	28/01/2020 12:00	Dry			
OH405	17.00	11.00 - 18.00	03/02/2020 12:00	Dry			
OH405	17.00	11.00 - 18.00	11/02/2020 12:00	Dry			
OH405	17.00	11.00 - 18.00	19/02/2020 12:00	Dry			
OH405	17.00	11.00 - 18.00	28/02/2020 12:00	Dry			
OH405	17.00	11.00 - 18.00	01/04/2020 12:00	Dry			
OH405	17.00	11.00 - 18.00	01/05/2020 12:00	Dry			
OH405	17.00	11.00 - 18.00	26/05/2020 12:00	Dry			
OH405	17.00	11.00 - 18.00	02/07/2020 12:00	Dry			
OH405	17.00	11.00 - 18.00	06/07/2020 12:00	Dry			
OH405	17.00	11.00 - 18.00	14/07/2020 13:40	Dry			
OH405	17.00	11.00 - 18.00	20/07/2020 13:45	Dry			
OH405	17.00	11.00 - 18.00	28/07/2020 13:42	Dry			
OH405	17.00	11.00 - 18.00	24/08/2020 15:48	Dry			
OH405	17.00	11.00 - 18.00	23/09/2020 13:42	Dry		17.10	
OH405	17.00	11.00 - 18.00	21/10/2020 14:35	Dry		17.10	
OH405	17.00	11.00 - 18.00	24/11/2020 14:18	Dry		17.10	
OH407	15.00	6.00 - 15.50	14/02/2019 16:30	Dry		15.20	
OH407	15.00	6.00 - 15.50	28/02/2019 13:45	Dry		15.20	
General Remarks:						CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
OH407	15.00	6.00 - 15.50	21/03/2019 10:00	Dry		15.20	
OH407	15.00	6.00 - 15.50	04/04/2019 12:35	Dry			
OH407	15.00	6.00 - 15.50	02/05/2019 13:40	Dry		15.20	
OH407	15.00	6.00 - 15.50	31/05/2019 10:00	Dry		15.20	
OH407	15.00	6.00 - 15.50	12/09/2019 14:15	Dry			
OH407	15.00	6.00 - 15.50	20/09/2019 15:06	Dry			
OH407	15.00	6.00 - 15.50	24/09/2019 12:00	15.10	216.65		
OH407	15.00	6.00 - 15.50	22/10/2019 12:00	15.10	216.65		
OH407	15.00	6.00 - 15.50	29/10/2019 12:00	15.09	216.66		
OH407	15.00	6.00 - 15.50	05/11/2019 10:25	15.08	216.67		
OH407	15.00	6.00 - 15.50	12/11/2019 10:48	15.09	216.66		
OH407	15.00	6.00 - 15.50	19/11/2019 14:00	15.10	216.65		
OH407	15.00	6.00 - 15.50	27/11/2019 13:09	15.09	216.66		
OH407	15.00	6.00 - 15.50	03/12/2019 10:36	15.09	216.66		
OH407	15.00	6.00 - 15.50	09/12/2019 15:51	15.10	216.65		
OH407	15.00	6.00 - 15.50	16/12/2019 15:45	15.11	216.64		
OH407	15.00	6.00 - 15.50	09/01/2020 12:00	Dry			
OH407	15.00	6.00 - 15.50	14/01/2020 12:00	Dry			
OH407	15.00	6.00 - 15.50	22/01/2020 12:00	15.10	216.65		
OH407	15.00	6.00 - 15.50	28/01/2020 12:00	15.11	216.64		
OH407	15.00	6.00 - 15.50	03/02/2020 12:00	15.10	216.65		
OH407	15.00	6.00 - 15.50	11/02/2020 12:00	15.12	216.63		
OH407	15.00	6.00 - 15.50	18/02/2020 12:00	15.11	216.64		
OH407	15.00	6.00 - 15.50	28/02/2020 12:00	15.10	216.65		
General Remarks:						CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
OH407	15.00	6.00 - 15.50	01/05/2020 12:00	15.10	216.65		
OH407	15.00	6.00 - 15.50	26/05/2020 12:00	15.11	216.64		
OH407	15.00	6.00 - 15.50	08/07/2020 12:40	15.10	216.65		
OH407	15.00	6.00 - 15.50	15/07/2020 13:58	15.11	216.64		
OH407	15.00	6.00 - 15.50	22/07/2020 13:05	Dry			
OH407	15.00	6.00 - 15.50	28/07/2020 15:04	Dry			
OH407	15.00	6.00 - 15.50	26/08/2020 12:04	Dry			
OH407	15.00	6.00 - 15.50	30/09/2020 14:58	Dry		15.20	
OH407	15.00	6.00 - 15.50	22/10/2020 14:39	Dry		15.20	
OH407	15.00	6.00 - 15.50	23/11/2020 14:30	Dry		15.20	
OH411	85.70	22.00 - 86.20	10/06/2020 12:00	81.64	198.86	85.80	
OH411	85.70	22.00 - 86.20	11/06/2020 12:00	81.70	198.80	85.80	
OH411	85.70	22.00 - 86.20	12/06/2020 12:00	81.80	198.70	85.80	
OH411	85.70	22.00 - 86.20	15/06/2020 12:00	81.91	198.59	85.80	
OH411	85.70	22.00 - 86.20	16/06/2020 12:00	81.95	198.55	85.80	
OH411	85.70	22.00 - 86.20	17/06/2020 12:00	82.48	198.02	85.80	
OH411	85.70	22.00 - 86.20	22/06/2020 12:00	83.05	197.45	85.80	
OH411	85.70	22.00 - 86.20	06/07/2020 12:00	83.66	196.84	85.80	
OH411	85.70	22.00 - 86.20	14/07/2020 15:15	Dry		85.80	
OH411	85.70	22.00 - 86.20	21/07/2020 12:58	83.98	196.52	85.80	
OH411	85.70	22.00 - 86.20	30/09/2020 13:57	83.85	196.65	85.80	
OH411	85.70	22.00 - 86.20	21/10/2020 13:10	80.42	200.08	85.80	
OH411	85.70	22.00 - 86.20	25/11/2020 09:11	79.75	200.75	85.80	
OH413	16.20	2.70 - 16.70	04/10/2019 11:40	Dry		16.31	
General Remarks:						CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
OH413	16.20	2.70 - 16.70	09/10/2019 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	10/10/2019 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	11/10/2019 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	22/10/2019 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	29/10/2019 15:40	Dry		16.31		
OH413	16.20	2.70 - 16.70	06/11/2019 14:30	Dry		16.31		
OH413	16.20	2.70 - 16.70	14/11/2019 13:20	Dry		16.31		
OH413	16.20	2.70 - 16.70	22/11/2019 16:08	Dry		16.31		
OH413	16.20	2.70 - 16.70	28/11/2019 12:06	Dry		16.31		
OH413	16.20	2.70 - 16.70	05/12/2019 12:25	Dry		16.31		
OH413	16.20	2.70 - 16.70	11/12/2019 15:36	Dry		16.31		
OH413	16.20	2.70 - 16.70	18/12/2019 15:45	Dry		16.31		
OH413	16.20	2.70 - 16.70	08/01/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	15/01/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	22/01/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	29/01/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	05/02/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	10/02/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	19/02/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	26/02/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	06/03/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	25/03/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	07/04/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	14/04/2020 12:00	Dry		16.31		
General Remarks:							CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
OH413	16.20	2.70 - 16.70	01/05/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	14/05/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	22/05/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	27/05/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	10/06/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	17/06/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	24/06/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	01/07/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	06/07/2020 12:00	Dry		16.31		
OH413	16.20	2.70 - 16.70	13/07/2020 10:32	Dry		16.31		
OH413	16.20	2.70 - 16.70	21/07/2020 09:32	Dry		16.31		
OH413	16.20	2.70 - 16.70	27/07/2020 13:58	Dry		16.31		
OH413	16.20	2.70 - 16.70	24/08/2020 11:42	Dry		16.31		
OH413	16.20	2.70 - 16.70	30/09/2020 16:07	Dry		16.31		
OH413	16.20	2.70 - 16.70	21/10/2020 09:38	Dry		16.31		
OH413	16.20	2.70 - 16.70	23/11/2020 10:14	Dry		16.26		
OH416	4.50	2.50 - 5.00	04/02/2019 14:25	2.44	284.41	4.50		
OH416	4.50	2.50 - 5.00	05/02/2019 09:35	2.24	284.61	4.50		
OH416	4.50	2.50 - 5.00	06/02/2019 09:54	2.24	284.61	4.50		
OH416	4.50	2.50 - 5.00	07/02/2019 09:02	2.23	284.62	4.50		
OH416	4.50	2.50 - 5.00	08/02/2019 14:22	2.20	284.65	4.50		
OH416	4.50	2.50 - 5.00	11/02/2019 09:38	2.04	284.81	4.50		
OH416	4.50	2.50 - 5.00	12/02/2019 09:05	2.04	284.81	4.50		
OH416	4.50	2.50 - 5.00	14/02/2019 09:12	2.07	284.78	4.50		
General Remarks:							CONTRACT 35560	CHECKED EL

**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
OH416	4.50	2.50 - 5.00	19/03/2019 13:40	2.18	284.67	4.50		
OH416	4.50	2.50 - 5.00	21/03/2019 09:30	2.20	284.65	4.50		
OH416	4.50	2.50 - 5.00	04/04/2019 12:45	2.35	284.50			
OH416	4.50	2.50 - 5.00	02/05/2019 12:15	2.66	284.19	4.50		
OH416	4.50	2.50 - 5.00	30/05/2019 14:00	2.77	284.08	4.50		
OH416	4.50	2.50 - 5.00	12/09/2019 11:50	2.92	283.93			
OH416	4.50	2.50 - 5.00	20/09/2019 14:35	3.04	283.81			
OH416	4.50	2.50 - 5.00	24/09/2019 12:00	3.00	283.85			
OH416	4.50	2.50 - 5.00	22/10/2019 12:00	1.94	284.91			
OH416	4.50	2.50 - 5.00	29/10/2019 12:00	1.80	285.05			
OH416	4.50	2.50 - 5.00	05/11/2019 09:37	1.81	285.04			
OH416	4.50	2.50 - 5.00	12/11/2019 10:00	1.66	285.19			
OH416	4.50	2.50 - 5.00	19/11/2019 15:35	1.74	285.11			
OH416	4.50	2.50 - 5.00	27/11/2019 10:26	1.59	285.26			
OH416	4.50	2.50 - 5.00	03/12/2019 16:19	1.81	285.04			
OH416	4.50	2.50 - 5.00	09/12/2019 12:00	1.98	284.87			
OH416	4.50	2.50 - 5.00	16/12/2019 14:34	1.74	285.11			
OH416	4.50	2.50 - 5.00	09/01/2020 12:00	1.85	285.00			
OH416	4.50	2.50 - 5.00	14/01/2020 12:00	1.64	285.21			
OH416	4.50	2.50 - 5.00	22/01/2020 12:00	1.88	284.97			
OH416	4.50	2.50 - 5.00	28/01/2020 12:00	1.87	284.98			
OH416	4.50	2.50 - 5.00	03/02/2020 12:00	1.85	285.00			
OH416	4.50	2.50 - 5.00	11/02/2020 12:00	1.93	284.92			
OH416	4.50	2.50 - 5.00	28/02/2020 12:00	1.82	285.03			
General Remarks:							CONTRACT 35560	CHECKED EL



**GROUNDWATER LEVELS**

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks
OH416	4.50	2.50 - 5.00	26/03/2020 12:00	2.13	284.72		
OH416	4.50	2.50 - 5.00	01/04/2020 12:00	2.30	284.55		
OH416	4.50	2.50 - 5.00	01/04/2020 13:53	2.30	284.55		Water quality monitoring level
OH416	4.50	2.50 - 5.00	01/04/2020 13:54	2.30	284.55		Water quality monitoring level
OH416	4.50	2.50 - 5.00	01/04/2020 13:55	2.30	284.55		Water quality monitoring level
OH416	4.50	2.50 - 5.00	01/04/2020 13:56	2.30	284.55		Water quality monitoring level
OH416	4.50	2.50 - 5.00	01/04/2020 13:57	2.30	284.55		Water quality monitoring level
OH416	4.50	2.50 - 5.00	01/04/2020 13:58	2.30	284.55		Water quality monitoring level
OH416	4.50	2.50 - 5.00	01/04/2020 13:59	2.30	284.55		Water quality monitoring level
OH416	4.50	2.50 - 5.00	01/05/2020 12:00	3.07	283.78		
OH416	4.50	2.50 - 5.00	26/05/2020 12:00	3.33	283.52		
OH416	4.50	2.50 - 5.00	02/07/2020 12:00	3.10	283.75		
OH416	4.50	2.50 - 5.00	07/07/2020 15:57	3.15	283.70		
OH416	4.50	2.50 - 5.00	13/07/2020 14:24	3.05	283.80		
OH416	4.50	2.50 - 5.00	20/07/2020 14:58	3.15	283.70		
OH416	4.50	2.50 - 5.00	27/07/2020 15:09	3.12	283.73		
OH416	4.50	2.50 - 5.00	24/08/2020 14:57	3.18	283.67		
OH416	4.50	2.50 - 5.00	23/09/2020 08:30	2.99	283.86	4.50	
OH416	4.50	2.50 - 5.00	23/11/2020 13:48	2.06	284.79	4.50	
OH417	71.40	5.50 - 71.90	04/10/2019 12:15	68.00	207.65	71.50	
OH417	71.40	5.50 - 71.90	08/10/2019 12:15	70.55	205.10	71.50	
OH417	71.40	5.50 - 71.90	09/10/2019 12:15	70.80	204.85	71.50	
OH417	71.40	5.50 - 71.90	10/10/2019 12:20	68.50	207.15	71.50	
OH417	71.40	5.50 - 71.90	11/10/2019 12:15	69.90	205.75	71.50	
General Remarks:						CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
OH417	71.40	5.50 - 71.90	31/10/2019 14:35	70.46	205.19	71.50		
OH417	71.40	5.50 - 71.90	06/11/2019 15:20	69.83	205.82	71.50		
OH417	71.40	5.50 - 71.90	14/11/2019 13:07	69.71	205.94	71.50		
OH417	71.40	5.50 - 71.90	22/11/2019 15:51	69.79	205.86	71.50		
OH417	71.40	5.50 - 71.90	05/12/2019 13:31	69.83	205.82	71.50		
OH417	71.40	5.50 - 71.90	11/12/2019 15:02	69.75	205.90	71.50		
OH417	71.40	5.50 - 71.90	18/12/2019 11:03	69.79	205.86	71.50		
OH417	71.40	5.50 - 71.90	08/01/2020 12:00	69.44	206.21	71.50		
OH417	71.40	5.50 - 71.90	15/01/2020 12:00	69.02	206.63	71.50		
OH417	71.40	5.50 - 71.90	22/01/2020 12:00	69.70	205.95	71.50		
OH417	71.40	5.50 - 71.90	29/01/2020 12:00	69.78	205.87	71.50		
OH417	71.40	5.50 - 71.90	05/02/2020 12:00	69.85	205.80	71.50		
OH417	71.40	5.50 - 71.90	10/02/2020 12:00	69.80	205.85	71.50		
OH417	71.40	5.50 - 71.90	19/02/2020 12:00	69.05	206.60	71.50		
OH417	71.40	5.50 - 71.90	26/02/2020 12:00	68.78	206.87	71.50		
OH417	71.40	5.50 - 71.90	06/03/2020 12:00	68.50	207.15	71.50		
OH417	71.40	5.50 - 71.90	25/03/2020 12:00	Dry		71.50		
OH417	71.40	5.50 - 71.90	06/04/2020 12:00	69.95	205.70	71.50		
OH417	71.40	5.50 - 71.90	01/05/2020 12:00	70.12	205.53	71.50		
OH417	71.40	5.50 - 71.90	14/05/2020 12:00	70.15	205.50	71.50		
OH417	71.40	5.50 - 71.90	22/05/2020 12:00	70.05	205.60	71.50		
OH417	71.40	5.50 - 71.90	27/05/2020 12:00	70.05	205.60	71.50		
OH417	71.40	5.50 - 71.90	04/06/2020 12:00	70.10	205.55	71.50		
OH417	71.40	5.50 - 71.90	10/06/2020 12:00	70.22	205.43	71.50		
General Remarks:							CONTRACT 35560	CHECKED EL



# GROUNDWATER LEVELS

CLIENT HIGHWAYS ENGLAND

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION

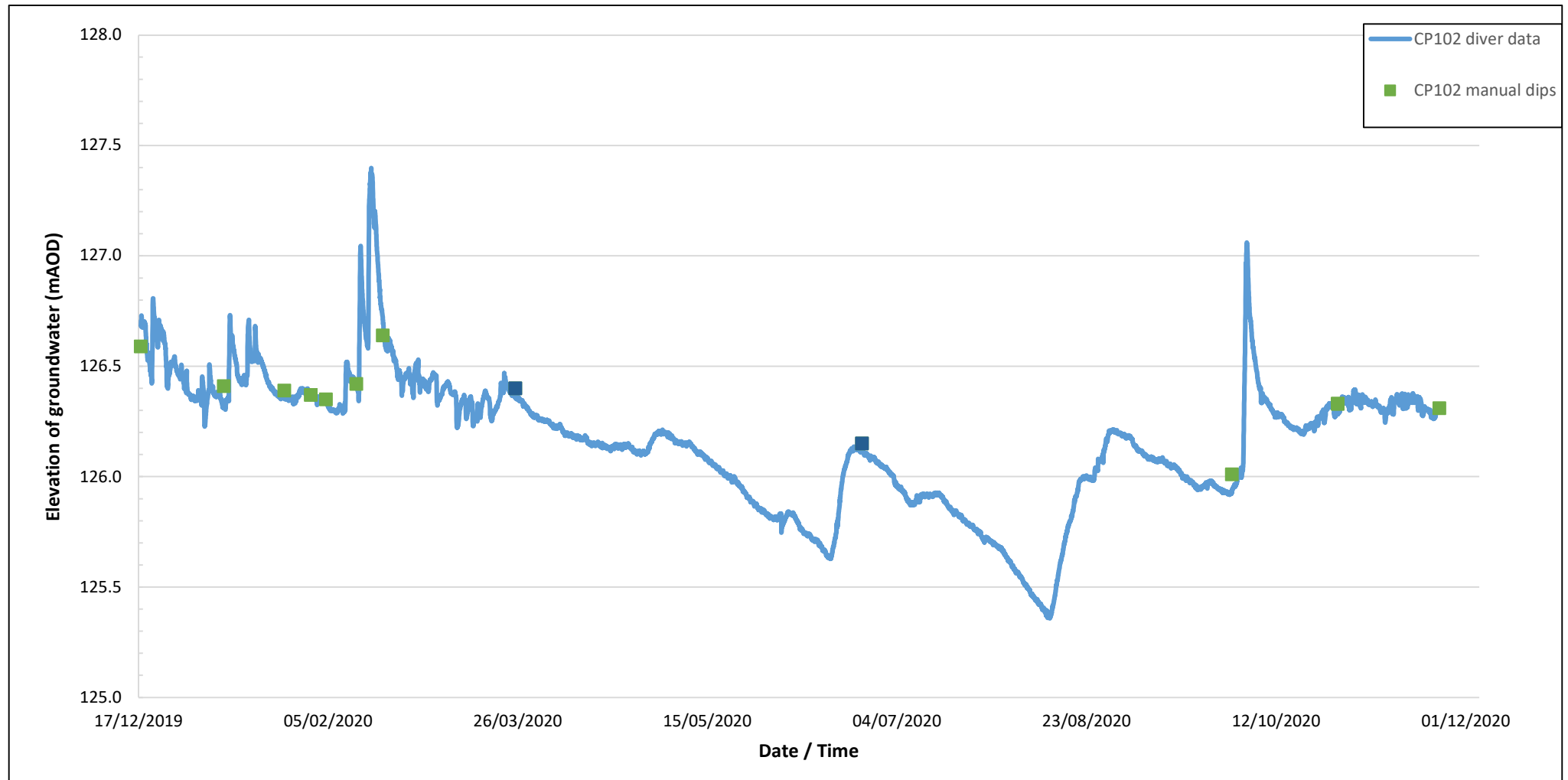
Borehole /trial pit no.	Installation depth (m)	Response zone (m)	Date / time	Water level (m - bgl)	Reduced water level (mOD)	Measured base depth (m - bgl)	Remarks	
OH417	71.40	5.50 - 71.90	22/06/2020 12:00	69.90	205.75	71.50		
OH417	71.40	5.50 - 71.90	01/07/2020 12:00	Dry		71.50		
OH417	71.40	5.50 - 71.90	06/07/2020 12:00	70.08	205.57	71.50		
OH417	71.40	5.50 - 71.90	13/07/2020 11:12	70.15	205.50	71.50		
OH417	71.40	5.50 - 71.90	21/07/2020 14:59	70.11	205.54	71.50		
OH417	71.40	5.50 - 71.90	27/07/2020 13:45	Dry		71.50		
OH417	71.40	5.50 - 71.90	30/09/2020 09:57	Dry		71.50		
OH417	71.40	5.50 - 71.90	21/10/2020 09:56	69.93	205.72	71.50		
OH417	71.40	5.50 - 71.90	21/10/2020 14:02	2.33	273.32	71.50		
OH417	71.40	5.50 - 71.90	23/11/2020 10:33	69.97	205.68	71.50		
General Remarks:							CONTRACT 35560	CHECKED EL

# DIVER DATA - COMBINED



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)

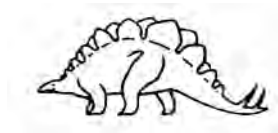


## REMARKS

Erroneous data removed for clarity.

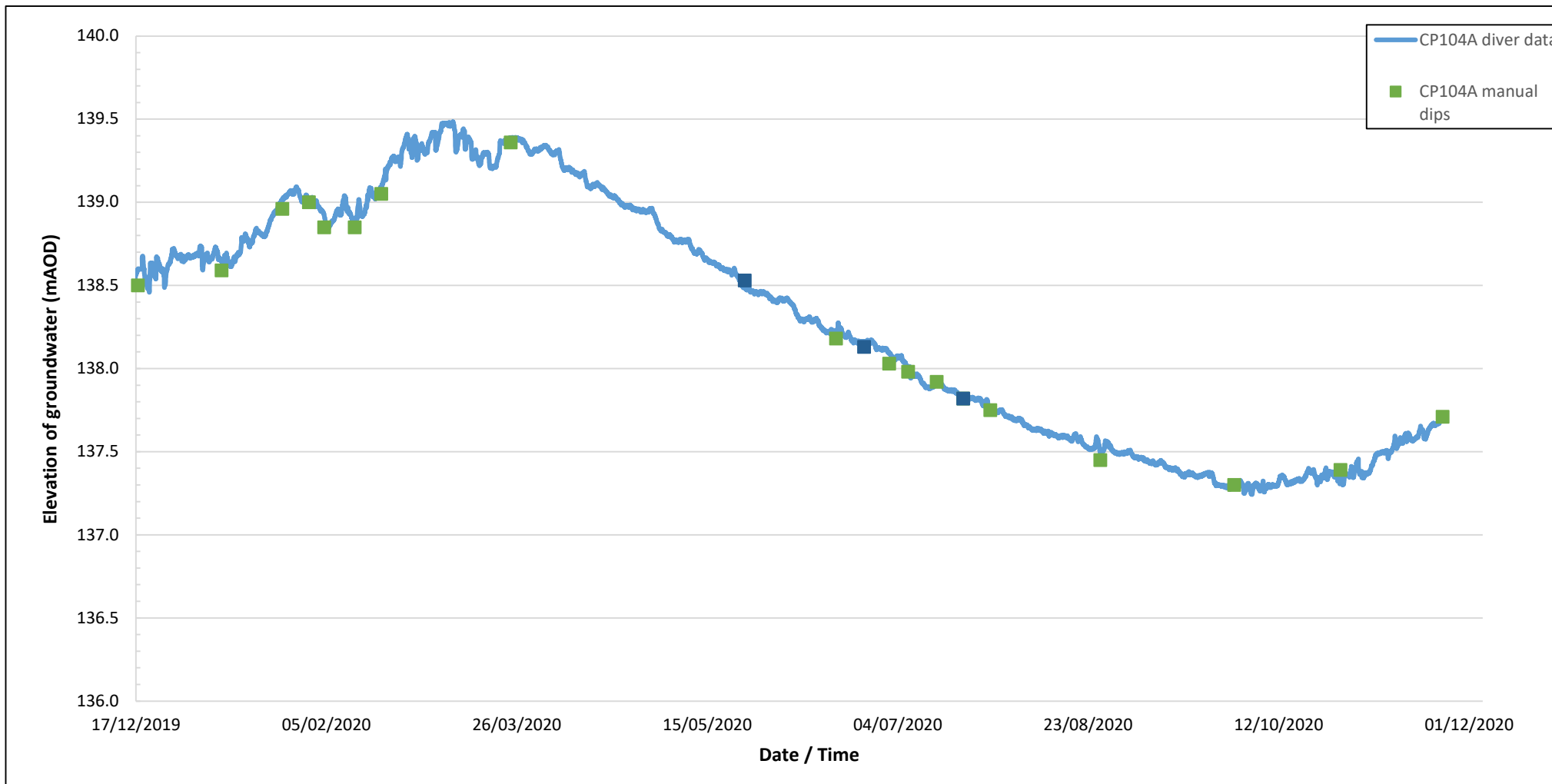
CONTRACT	CHECKED
<b>35560</b>	<b>EC</b>

# DIVER DATA - COMBINED



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)



## REMARKS

Erroneous data removed for clarity.

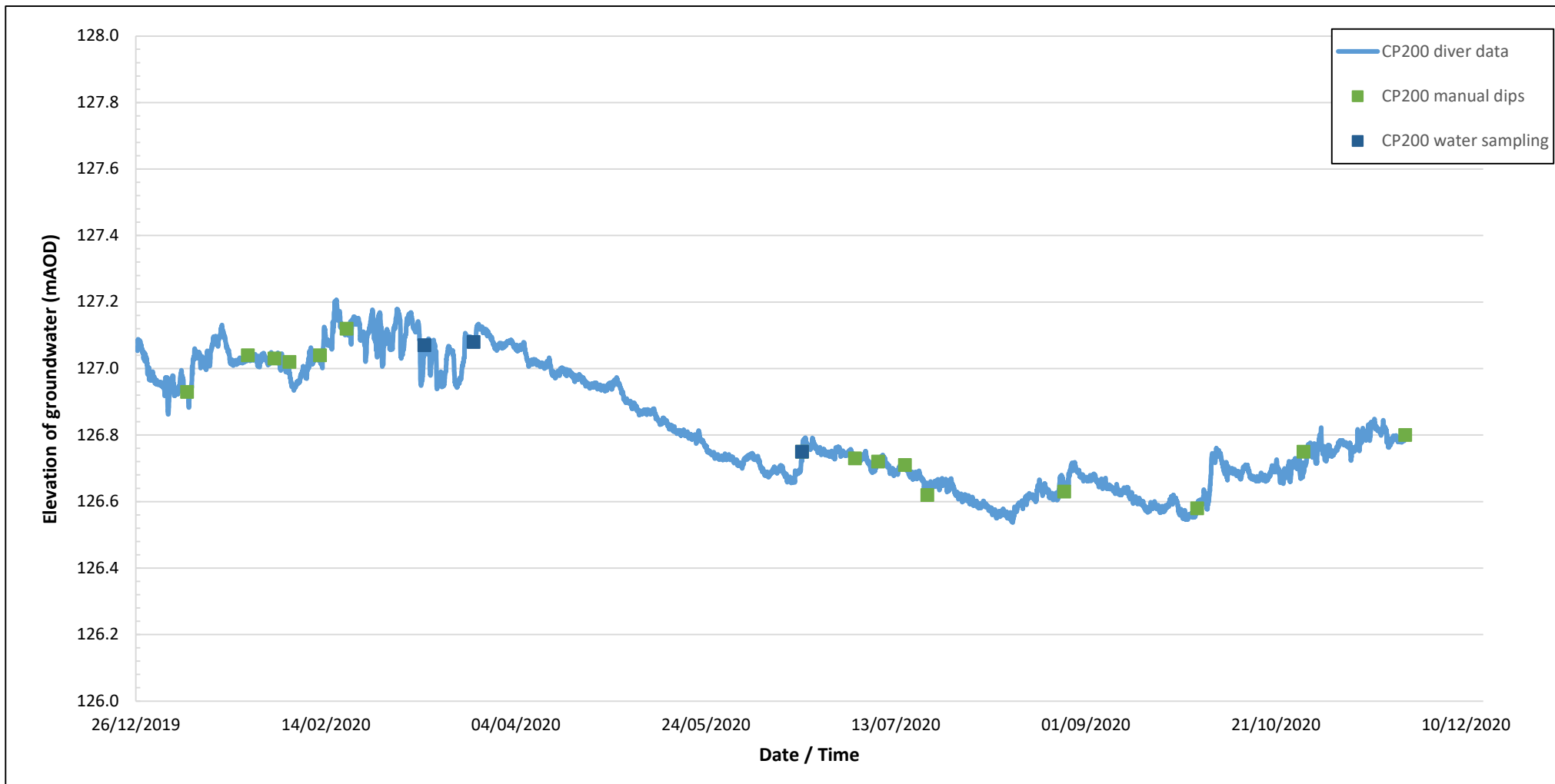
CONTRACT	CHECKED
<b>35560</b>	<b>EC</b>

# DIVER DATA - COMBINED



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)



## REMARKS

Erroneous data removed for clarity.

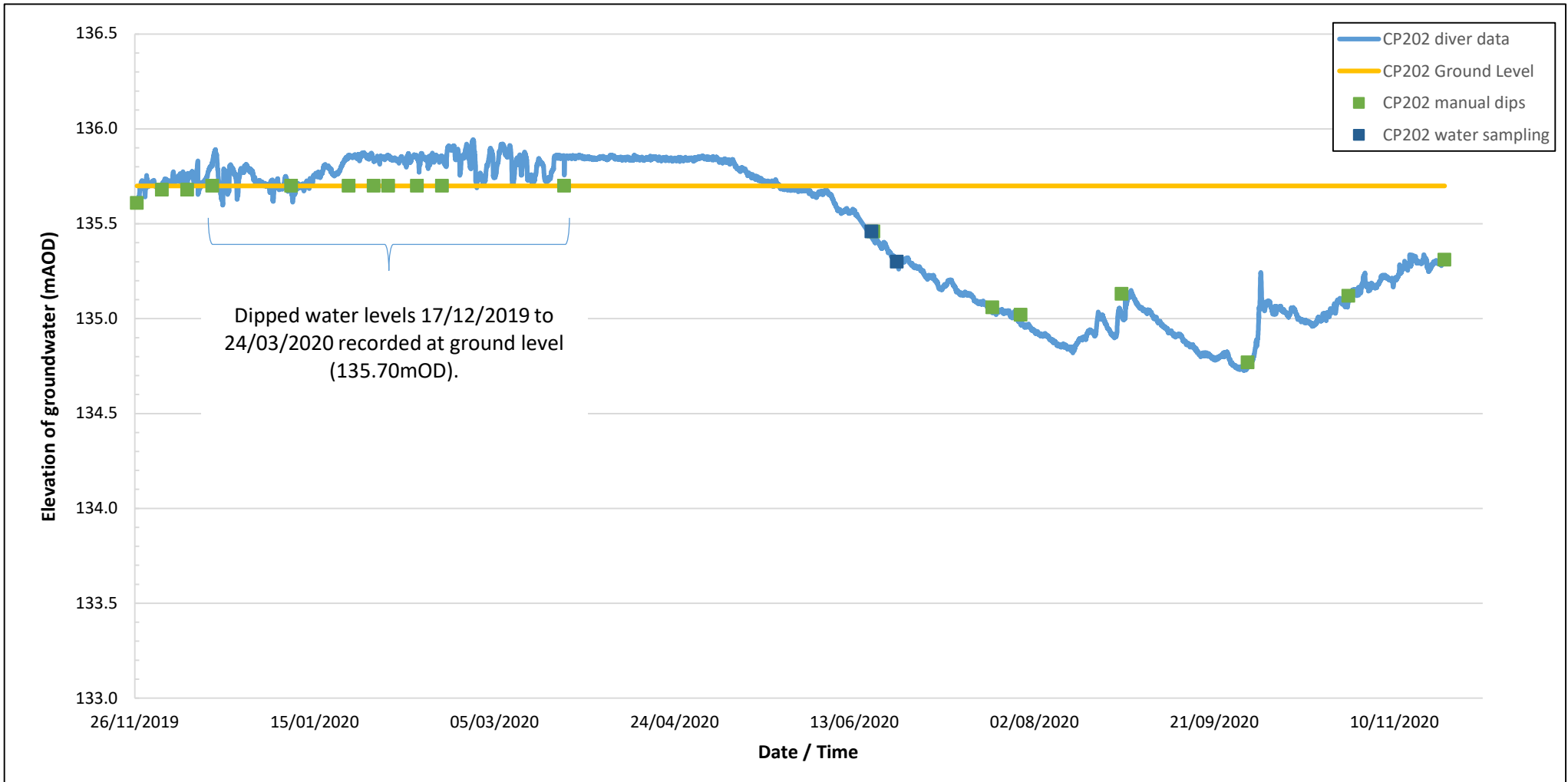
CONTRACT	CHECKED
<b>35560</b>	<b>EC</b>

# DIVER DATA - COMBINED



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)

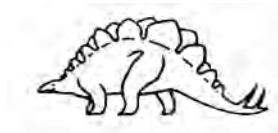


**REMARKS**

Erroneous data removed for clarity.

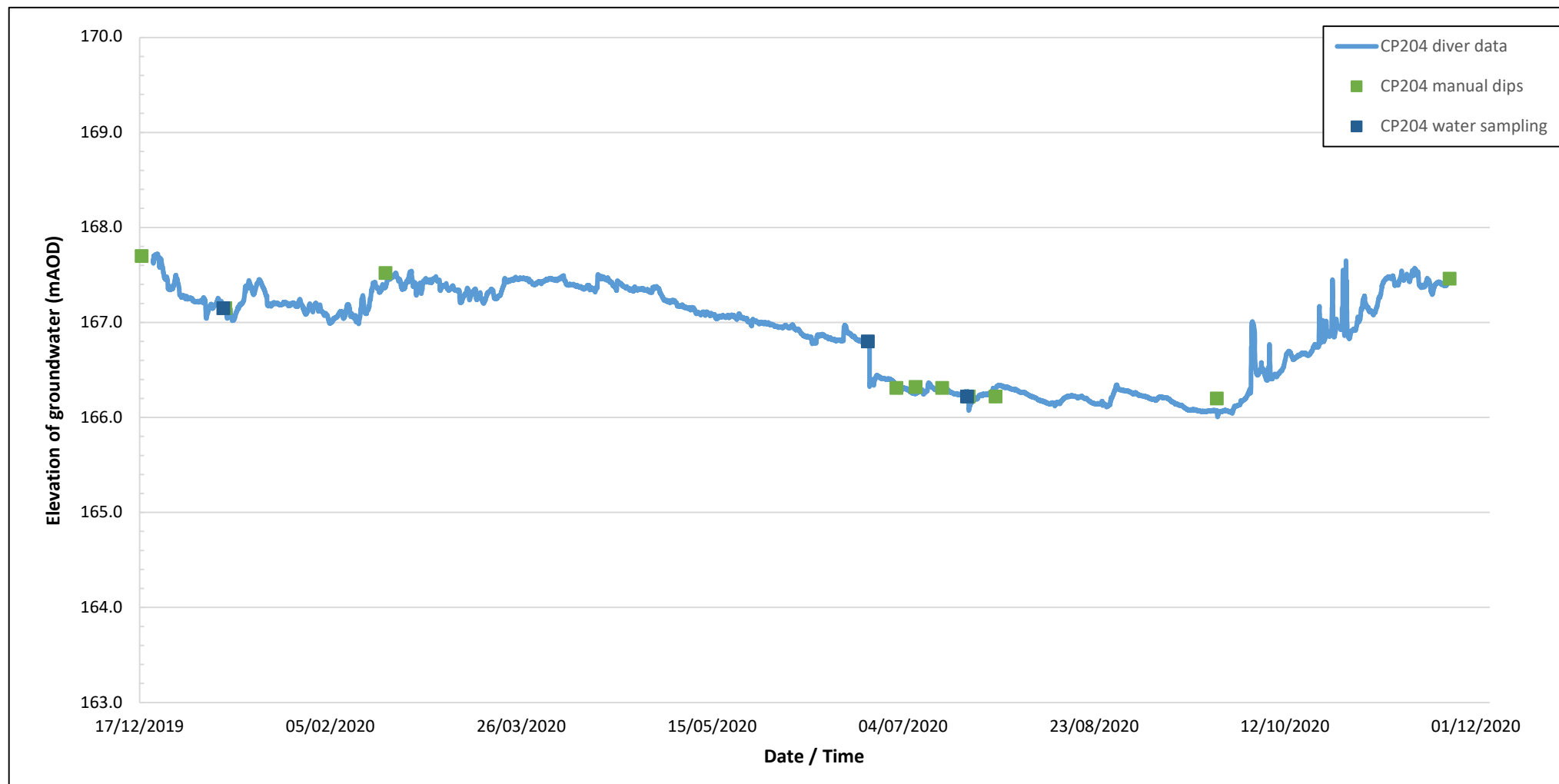
CONTRACT	CHECKED
<b>35560</b>	<b>EC</b>

# DIVER DATA - COMBINED



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)



## REMARKS

Erroneous data removed for clarity.

CONTRACT	CHECKED
<b>35560</b>	<b>EC</b>

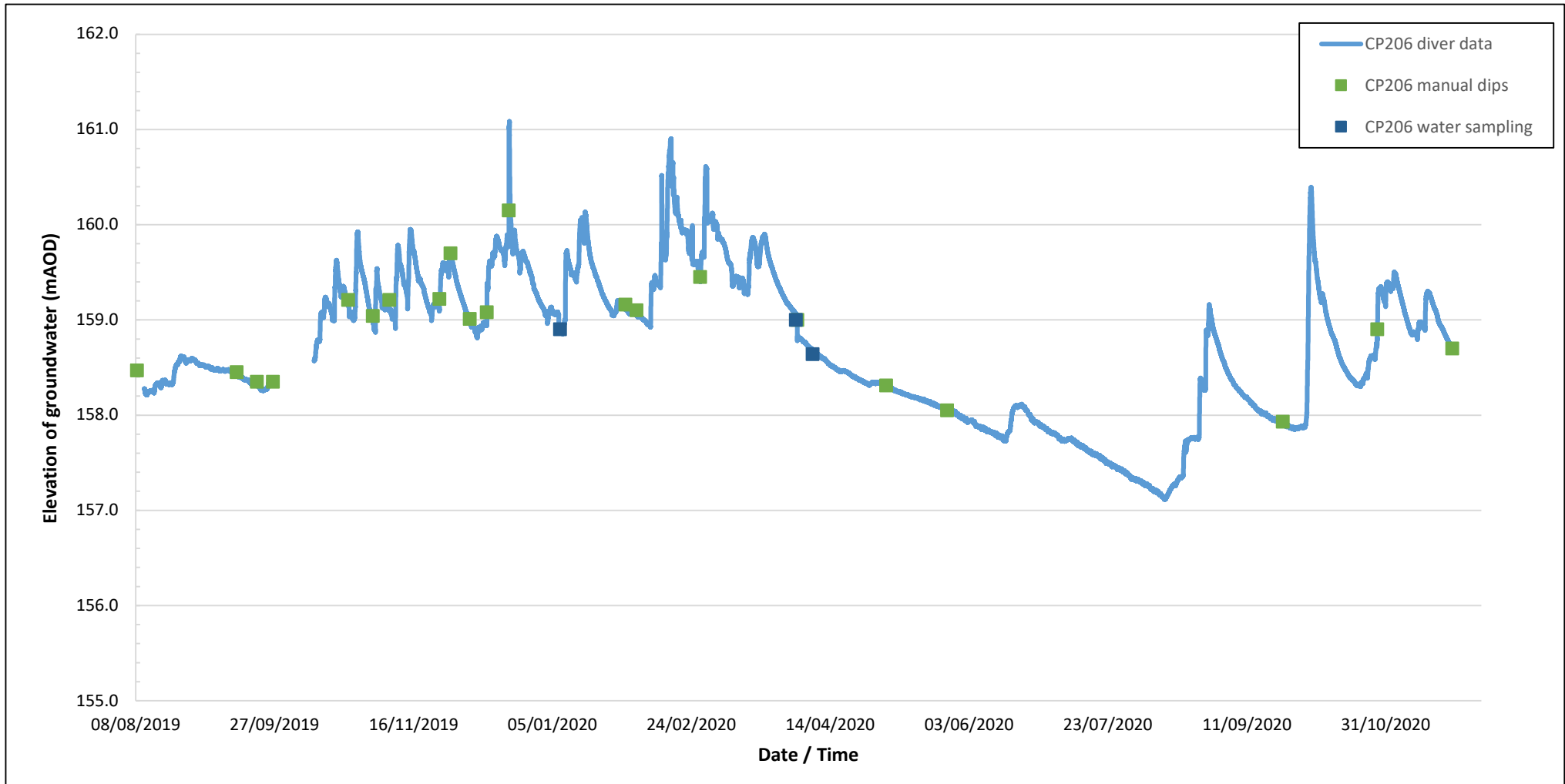


# DIVER DATA - COMBINED



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)



**REMARKS**

Erroneous data removed for clarity.

Breaks in the data set represent diver suspected of 'sticking' to pipework during replacement and slowly sinking to correct depth over time.

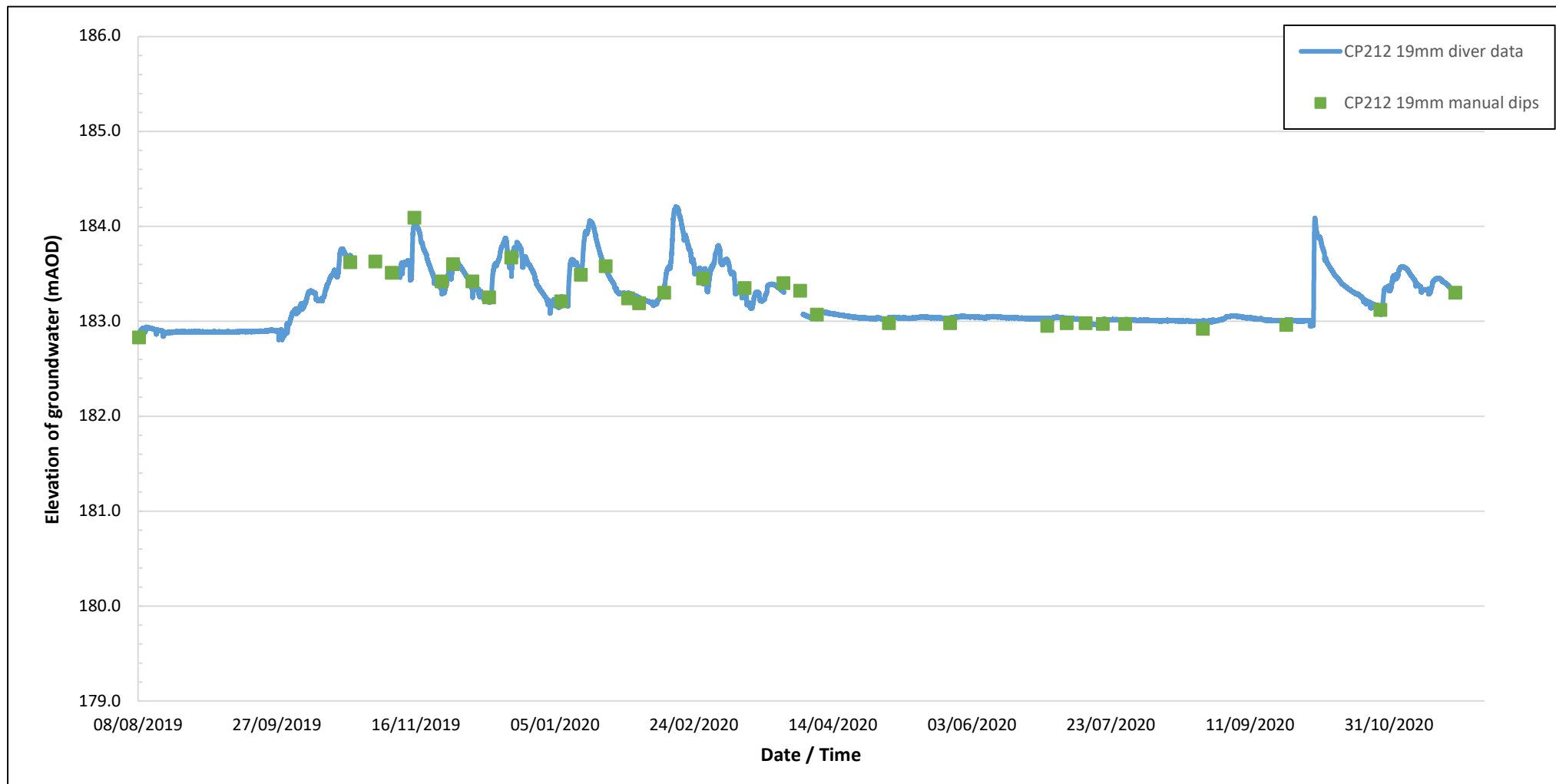
CONTRACT	CHECKED
<b>35560</b>	<b>EC</b>

# DIVER DATA - COMBINED



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)



**REMARKS**

Erroneous data removed for clarity.

Breaks in the data set represent diver suspected of 'sticking' to pipework during replacement and slowly sinking to correct depth over time

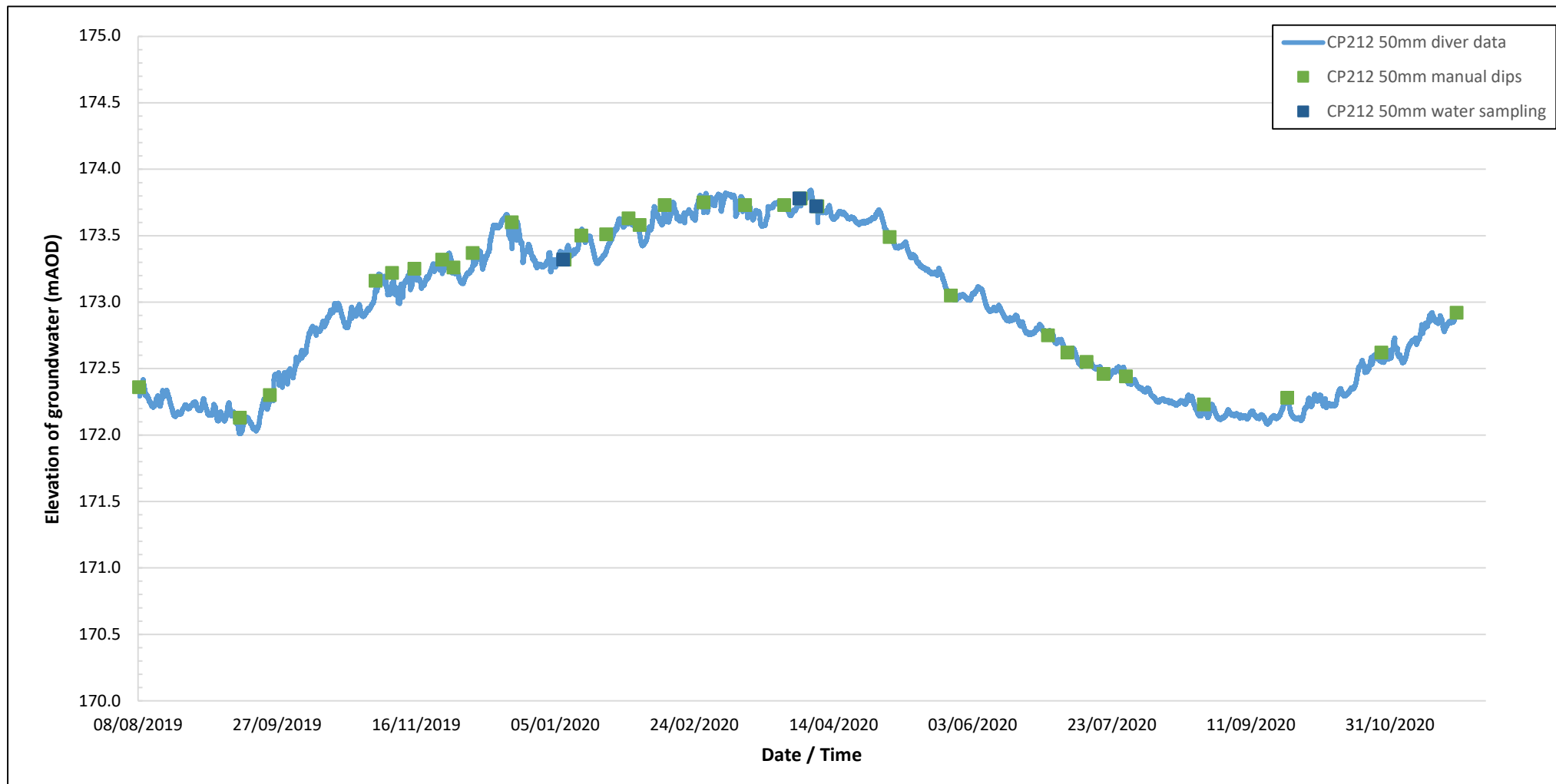
CONTRACT	CHECKED
<b>35560</b>	<b>EC</b>

# DIVER DATA - COMBINED



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)



## REMARKS

Erroneous data removed for clarity.

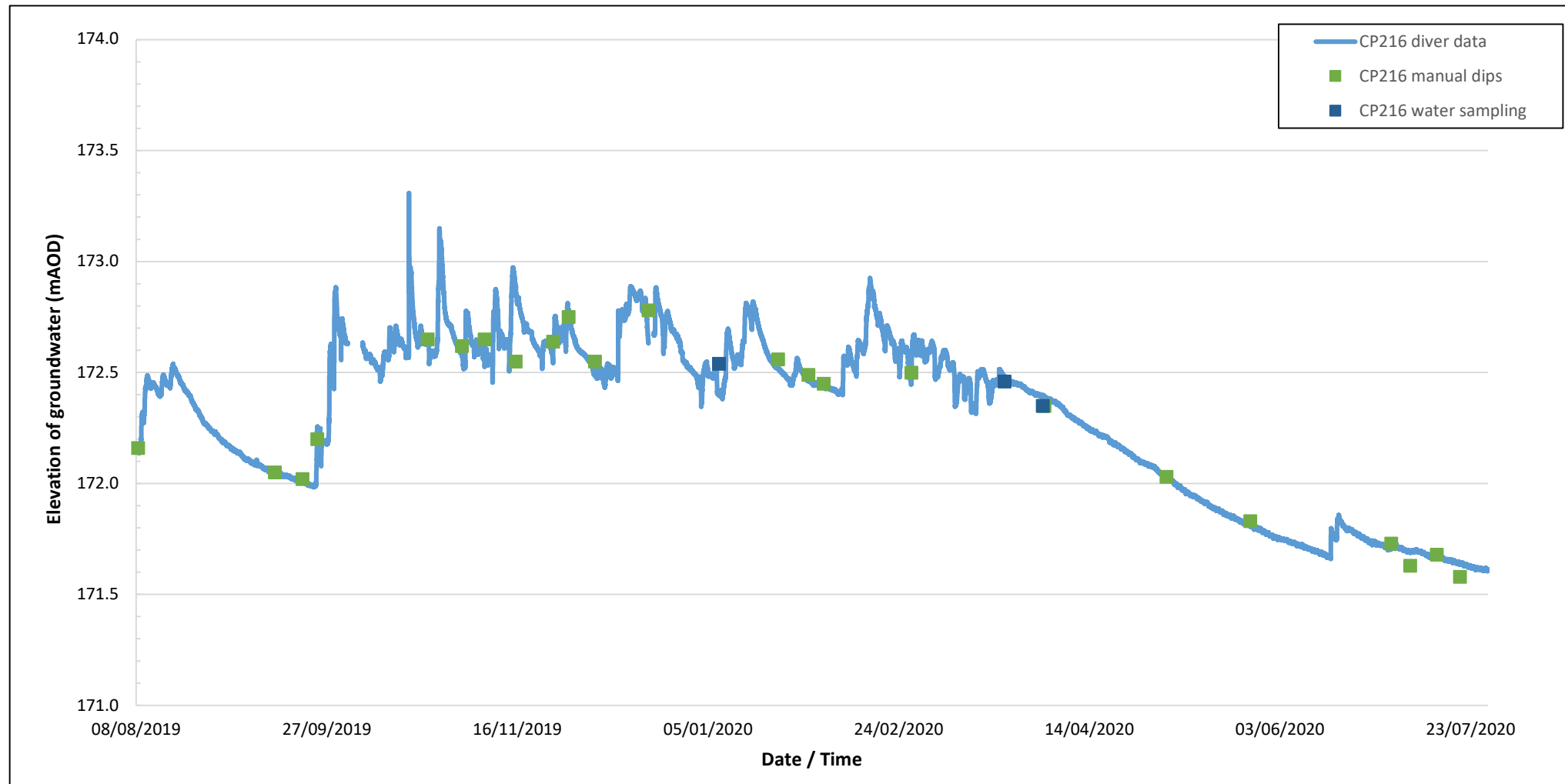
CONTRACT	CHECKED
<b>35560</b>	<b>EC</b>

# DIVER DATA - COMBINED



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)



**REMARKS**

Erroneous data removed for clarity.

Breaks in the data set represent diver suspected of 'sticking' to pipework during replacement and slowly sinking to correct depth over time.

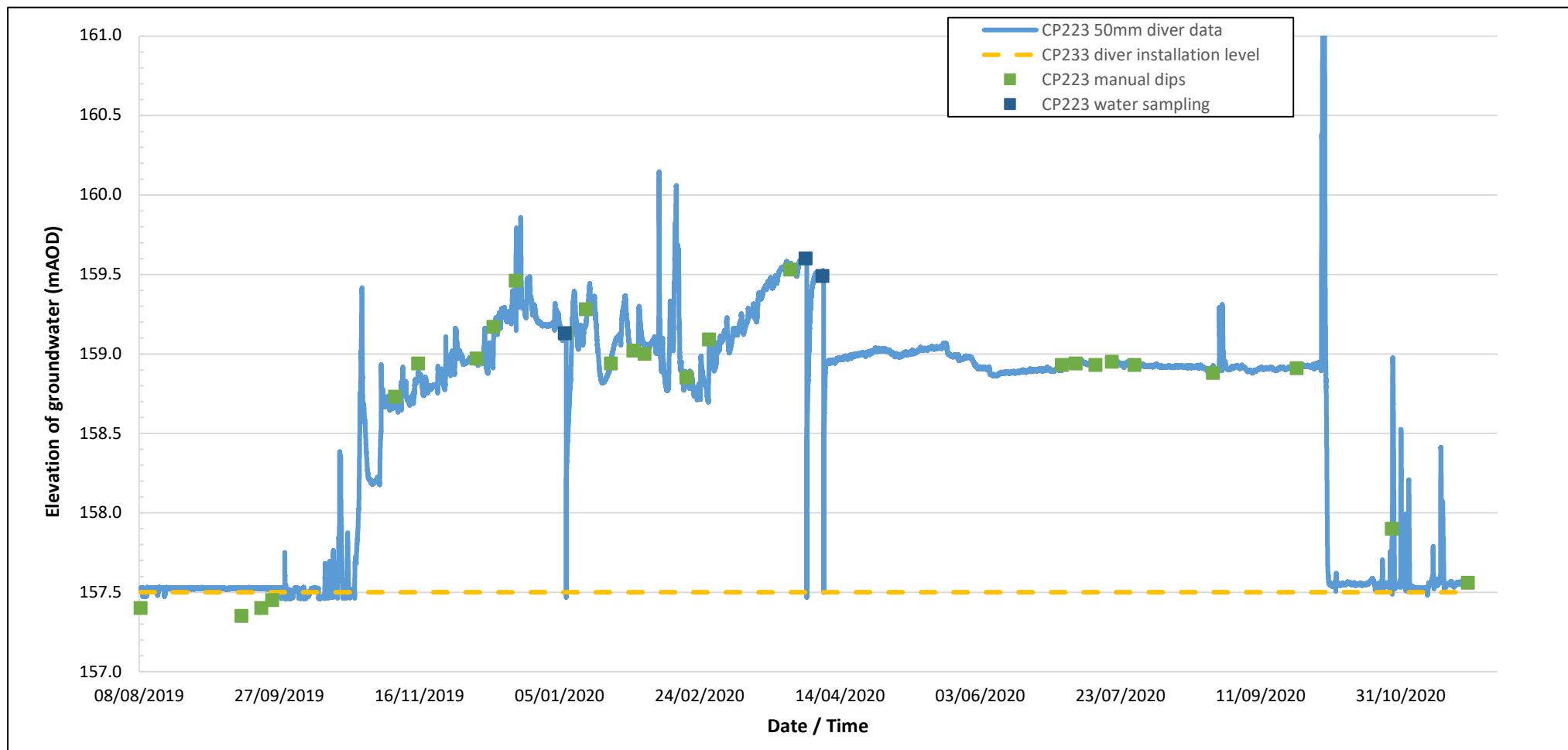
CONTRACT	CHECKED
<b>35205</b>	

# DIVER DATA - COMBINED



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)



**REMARKS**

Erroneous data removed for clarity.

Breaks in the data set represent diver suspected of 'sticking' to pipework during replacement and slowly sinking to correct depth over time

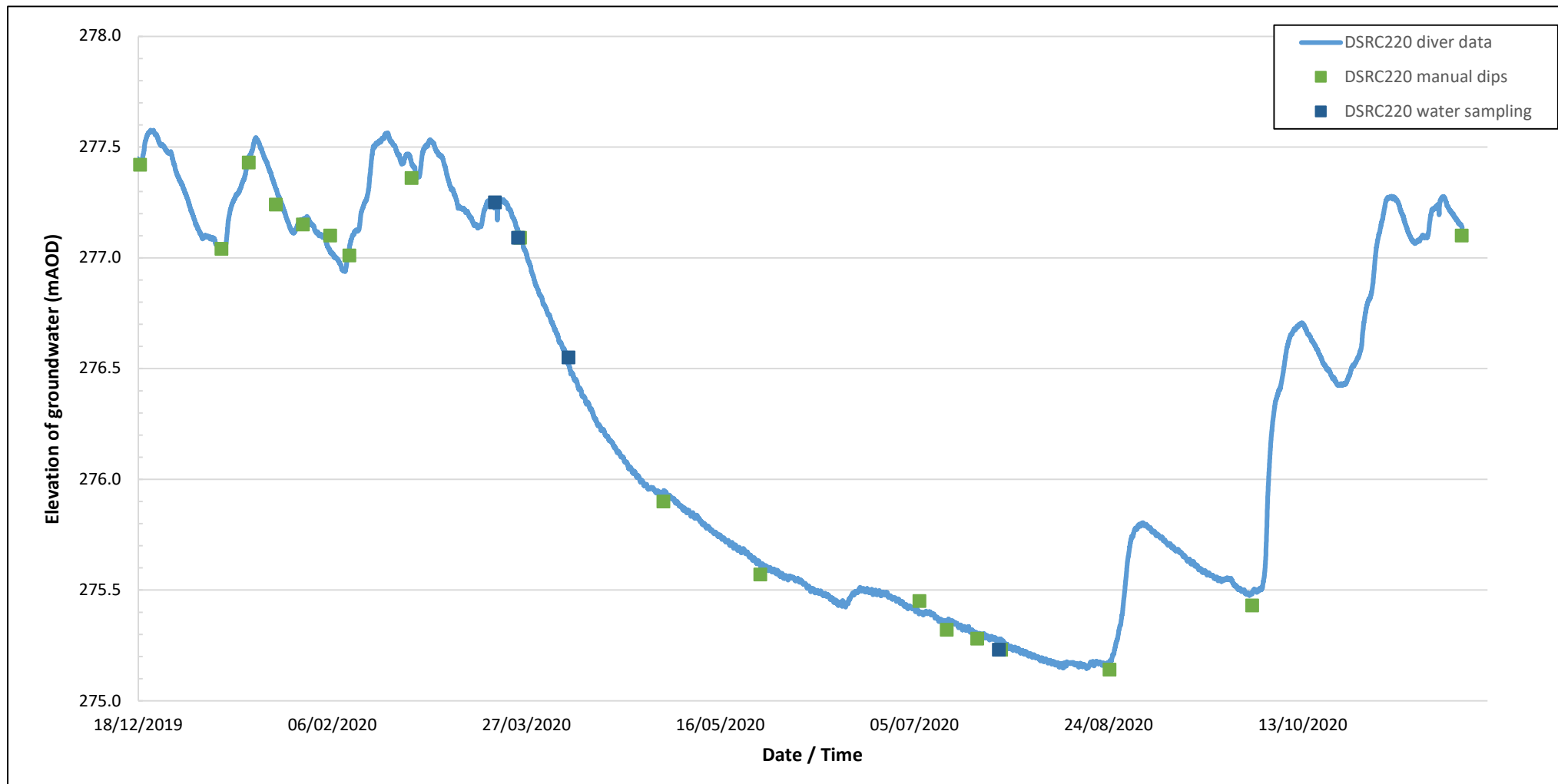
CONTRACT	CHECKED
<b>35560</b>	<b>EC</b>

# DIVER DATA - COMBINED



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)



**REMARKS**

Erroneous data removed for clarity.

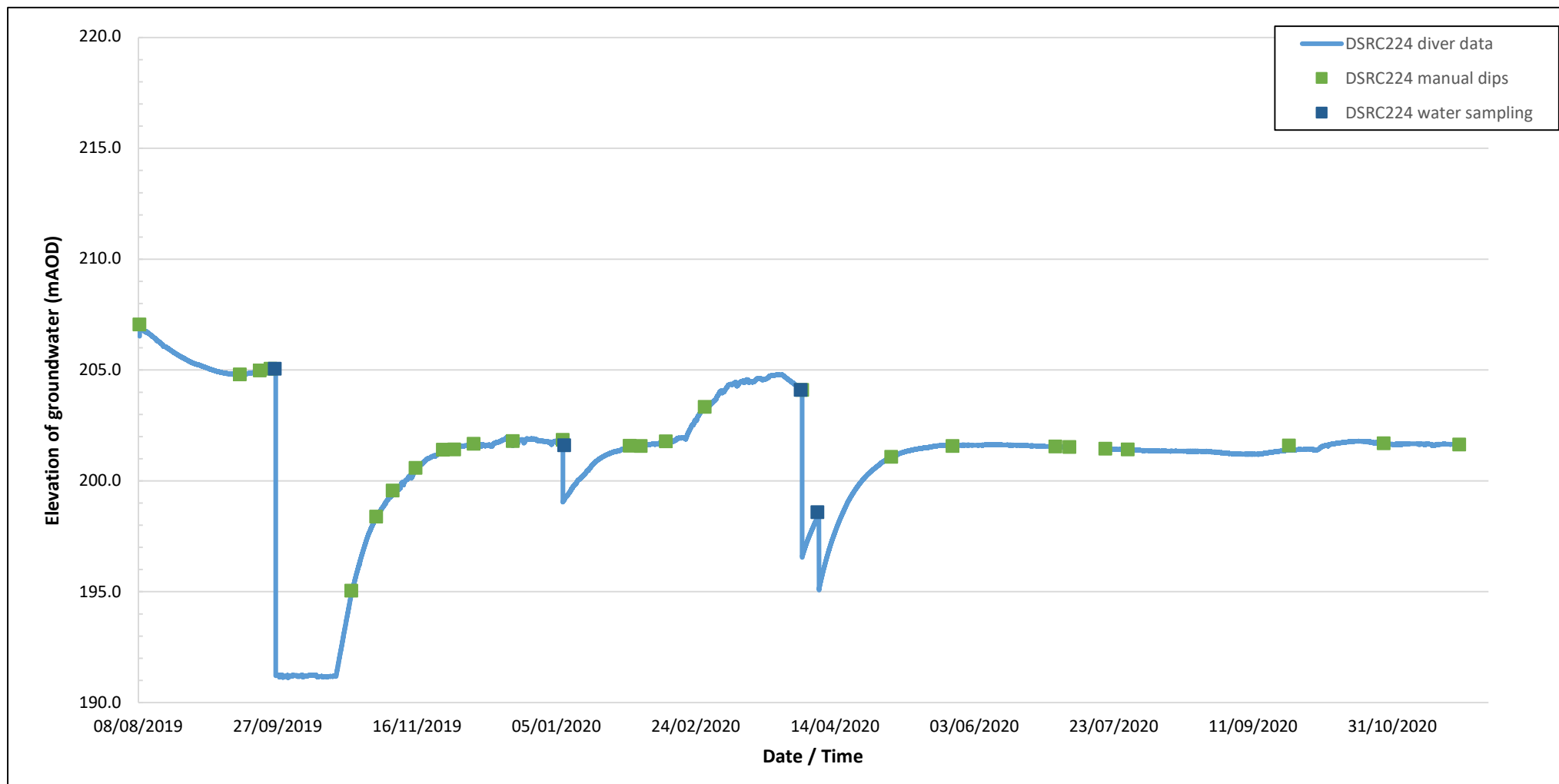
CONTRACT	CHECKED
<b>35560</b>	<b>EC</b>

# DIVER DATA - COMBINED



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)



## REMARKS

Erroneous data removed for clarity.

Troughs in the data coincide with water sampling

Breaks in the data set represent diver suspected of 'sticking' to pipework during replacement and slowly sinking to correct depth over time

CONTRACT

CHECKED

**35560**

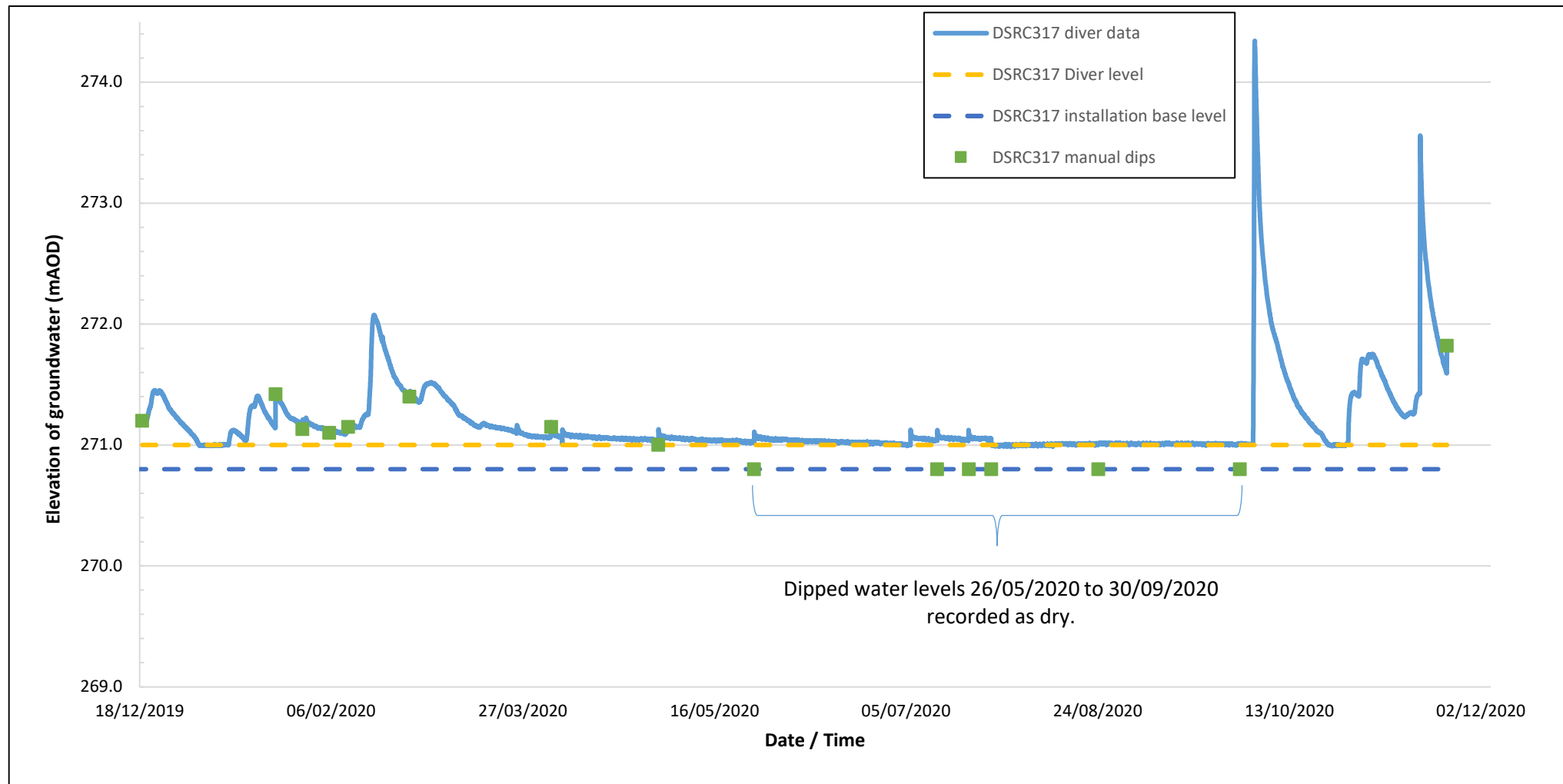
**EC**

# DIVER DATA - COMBINED



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)



**REMARKS**

Erroneous data removed for clarity.

CONTRACT	CHECKED
<b>35560</b>	<b>EC</b>

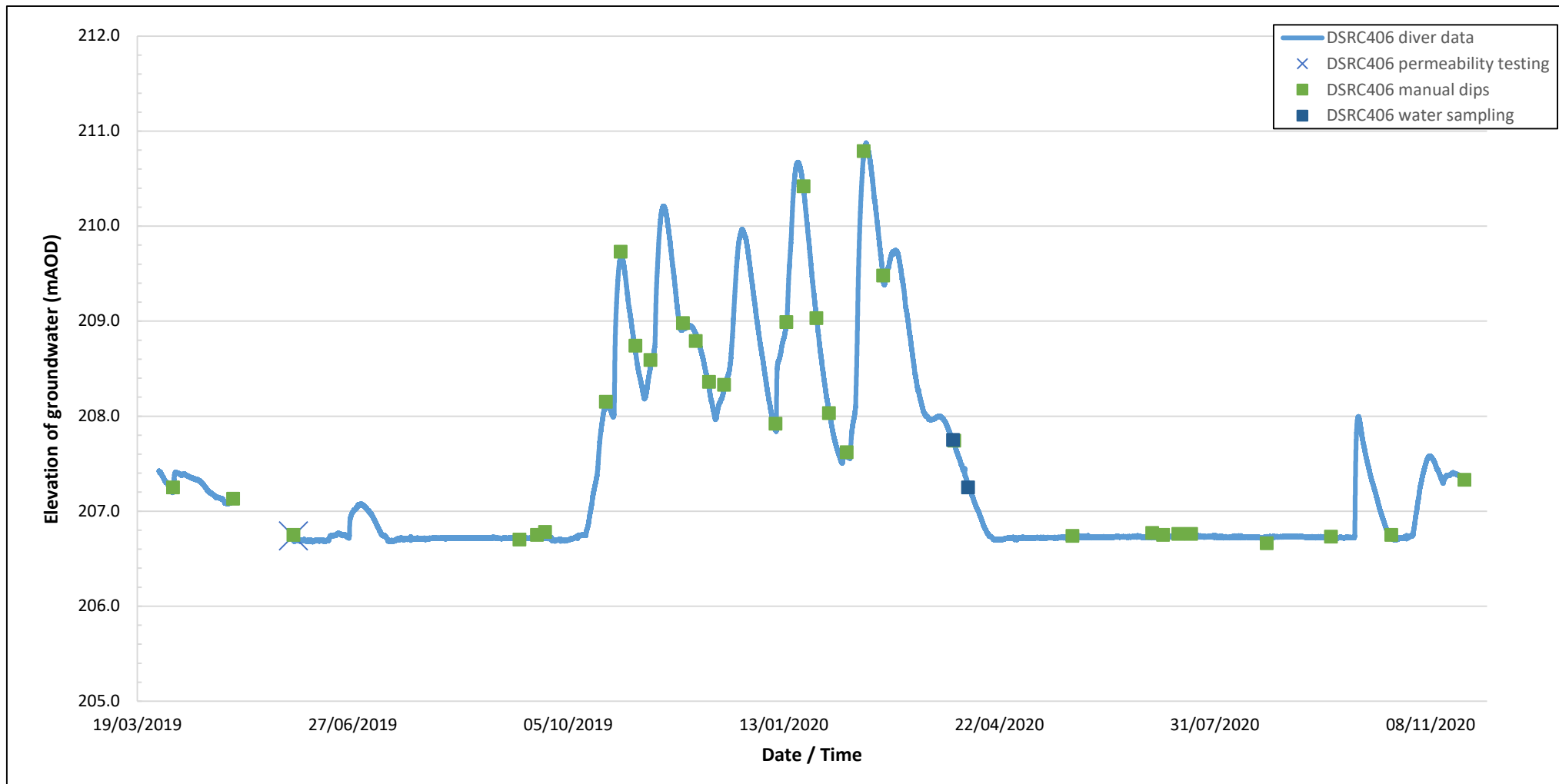


# DIVER DATA - COMBINED



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 1



**REMARKS**

Erroneous data removed for clarity.

Barometer not working 02/05/2019-30/05/2019

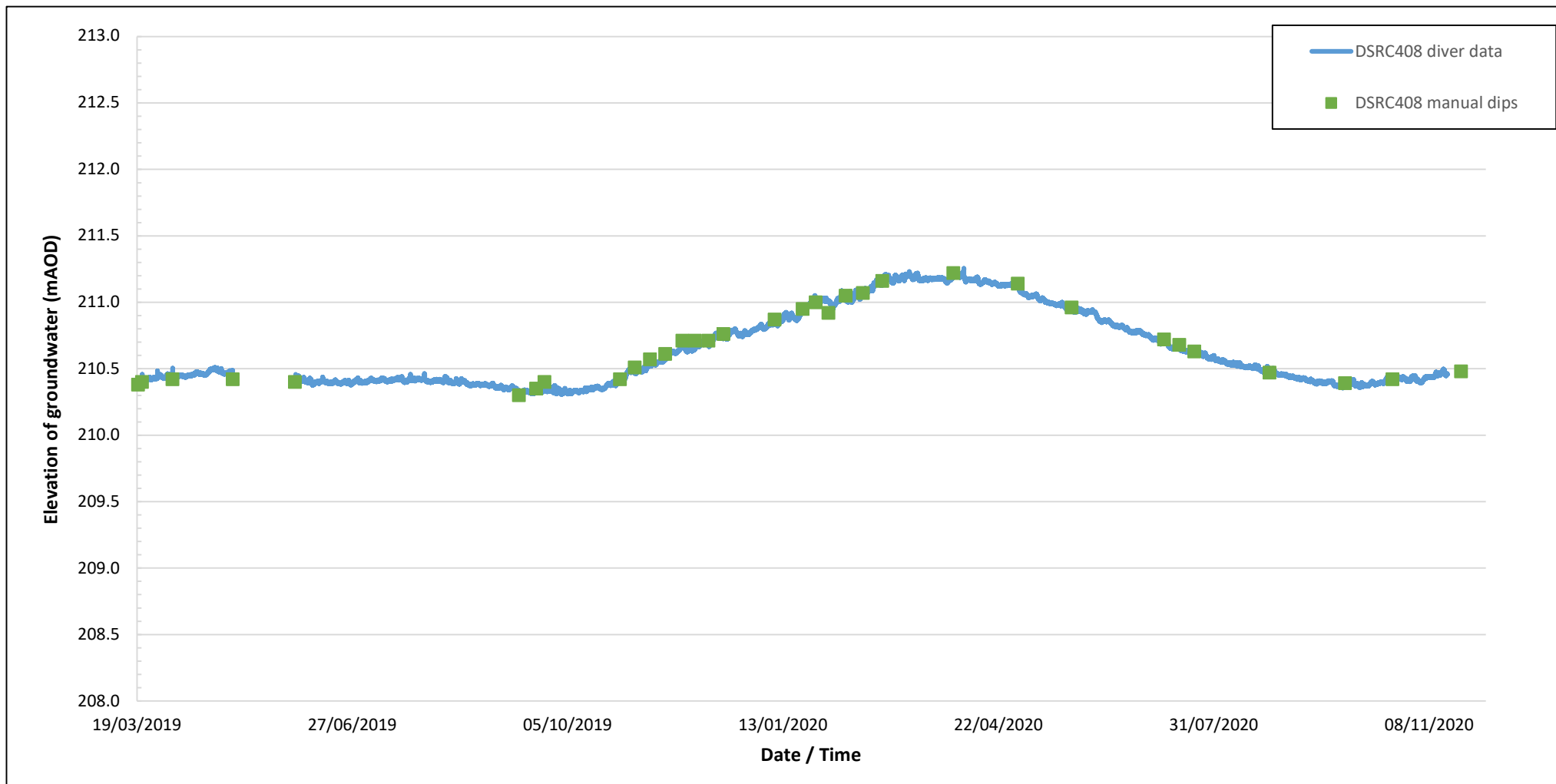
CONTRACT	CHECKED
<b>35560</b>	<b>EC</b>

# DIVER DATA - COMBINED



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 1



**REMARKS**

Erroneous data removed for clarity.

Barometer not working 02/05/2019-30/05/2019

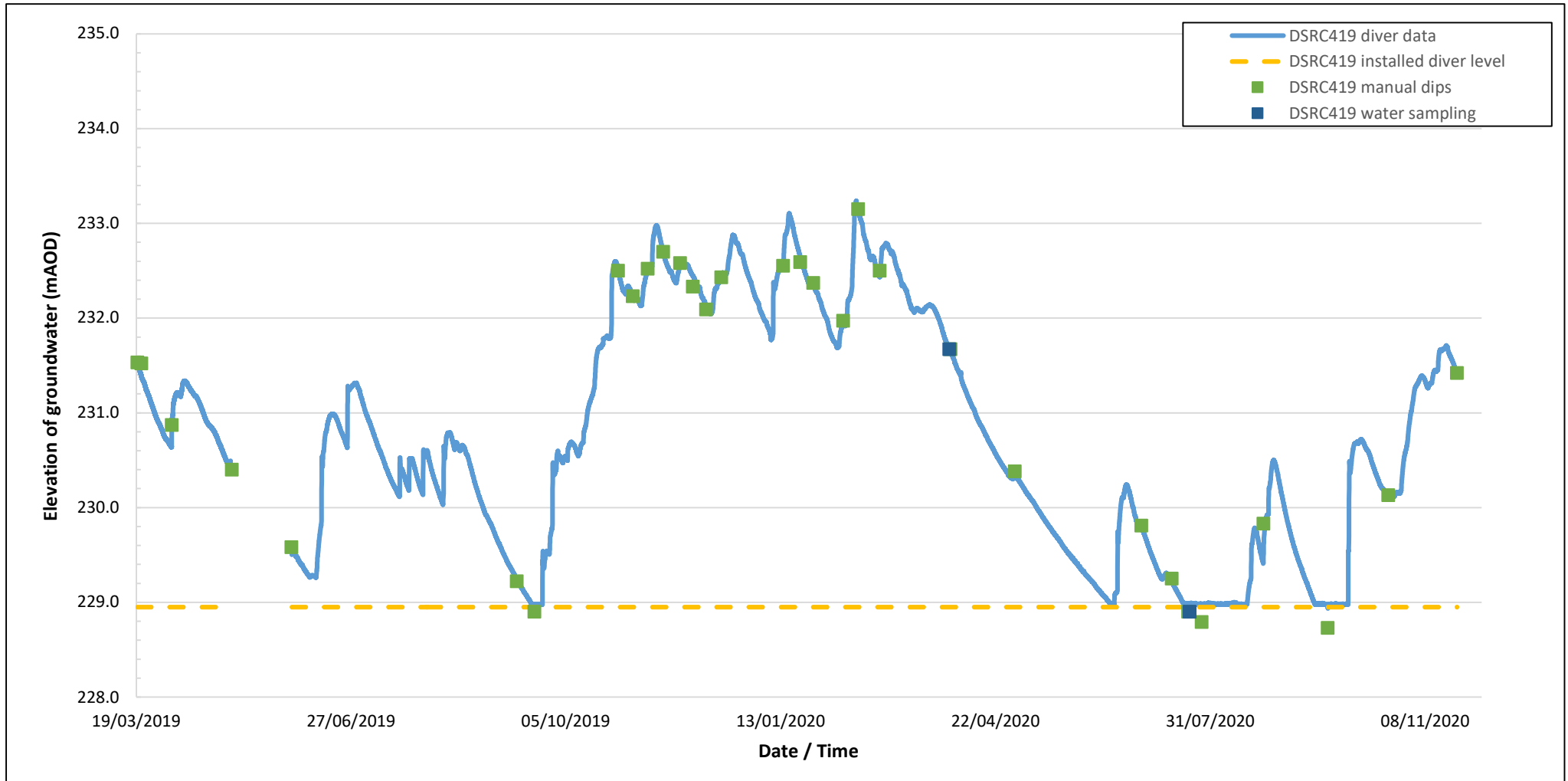
CONTRACT	CHECKED
<b>35560</b>	<b>EC</b>

# DIVER DATA - COMBINED



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 1



**REMARKS**

Erroneous data removed for clarity.

Barometer not working 02/05/2019-30/05/2019

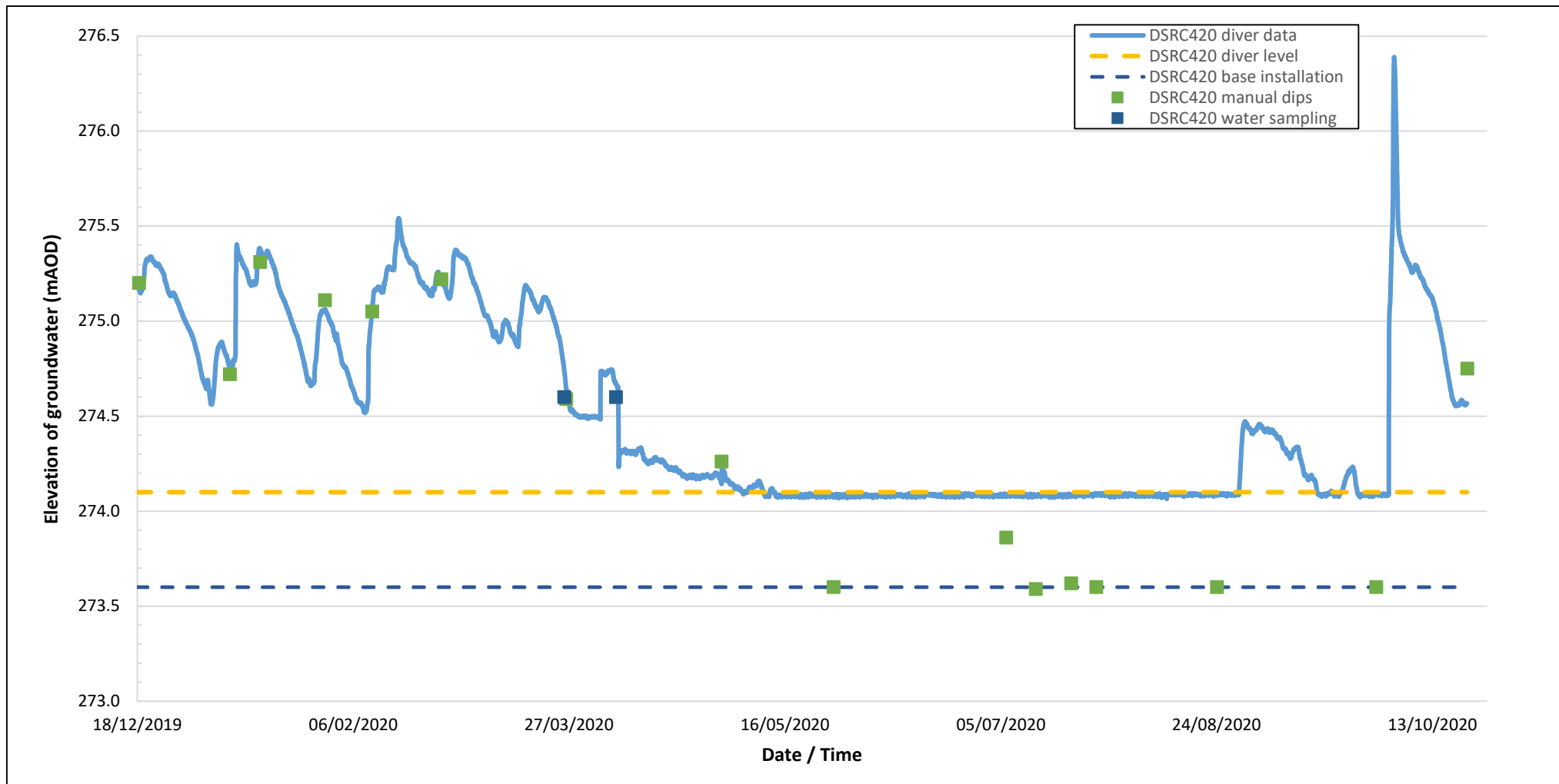
CONTRACT	CHECKED
<b>35560</b>	<b>EC</b>

# DIVER DATA - COMBINED



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

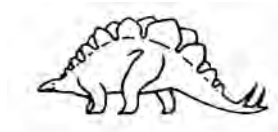


**REMARKS**

Erroneous data removed for clarity.

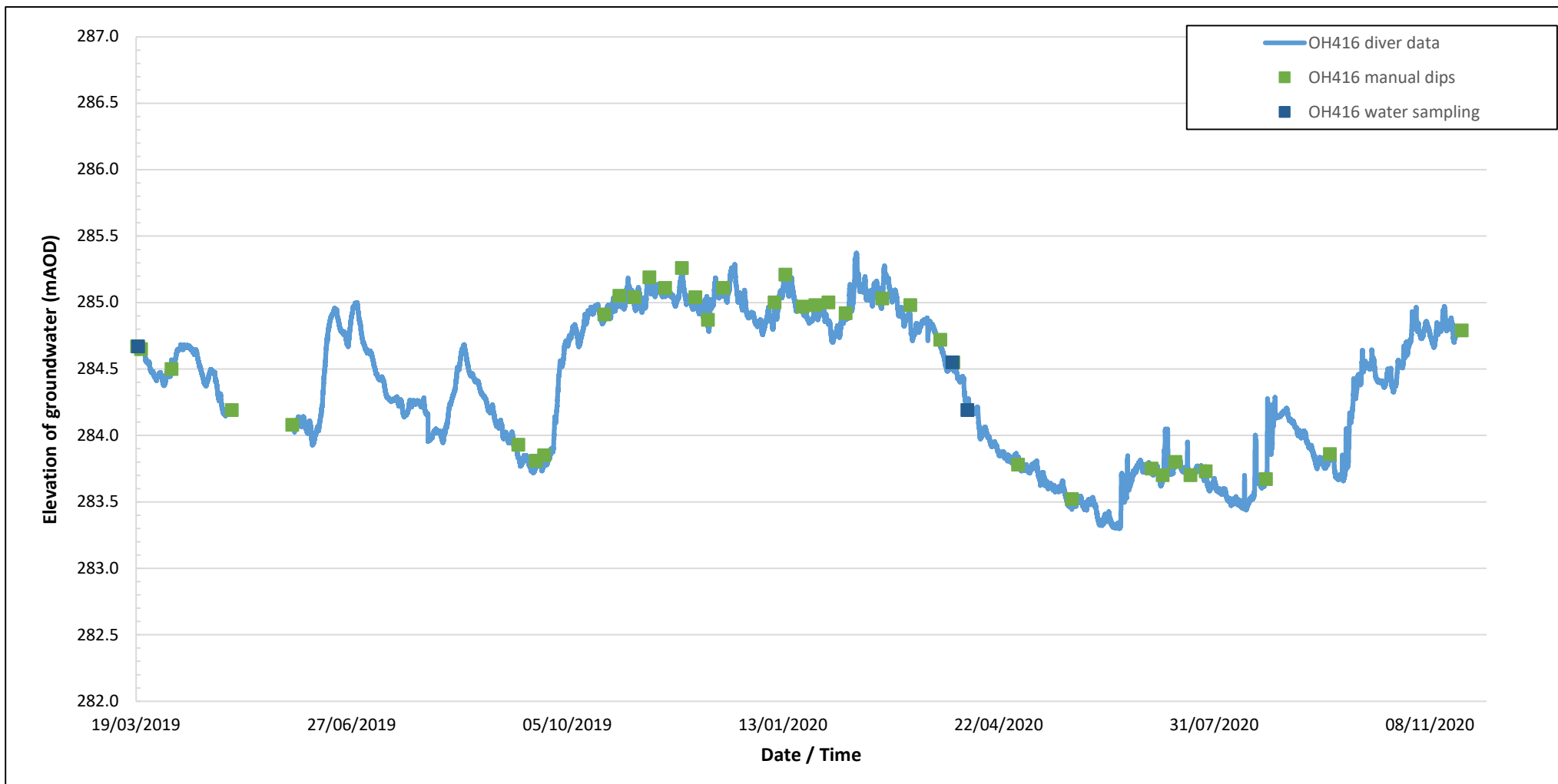
CONTRACT	CHECKED
<b>35560</b>	<b>EC</b>

# DIVER DATA - COMBINED



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 1



**REMARKS**

Erroneous data removed for clarity.

Barometer not working 02/05/2019-31/05/2019

CONTRACT	CHECKED
<b>35560</b>	<b>EC</b>



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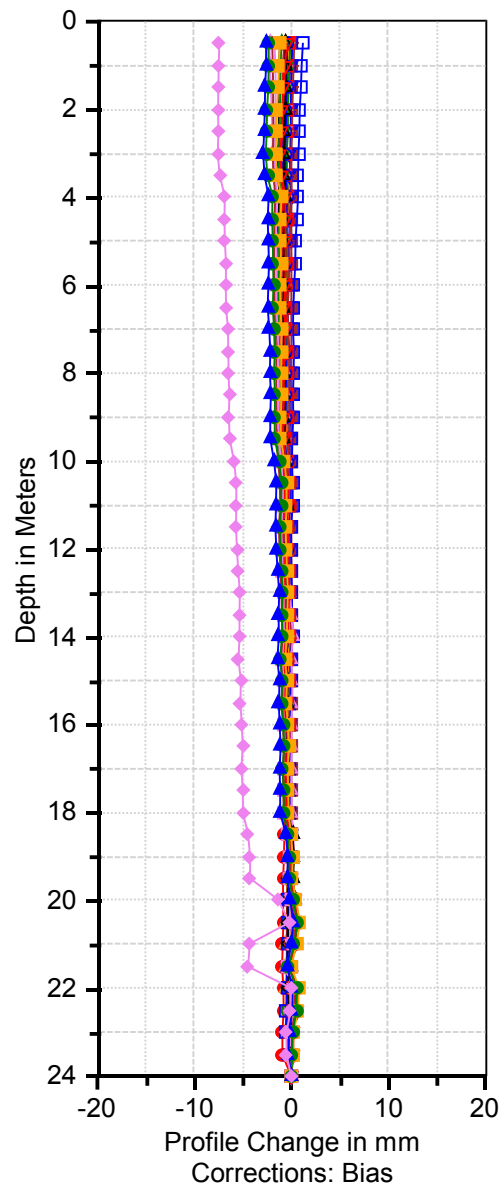
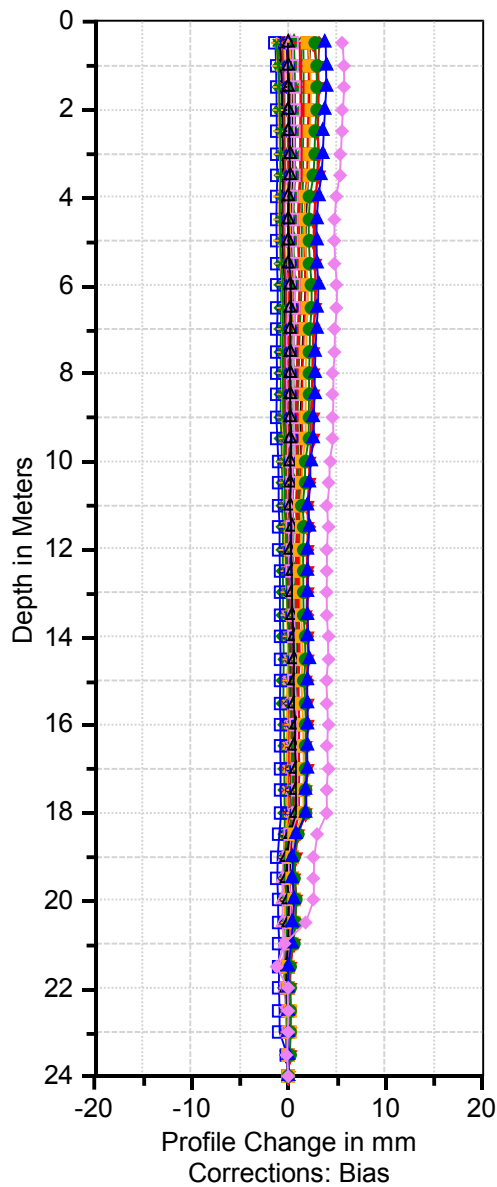
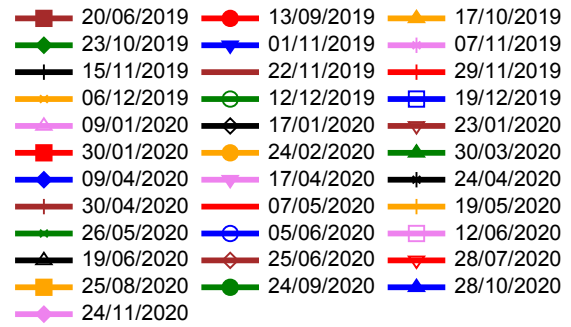
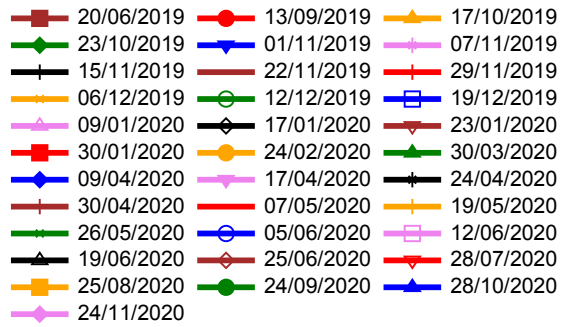
# **APPENDIX D**

## **D2: INCLINOMETER MONITORING**



CP208 A

CP208 B



Geotechnical Engineering Limited  
INCLINOMETER DATA



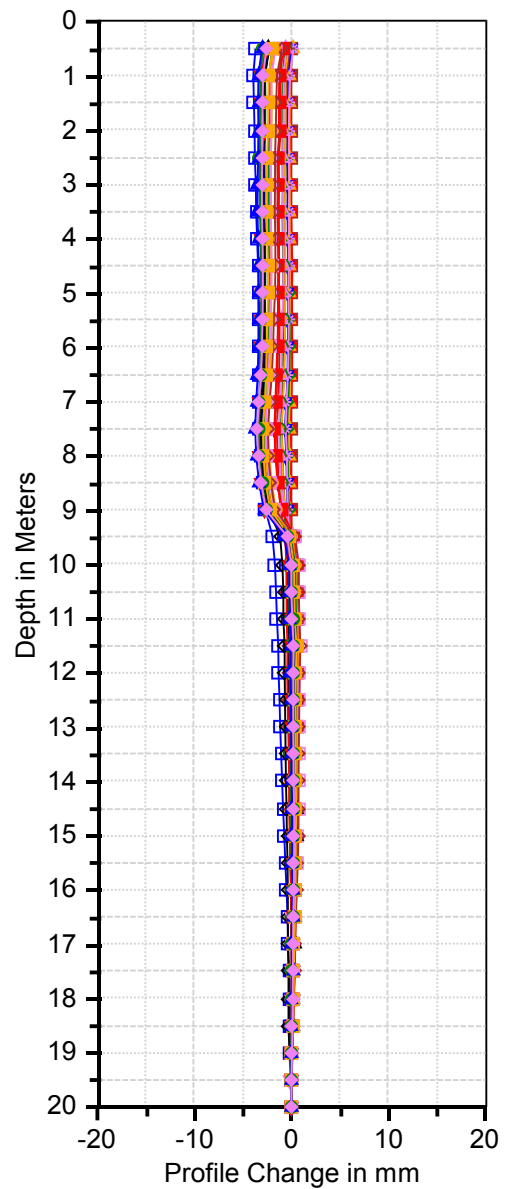
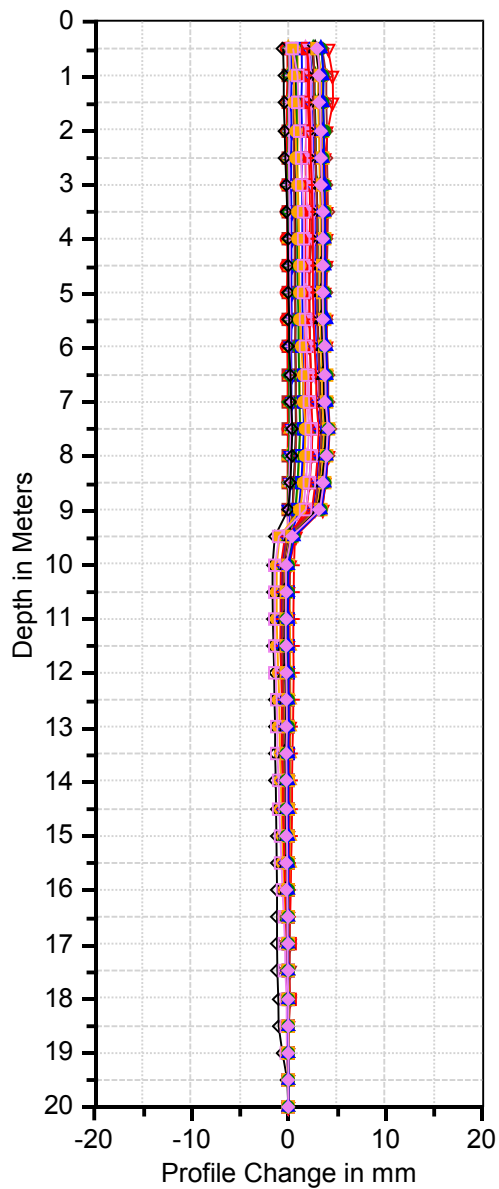
CLIENT: OSBORNE  
SITE: HE551505 A417 Missing Link Ground Investigation - Phase 2A (1077)

CP209 A

CP209 B

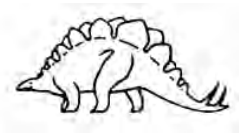
- |              |              |              |
|--------------|--------------|--------------|
| ■ 21/06/2019 | ● 13/09/2019 | ▲ 17/10/2019 |
| ◆ 23/10/2019 | ▼ 01/11/2019 | ◇ 07/11/2019 |
| ⊕ 15/11/2019 | ⊖ 22/11/2019 | ⊗ 29/11/2019 |
| ⊘ 06/12/2019 | ○ 12/12/2019 | □ 19/12/2019 |
| △ 09/01/2020 | ◇ 17/01/2020 | ▽ 23/01/2020 |
| ■ 30/01/2020 | ● 24/02/2020 | ▲ 30/03/2020 |
| ◆ 09/04/2020 | ▼ 17/04/2020 | ◇ 24/04/2020 |
| ⊕ 30/04/2020 | ⊖ 07/05/2020 | ⊗ 19/05/2020 |
| ⊘ 26/05/2020 | ○ 05/06/2020 | □ 12/06/2020 |
| △ 19/06/2020 | ◇ 25/06/2020 | ▽ 28/07/2020 |
| ■ 25/08/2020 | ● 24/09/2020 | ▲ 28/10/2020 |
| ◆ 24/11/2020 |              |              |

- |              |              |              |
|--------------|--------------|--------------|
| ■ 21/06/2019 | ● 13/09/2019 | ▲ 17/10/2019 |
| ◆ 23/10/2019 | ▼ 01/11/2019 | ◇ 07/11/2019 |
| ⊕ 15/11/2019 | ⊖ 22/11/2019 | ⊗ 29/11/2019 |
| ⊘ 06/12/2019 | ○ 12/12/2019 | □ 19/12/2019 |
| △ 09/01/2020 | ◇ 17/01/2020 | ▽ 23/01/2020 |
| ■ 30/01/2020 | ● 24/02/2020 | ▲ 30/03/2020 |
| ◆ 09/04/2020 | ▼ 17/04/2020 | ◇ 24/04/2020 |
| ⊕ 30/04/2020 | ⊖ 07/05/2020 | ⊗ 19/05/2020 |
| ⊘ 26/05/2020 | ○ 05/06/2020 | □ 12/06/2020 |
| △ 19/06/2020 | ◇ 25/06/2020 | ▽ 28/07/2020 |
| ■ 25/08/2020 | ● 24/09/2020 | ▲ 28/10/2020 |
| ◆ 24/11/2020 |              |              |





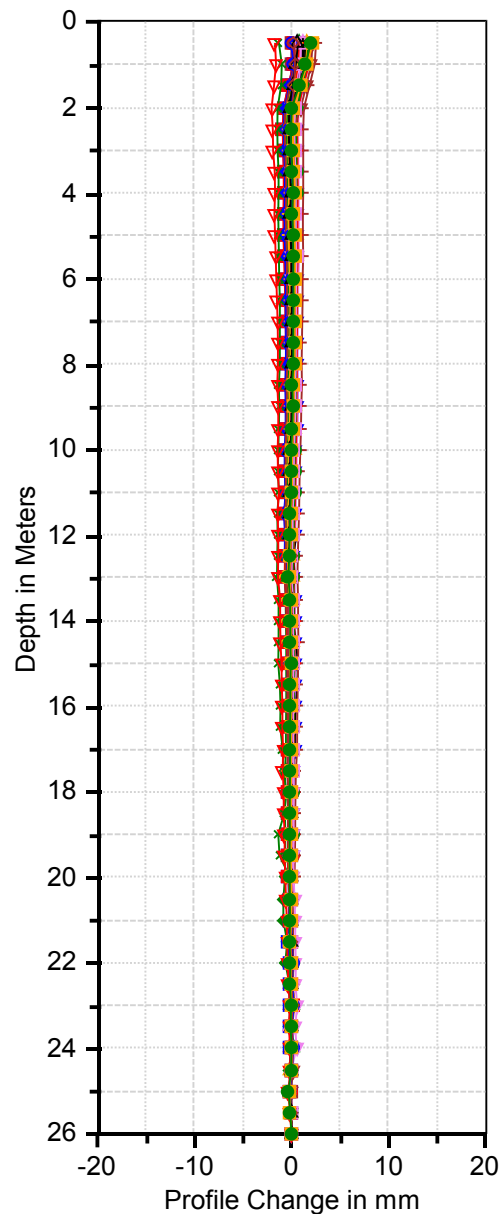
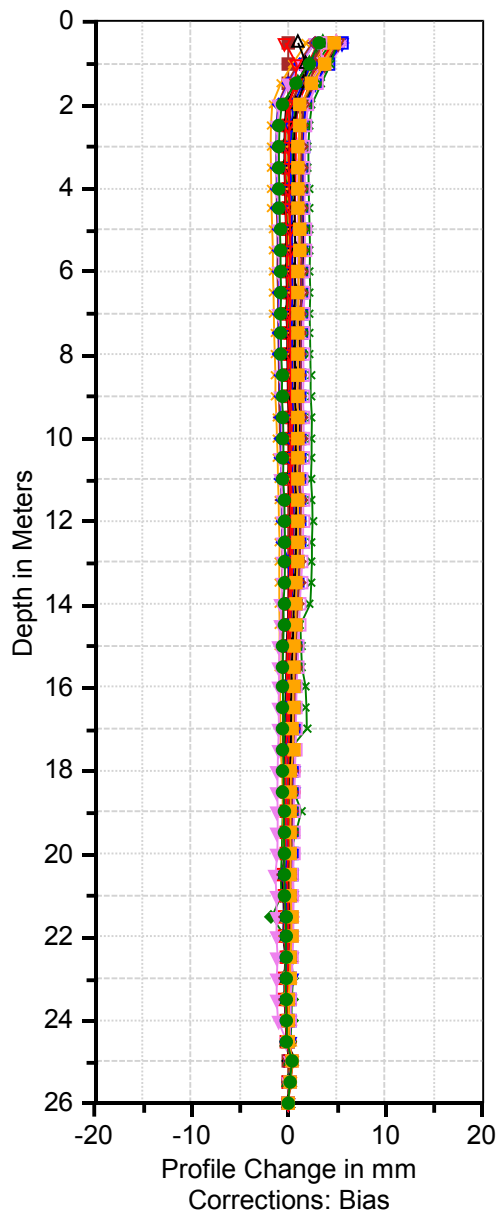
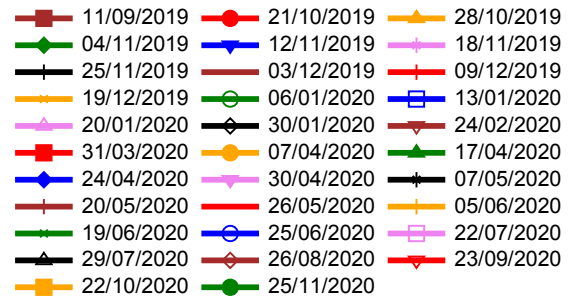
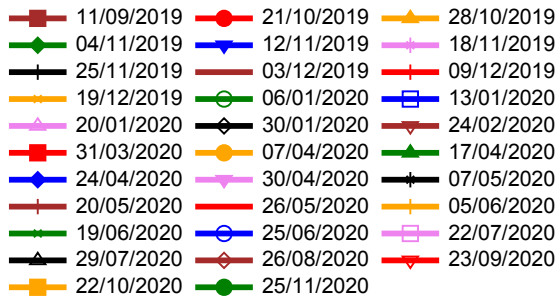
Geotechnical Engineering Limited  
INCLINOMETER DATA



CLIENT OSBORNE  
SITE HE551505 A417 Missing Link Ground Investigation - Phase 2A (1059)

CP213 A

CP213 B



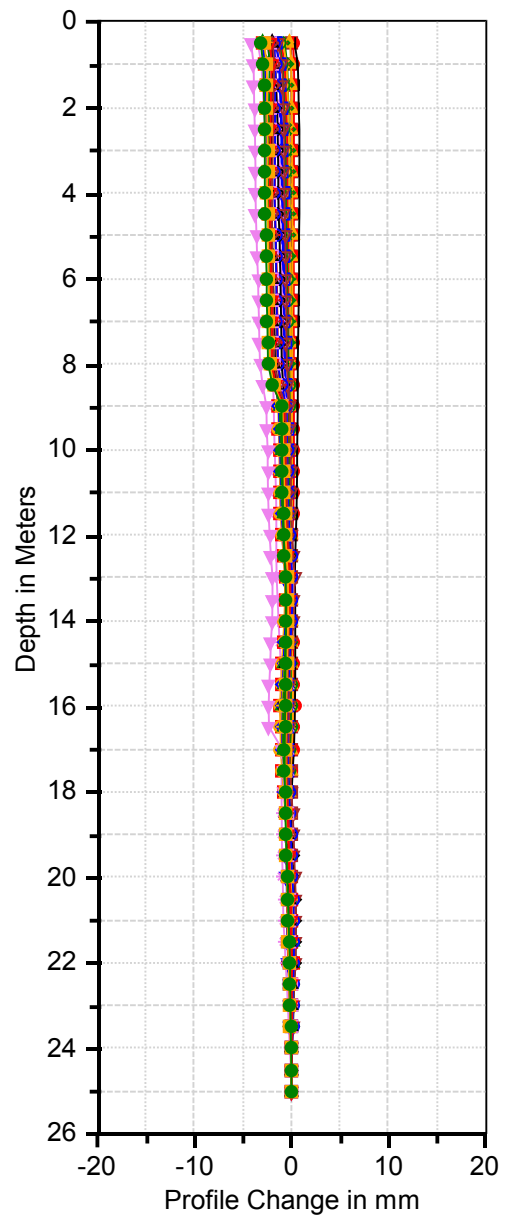
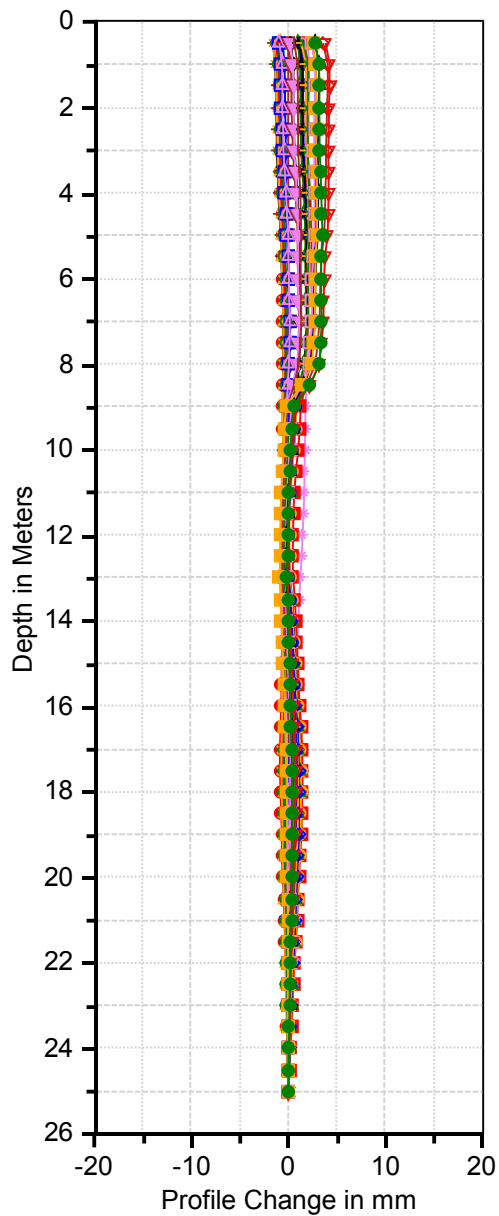
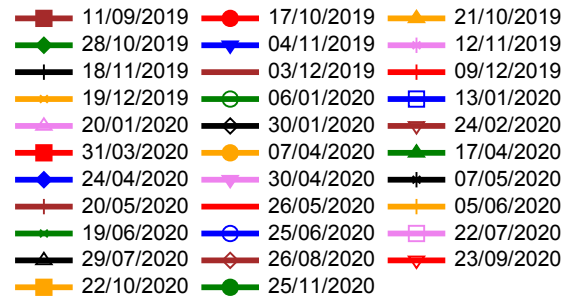
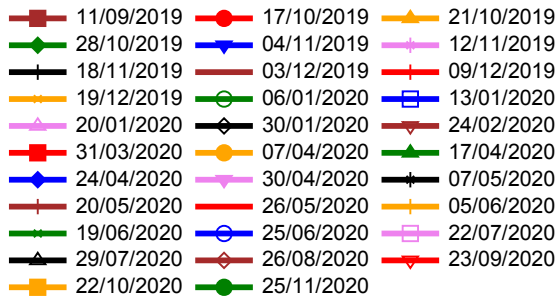
Geotechnical Engineering Limited  
INCLINOMETER DATA

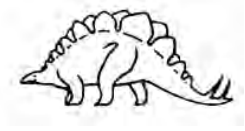


CLIENT: OSBORNE  
SITE: HE551505 A417 Missing Link Ground Investigation - Phase 2A (1059)

CP214 A

CP214 B

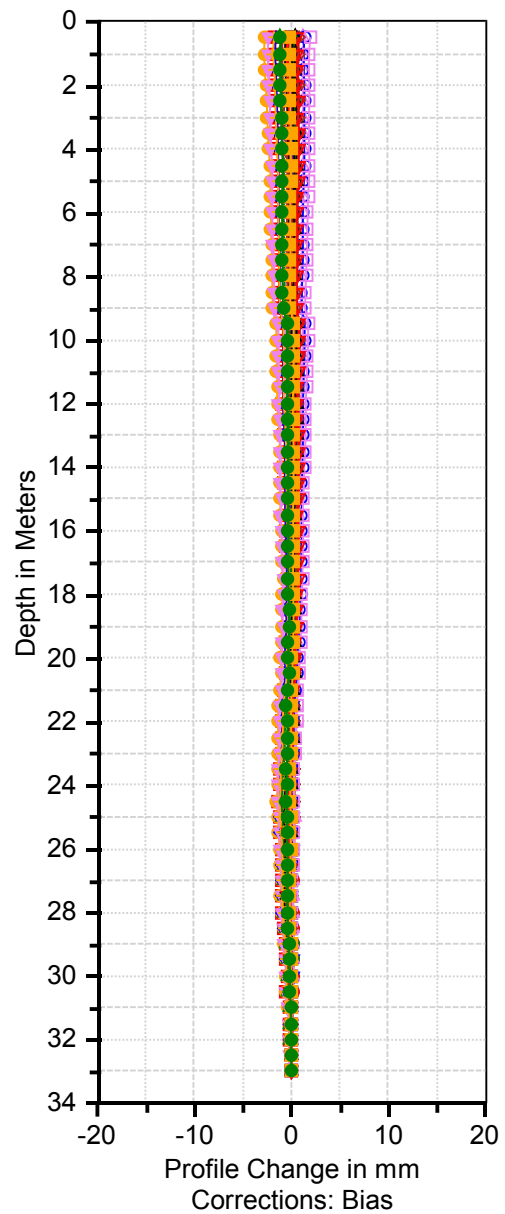
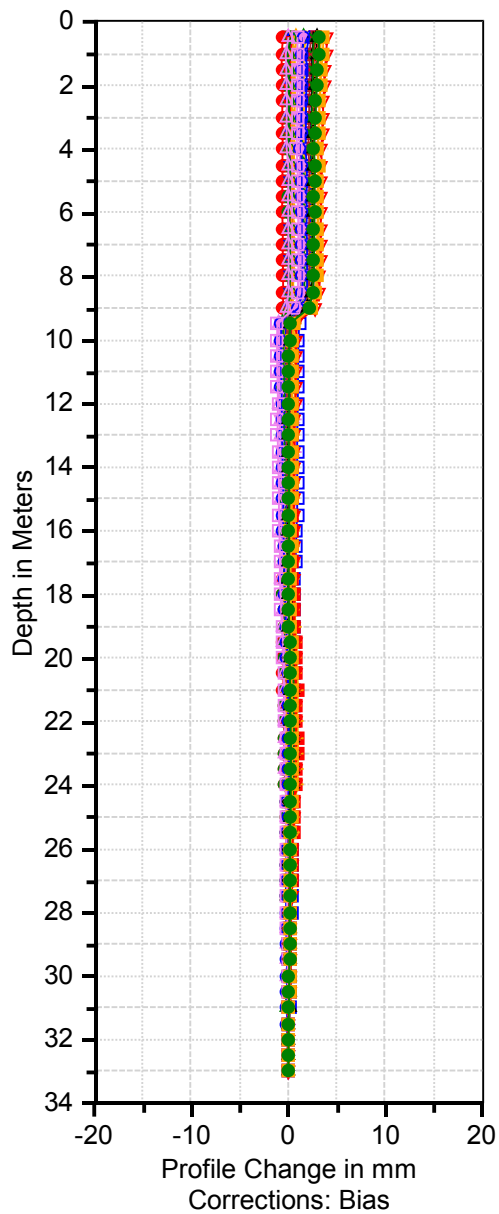
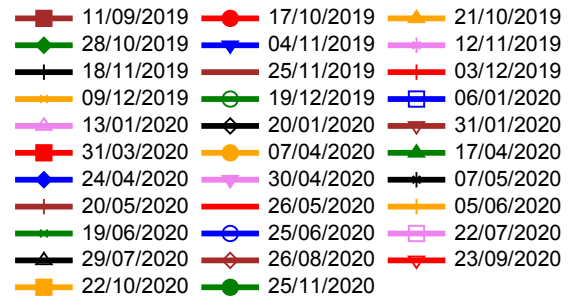
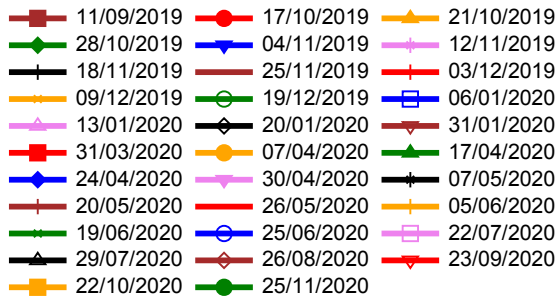


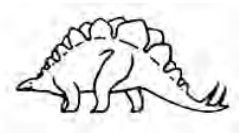


CLIENT: OSBORNE  
 SITE: HE551505 A417 Missing Link Ground Investigation - Phase 2A (992)

CP217 A

CP217 B





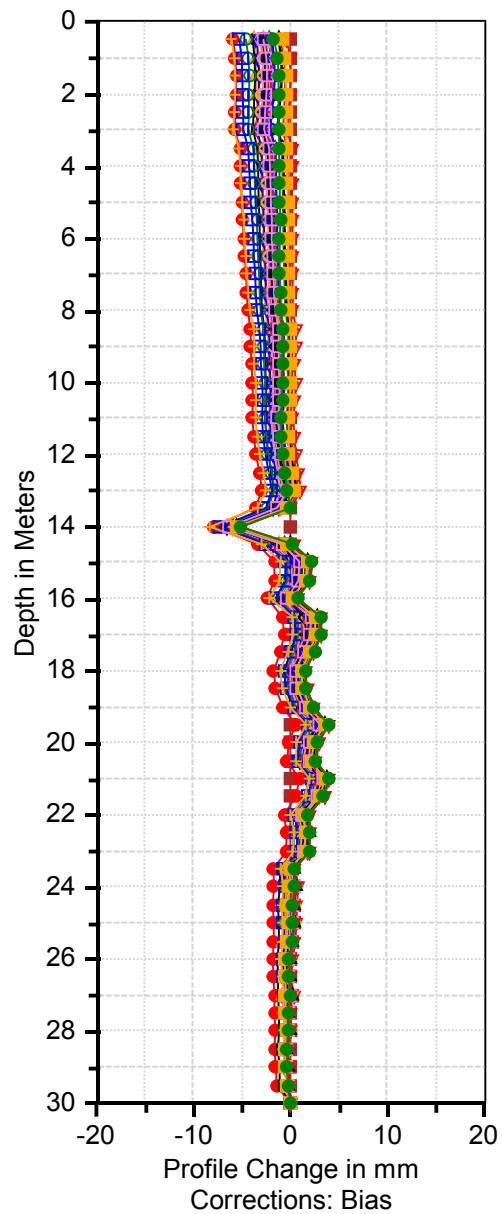
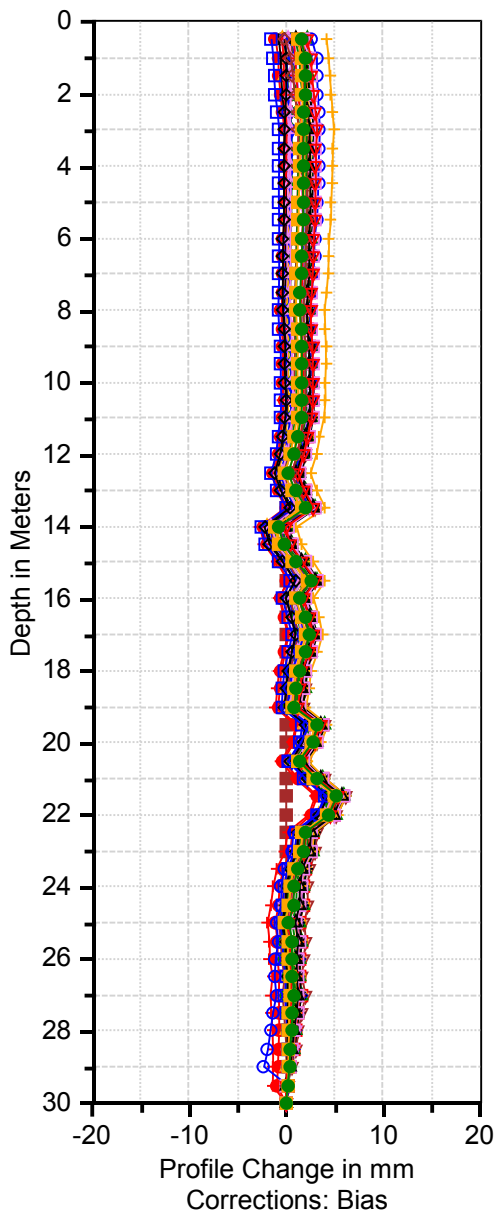
CLIENT: OSBORNE  
 SITE: HE551505 A417 Missing Link Ground Investigation - Phase 2A (1077)

DSRC207 A

DSRC207 B

- |              |              |              |
|--------------|--------------|--------------|
| ■ 21/06/2019 | ● 13/09/2019 | ▲ 18/10/2019 |
| ◆ 23/10/2019 | ▼ 01/11/2019 | ◇ 07/11/2019 |
| ⊕ 15/11/2019 | ⊖ 22/11/2019 | ⊗ 29/11/2019 |
| ⊙ 06/12/2019 | ○ 12/12/2019 | □ 19/12/2019 |
| △ 09/01/2020 | ◇ 17/01/2020 | ▽ 23/01/2020 |
| ■ 31/01/2020 | ● 24/02/2020 | ▲ 30/03/2020 |
| ◆ 09/04/2020 | ▼ 17/04/2020 | ◇ 24/04/2020 |
| ⊕ 30/04/2020 | ⊖ 07/05/2020 | ⊗ 19/05/2020 |
| ⊙ 26/05/2020 | ○ 05/06/2020 | □ 19/06/2020 |
| △ 25/06/2020 | ◇ 25/08/2020 | ▽ 24/09/2020 |
| ■ 28/10/2020 | ● 24/11/2020 |              |

- |              |              |              |
|--------------|--------------|--------------|
| ■ 21/06/2019 | ● 13/09/2019 | ▲ 18/10/2019 |
| ◆ 23/10/2019 | ▼ 01/11/2019 | ◇ 07/11/2019 |
| ⊕ 15/11/2019 | ⊖ 22/11/2019 | ⊗ 29/11/2019 |
| ⊙ 06/12/2019 | ○ 12/12/2019 | □ 19/12/2019 |
| △ 09/01/2020 | ◇ 17/01/2020 | ▽ 23/01/2020 |
| ■ 31/01/2020 | ● 24/02/2020 | ▲ 30/03/2020 |
| ◆ 09/04/2020 | ▼ 17/04/2020 | ◇ 24/04/2020 |
| ⊕ 30/04/2020 | ⊖ 07/05/2020 | ⊗ 19/05/2020 |
| ⊙ 26/05/2020 | ○ 05/06/2020 | □ 19/06/2020 |
| △ 25/06/2020 | ◇ 25/08/2020 | ▽ 24/09/2020 |
| ■ 28/10/2020 | ● 24/11/2020 |              |



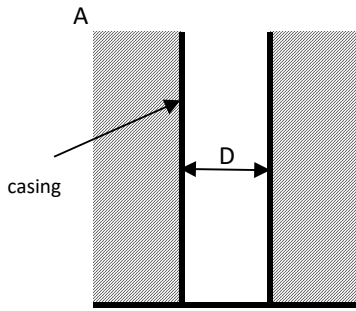


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# **APPENDIX D**

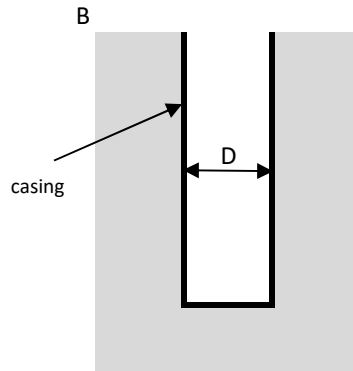
## **D3: PERMEABILITY TESTING**

# PERMEABILITY TEST - INTAKE FACTORS



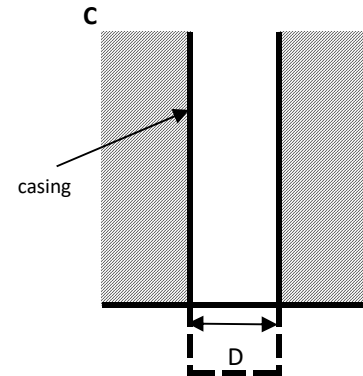
$$F=2D$$

Soil flush with bottom  
at impervious  
boundary



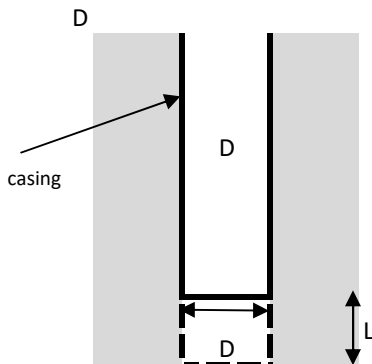
$$F=2.75D$$

Soil flush with bottom  
in uniform soil



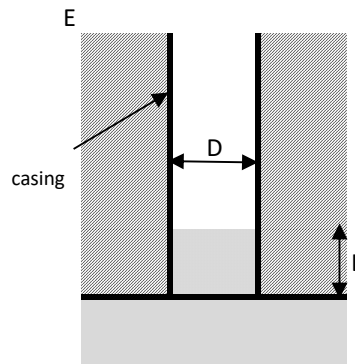
$$F = \frac{2\pi L}{\ln \left[ \frac{2L}{D} + \sqrt{1 + \left( \frac{2L}{D} \right)^2} \right]}$$

Well point or hole  
extended at impervious  
boundary



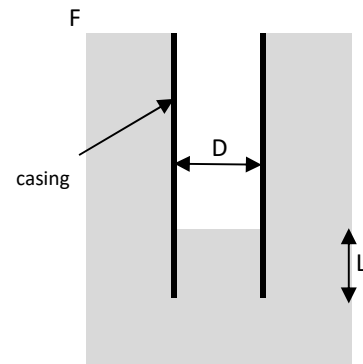
$$F = \frac{2\pi L}{\ln \left[ \frac{L}{D} + \sqrt{1 + (L/D)^2} \right]}$$

Well point or hole  
extended in uniform  
soil



$$F = \frac{2D}{1 + \left( \frac{8}{\pi} \right) \left( \frac{L}{D} \right)}$$

Soil in casing with  
bottom at impervious  
boundary



$$F = \frac{2.75D}{1 + \left( \frac{11}{\pi} \right) \left( \frac{L}{D} \right)}$$

Soil in casing with  
bottom in uniform soil

## REMARKS

Expressions come from Hvorslev.

BS EN ISO 22282-2:2012 recommends the use of intake factors given above for the Hvorslev method variable head test.

BS EN ISO 22282-2:2012 reports equation D as suitable for the Velocity method variable head test where  $1.2 < L/D < 10$ .

BS EN ISO 22282-2:2012 refers to a simpler version of Equation D for  $L/D > 10$ , however Equation D will still apply for  $L/D > 10$ .

Equation D may be used for tests using piezometer tips.

Cases A and B tend to measure the mean permeability of the soil; C and D the horizontal permeability; E and F the vertical permeability.

Where the horizontal permeability is much greater than the vertical, all tests tend to measure the former.

# PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT HIGHWAYS ENGLAND

BOREHOLE **DSRC109**

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A



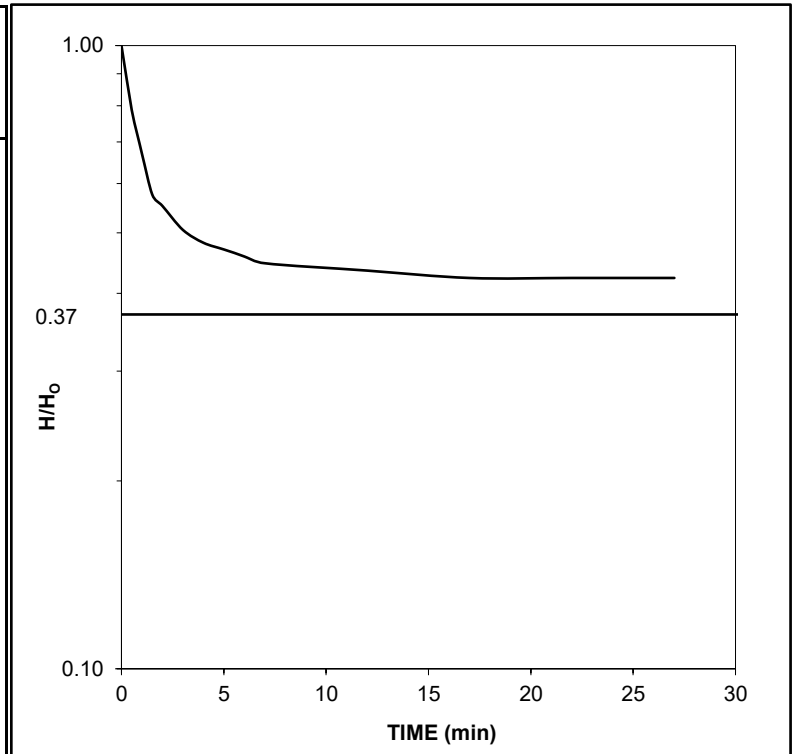
## Falling Head Test 1

### DEPTH RECORD

BASE OF FILTER	21.00 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	2.50 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	18.50 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	20.20 m*	DATE	18/11/2020

### TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H <sub>0</sub>
0.00	19.35	0.85	1.00
0.50	19.53	0.67	0.79
1.00	19.63	0.57	0.67
1.50	19.71	0.49	0.58
2.00	19.73	0.47	0.55
3.00	19.77	0.43	0.51
4.00	19.79	0.41	0.48
5.00	19.80	0.40	0.47
6.00	19.81	0.39	0.46
7.00	19.82	0.38	0.45
12.00	19.83	0.37	0.44
17.00	19.84	0.36	0.42
22.00	19.84	0.36	0.42
27.00	19.84	0.36	0.42



Hvorslev method 
$$k = \frac{A}{FT}$$

Velocity graph method 
$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case\*  D

### RESULTS

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m <sup>2</sup>	Cross sectional area of access tube, A	0.0020 m <sup>2</sup>
Intake factor*, F	m	Intake factor*, F	m
Time lag, T	0 s	Variable head, H <sub>1</sub>	0.00 m at time, t <sub>1</sub> 0 s
		Variable head, H <sub>2</sub>	0.00 m at time, t <sub>2</sub> 0 s
<b>Permeability, k</b>	-- ms <sup>-1</sup>	<b>Permeability, k</b>	-- ms <sup>-1</sup>

### REMARKS

\*Measured water level (20.20m bgl) is within sump (20.00-20.50m bgl) at base of well.  
100 litres water added.

Unable to determine intake factor, test within slotted section and above water level.

\* See intake factors key sheet

Test Operator: BT

CONTRACT	CHECKED
<b>35560</b>	<b>JH</b>

BT, BT

# PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT HIGHWAYS ENGLAND

BOREHOLE **DSRC109**

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A



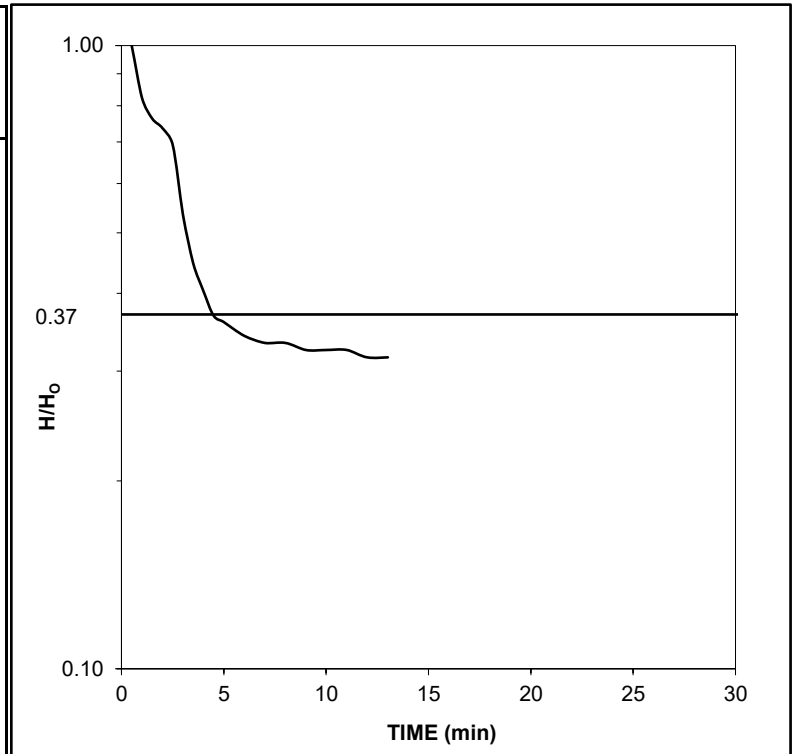
## Falling Head Test 2

### DEPTH RECORD

BASE OF FILTER	21.00 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	2.50 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	18.50 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	
DEPTH TO STANDING WATER BELOW DATUM	20.20 m*	DATE	18/11/2020

### TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H <sub>0</sub>
0.50	19.06	1.14	1.00
1.00	19.26	0.94	0.82
1.50	19.33	0.87	0.76
2.00	19.36	0.84	0.74
2.50	19.41	0.79	0.69
3.00	19.59	0.61	0.54
3.50	19.69	0.51	0.45
4.00	19.74	0.46	0.40
4.50	19.78	0.42	0.37
5.00	19.79	0.41	0.36
6.00	19.81	0.39	0.34
7.00	19.82	0.38	0.33
8.00	19.82	0.38	0.33
9.00	19.83	0.37	0.32
10.00	19.83	0.37	0.32
11.00	19.83	0.37	0.32
12.00	19.84	0.36	0.32
13.00	19.84	0.36	0.32



Hvorslev method 
$$k = \frac{A}{FT}$$

Velocity graph method 
$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case\*  D

### RESULTS

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m <sup>2</sup>	Cross sectional area of access tube, A	0.0020 m <sup>2</sup>
Intake factor*, F	m	Intake factor*, F	m
Time lag, T	0 s	Variable head, H <sub>1</sub>	0.00 m at time, t <sub>1</sub> 0 s
		Variable head, H <sub>2</sub>	0.00 m at time, t <sub>2</sub> 0 s
<b>Permeability, k</b>	-- ms <sup>-1</sup>	<b>Permeability, k</b>	-- ms <sup>-1</sup>

### REMARKS

\*Measured water level (20.20m bgl) is within sump (20.00-20.50m bgl) at base of well.  
100 litres water added.

Unable to determine intake factor, test within slotted section and above water level.

\* See intake factors key sheet

Test Operator: BT

CONTRACT	CHECKED
<b>35560</b>	<b>JH</b>

BT BT



# PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT HIGHWAYS ENGLAND

BOREHOLE **DSRC109**

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A



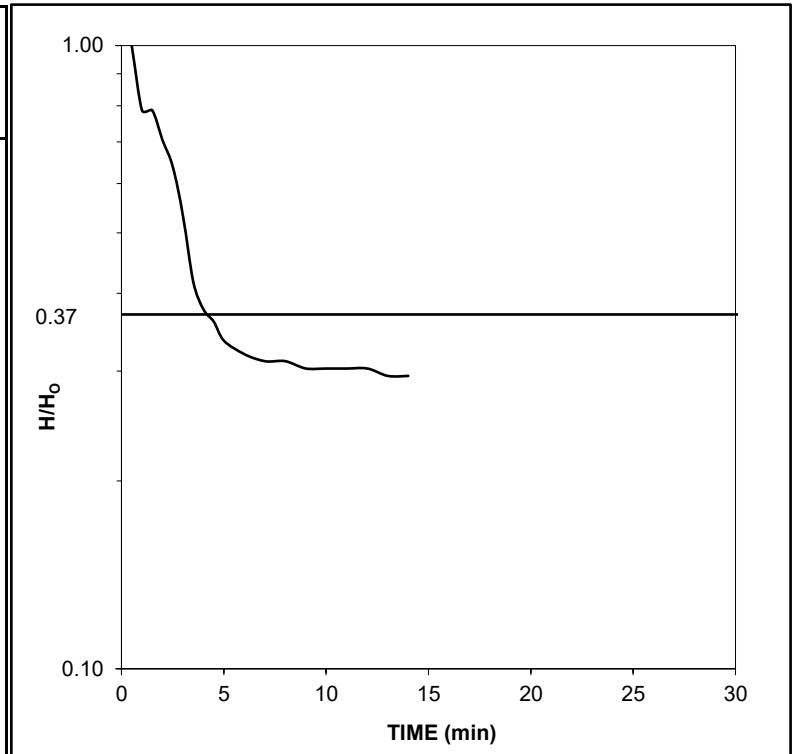
## Falling Head Test 3

### DEPTH RECORD

BASE OF FILTER	21.00 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	2.50 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	18.50 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	
DEPTH TO STANDING WATER BELOW DATUM	20.20 m*	DATE	18/11/2020

### TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H <sub>0</sub>
0.50	18.98	1.22	1.00
1.00	19.24	0.96	0.79
1.50	19.24	0.96	0.79
2.00	19.34	0.86	0.70
2.50	19.42	0.78	0.64
3.00	19.55	0.65	0.53
3.50	19.69	0.51	0.42
4.00	19.74	0.46	0.38
4.50	19.76	0.44	0.36
5.00	19.79	0.41	0.34
6.00	19.81	0.39	0.32
7.00	19.82	0.38	0.31
8.00	19.82	0.38	0.31
9.00	19.83	0.37	0.30
10.00	19.83	0.37	0.30
11.00	19.83	0.37	0.30
12.00	19.83	0.37	0.30
13.00	19.84	0.36	0.30
14.00	19.84	0.36	0.30



Hvorslev method

$$k = \frac{A}{FT}$$

Velocity graph method

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case\*  D

### RESULTS

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m <sup>2</sup>	Cross sectional area of access tube, A	0.0020 m <sup>2</sup>
Intake factor*, F	m	Intake factor*, F	m
Time lag, T	0 s	Variable head, H <sub>1</sub>	0.00 m at time, t <sub>1</sub> 0 s
		Variable head, H <sub>2</sub>	0.00 m at time, t <sub>2</sub> 0 s
<b>Permeability, k</b>	-- ms <sup>-1</sup>	<b>Permeability, k</b>	-- ms <sup>-1</sup>

### REMARKS

\*Measured water level (20.20m bgl) is within sump (20.00-20.50m bgl) at base of well.  
100 litres water added.

Unable to determine intake factor, test within slotted section and above water level.

\* See intake factors key sheet

Test Operator: BT

CONTRACT	CHECKED
<b>35560</b>	<b>JH</b>

BT, BT

# PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012



CLIENT HIGHWAYS ENGLAND

BOREHOLE **DSRC218**

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A

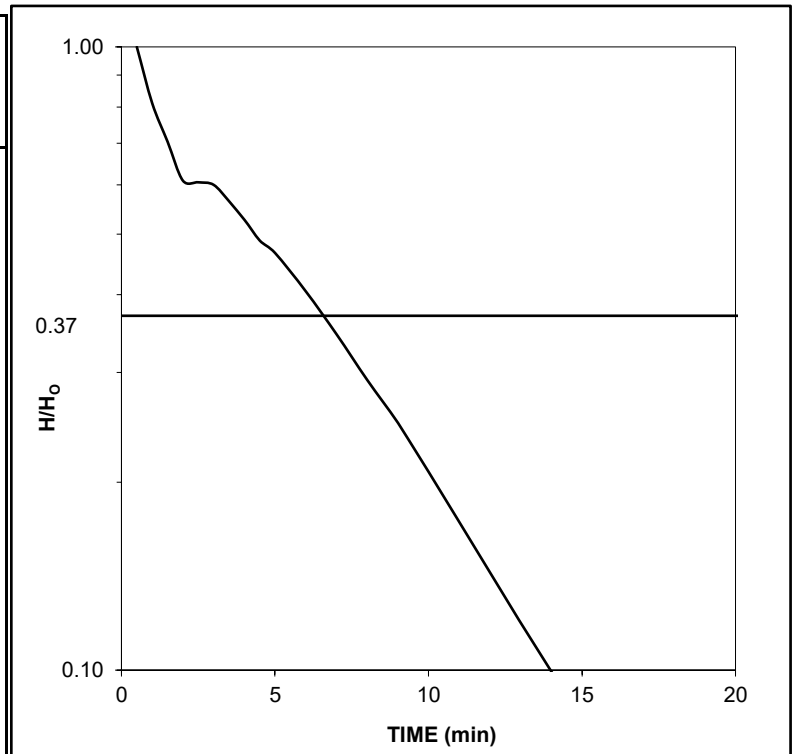
**Falling Head Test 1**

**DEPTH RECORD**

BASE OF FILTER	15.50 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	2.00 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	13.50 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.18 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	6.99 m	DATE	16/11/2020

**TEST RECORD**

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H <sub>0</sub>
0.50	1.61	5.38	1.00
1.00	2.62	4.37	0.81
1.50	3.20	3.79	0.70
2.00	3.71	3.28	0.61
2.50	3.73	3.26	0.61
3.00	3.76	3.23	0.60
3.50	3.95	3.04	0.57
4.00	4.15	2.84	0.53
4.50	4.36	2.63	0.49
5.00	4.48	2.51	0.47
6.00	4.81	2.18	0.41
7.00	5.13	1.86	0.35
8.00	5.42	1.57	0.29
9.00	5.65	1.34	0.25
10.00	5.87	1.12	0.21
15.00	6.54	0.45	0.08
20.00	6.78	0.21	0.04
25.00	6.86	0.13	0.02
30.00	6.90	0.09	0.02



Hvorslev method

$$k = \frac{A}{FT}$$

Velocity graph method

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case\*  D

**RESULTS**

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m <sup>2</sup>	Cross sectional area of access tube, A	0.0020 m <sup>2</sup>
Intake factor*, F	m	Intake factor*, F	m
Time lag, T	0 s	Variable head, H <sub>1</sub>	0.00 m at time, t <sub>1</sub> 0 s
		Variable head, H <sub>2</sub>	0.00 m at time, t <sub>2</sub> 0 s
<b>Permeability, k</b>	-- ms <sup>-1</sup>	<b>Permeability, k</b>	-- ms <sup>-1</sup>

**REMARKS**

100 litres water added.  
Unable to determine intake factor, test within slotted section.

Test Operator: BT

CONTRACT	CHECKED
<b>35560</b>	<b>JH</b>

\* See intake factors key sheet

# PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012



CLIENT HIGHWAYS ENGLAND

BOREHOLE **DSRC218**

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A

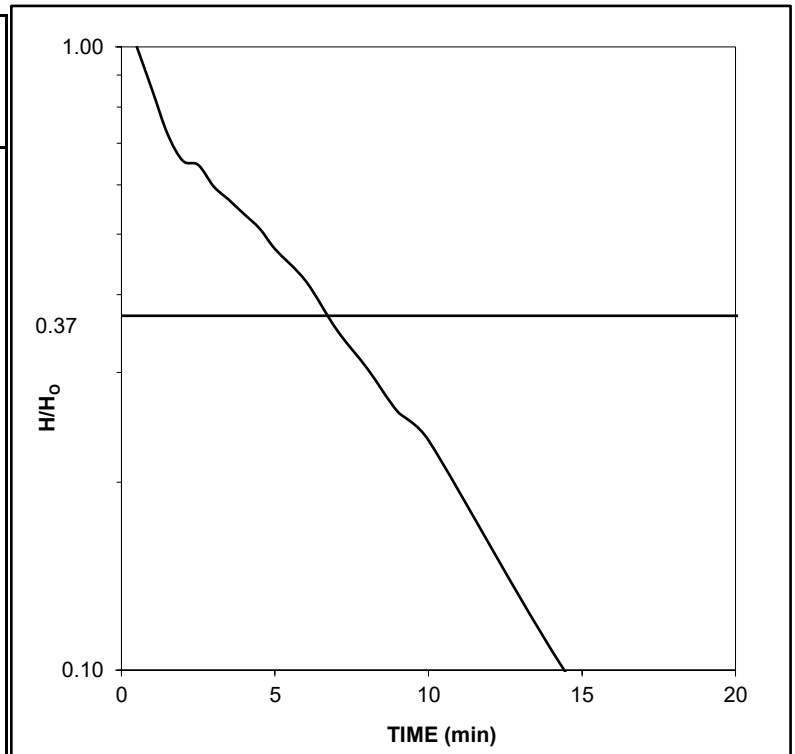
**Falling Head Test 2**

**DEPTH RECORD**

BASE OF FILTER	15.50 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	2.00 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	13.50 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.18 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	6.99 m	DATE	16/11/2020

**TEST RECORD**

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H <sub>0</sub>
0.50	1.90	5.09	1.00
1.00	2.65	4.34	0.85
1.50	3.30	3.69	0.72
2.00	3.65	3.34	0.66
2.50	3.70	3.29	0.65
3.00	3.95	3.04	0.60
3.50	4.10	2.89	0.57
4.00	4.25	2.74	0.54
4.50	4.39	2.60	0.51
5.00	4.58	2.41	0.47
6.00	4.85	2.14	0.42
7.00	5.20	1.79	0.35
8.00	5.44	1.55	0.30
9.00	5.67	1.32	0.26
10.00	5.80	1.19	0.23
15.00	6.53	0.46	0.09
20.00	6.76	0.23	0.05
25.00	6.86	0.13	0.03
30.00	6.87	0.12	0.02



Hvorslev method 
$$k = \frac{A}{FT}$$

Velocity graph method 
$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case\*  D

**RESULTS**

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m <sup>2</sup>	Cross sectional area of access tube, A	0.0020 m <sup>2</sup>
Intake factor*, F	m	Intake factor*, F	m
Time lag, T	0 s	Variable head, H <sub>1</sub>	0.00 m at time, t <sub>1</sub> 0 s
		Variable head, H <sub>2</sub>	0.00 m at time, t <sub>2</sub> 0 s
<b>Permeability, k</b>	-- ms <sup>-1</sup>	<b>Permeability, k</b>	-- ms <sup>-1</sup>

**REMARKS** Test Operator: BT  
 100 litres water added.  
 Unable to determine intake factor, test within slotted section.

CONTRACT	CHECKED
<b>35560</b>	<b>JH</b>

\* See intake factors key sheet

# PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT HIGHWAYS ENGLAND

BOREHOLE **DSRC218**

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A

**Rising Head Test 1**

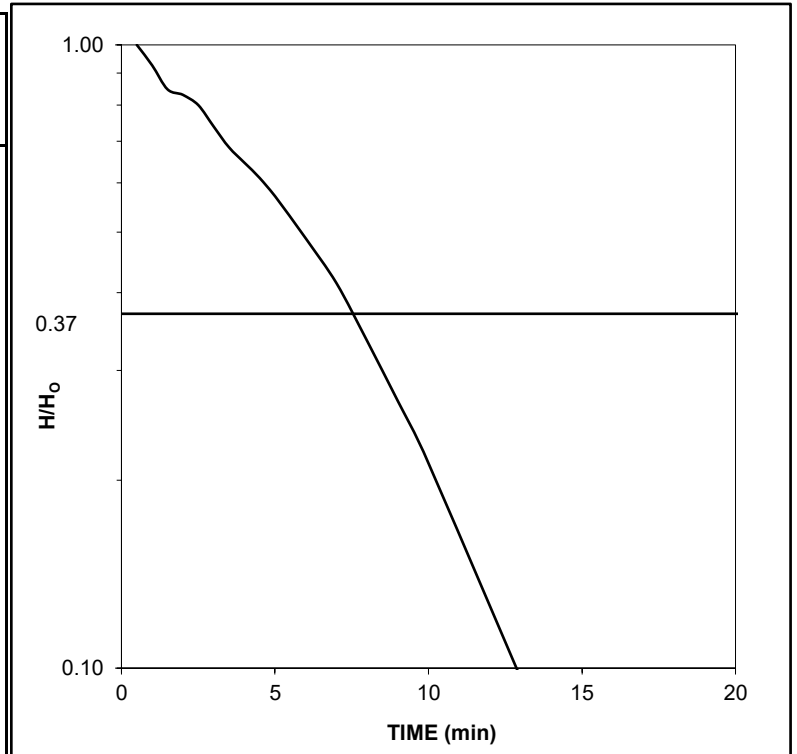


**DEPTH RECORD**

BASE OF FILTER	15.50 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	2.00 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	13.50 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.18 m	TYPE OF TEST	RISING
DEPTH TO STANDING WATER BELOW DATUM	6.99 m	DATE	16/11/2020

**TEST RECORD**

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H <sub>0</sub>
0.50	14.50	7.51	1.00
1.00	13.95	6.96	0.93
1.50	13.36	6.37	0.85
2.00	13.23	6.24	0.83
2.50	13.00	6.01	0.80
3.00	12.54	5.55	0.74
3.50	12.13	5.14	0.68
4.00	11.85	4.86	0.65
4.50	11.58	4.59	0.61
5.00	11.28	4.29	0.57
6.00	10.66	3.67	0.49
7.00	10.10	3.11	0.41
8.00	9.50	2.51	0.33
9.00	9.00	2.01	0.27
10.00	8.59	1.60	0.21
15.00	7.41	0.42	0.06
20.00	7.09	0.10	0.01
25.00	7.02	0.03	0.00
30.00	7.00	0.01	0.00



Hvorslev method 
$$k = \frac{A}{FT}$$

Velocity graph method 
$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case\*  D

**RESULTS**

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m <sup>2</sup>	Cross sectional area of access tube, A	0.0020 m <sup>2</sup>
Intake factor*, F	m	Intake factor*, F	m
Time lag, T	0 s	Variable head, H <sub>1</sub>	0.00 m at time, t <sub>1</sub> 0 s
		Variable head, H <sub>2</sub>	0.00 m at time, t <sub>2</sub> 0 s
<b>Permeability, k</b>	-- ms <sup>-1</sup>	<b>Permeability, k</b>	-- ms <sup>-1</sup>

**REMARKS**

Water removed using MP1 submersible pump.  
 Unable to determine intake factor, test within slotted section.

Test Operator: BT

CONTRACT	CHECKED
<b>35560</b>	<b>JH</b>

\* See intake factors key sheet

# PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012



CLIENT HIGHWAYS ENGLAND

BOREHOLE **DSRC220**

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A

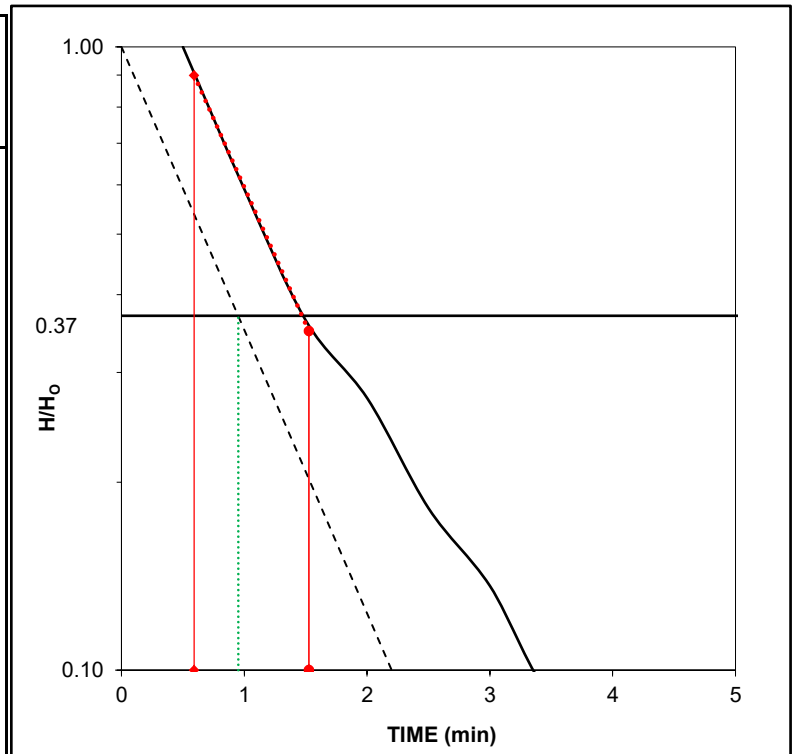
**Falling Head Test 1**

**DEPTH RECORD**

BASE OF FILTER	13.50 m	BOREHOLE DIAMETER IN TEST SECTION	0.14 m
TOP OF FILTER	3.00 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	10.50 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.24 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	1.78 m	DATE	17/11/2020

**TEST RECORD**

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H <sub>0</sub>
0.50	1.56	0.22	1.00
1.00	1.65	0.13	0.59
1.50	1.70	0.08	0.36
2.00	1.72	0.06	0.27
2.50	1.74	0.04	0.18
3.00	1.75	0.03	0.14
3.50	1.76	0.02	0.09
4.00	1.76	0.02	0.09
4.50	1.77	0.01	0.05
5.00	1.77	0.01	0.05
6.00	1.77	0.01	0.05
7.00	1.77	0.01	0.05
8.00	1.78	0.00	0.00
9.00	1.78	0.00	0.00
10.00	1.78	0.00	0.00
15.00	1.78	0.00	0.00
20.00	1.78	0.00	0.00
25.00	1.78	0.00	0.00
30.00	1.78	0.00	0.00



Hvorslev method 
$$k = \frac{A}{FT}$$

Velocity graph method 
$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case\*  D

**RESULTS**

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m <sup>2</sup>	Cross sectional area of access tube, A	0.0020 m <sup>2</sup>
Intake factor*, F	13.167 m	Intake factor*, F	13.167 m
Time lag, T	57 s	Variable head, H <sub>1</sub>	0.20 m at time, t <sub>1</sub> 35.4 s
		Variable head, H <sub>2</sub>	0.08 m at time, t <sub>2</sub> 91.5 s
<b>Permeability, k</b>	<b>2.6E-06 ms<sup>-1</sup></b>	<b>Permeability, k</b>	<b>2.5E-06 ms<sup>-1</sup></b>

**REMARKS**

100 litres water added.

Test Operator: BT

CONTRACT	CHECKED
<b>35560</b>	<b>JH</b>

\* See intake factors key sheet

# PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT HIGHWAYS ENGLAND

BOREHOLE **DSRC220**

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A



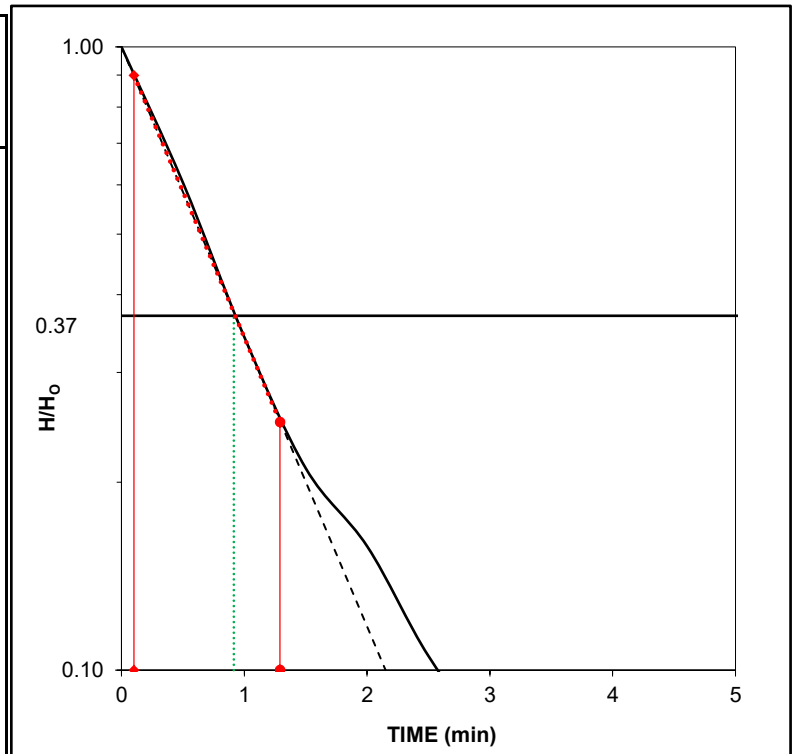
## Falling Head Test 2

### DEPTH RECORD

BASE OF FILTER	13.50 m	BOREHOLE DIAMETER IN TEST SECTION	0.14 m
TOP OF FILTER	3.00 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	10.50 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.24 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	1.78 m	DATE	17/11/2020

### TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H <sub>0</sub>
0.00	1.40	0.38	1.00
0.50	1.55	0.23	0.61
1.00	1.65	0.13	0.34
1.50	1.70	0.08	0.21
2.00	1.72	0.06	0.16
2.50	1.74	0.04	0.11
3.00	1.75	0.03	0.08
3.50	1.75	0.03	0.08
4.00	1.76	0.02	0.05
4.50	1.76	0.02	0.05
5.00	1.76	0.02	0.05
6.00	1.77	0.01	0.03
7.00	1.77	0.01	0.03
8.00	1.77	0.01	0.03
9.00	1.77	0.01	0.03
10.00	1.77	0.01	0.03
15.00	1.78	0.00	0.00
20.00	1.78	0.00	0.00
25.00	1.78	0.00	0.00
30.00	1.78	0.00	0.00



Hvorslev method 
$$k = \frac{A}{FT}$$

Velocity graph method 
$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case\*  D

### RESULTS

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m <sup>2</sup>	Cross sectional area of access tube, A	0.0020 m <sup>2</sup>
Intake factor*, F	13.167 m	Intake factor*, F	13.167 m
Time lag, T	54.9 s	Variable head, H <sub>1</sub>	0.34 m at time, t <sub>1</sub> 6 s
		Variable head, H <sub>2</sub>	0.10 m at time, t <sub>2</sub> 77.4 s
<b>Permeability, k</b>	<b>2.7E-06 ms<sup>-1</sup></b>	<b>Permeability, k</b>	<b>2.7E-06 ms<sup>-1</sup></b>

### REMARKS

100 litres water added.

Test Operator: BT

CONTRACT	CHECKED
<b>35560</b>	<b>JH</b>

BT, BT \* See intake factors key sheet

# PERMEABILITY TEST - VARIABLE HEAD



BS EN ISO 22282-2:2012

CLIENT HIGHWAYS ENGLAND

BOREHOLE **DSRC220**

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A

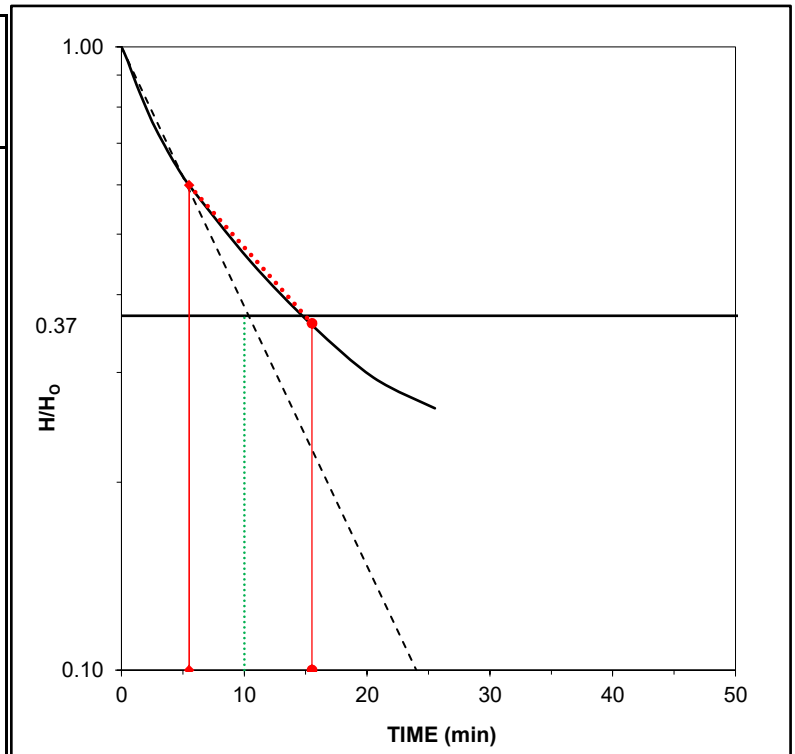
**Rising Head Test 1**

**DEPTH RECORD**

BASE OF FILTER	13.50 m	BOREHOLE DIAMETER IN TEST SECTION	0.14 m
TOP OF FILTER	3.00 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	10.50 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.24 m	TYPE OF TEST	RISING
DEPTH TO STANDING WATER BELOW DATUM	1.78 m	DATE	17/11/2020

**TEST RECORD**

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H <sub>0</sub>
0	2.73	0.95	1.00
0.5	2.68	0.90	0.95
1.5	2.58	0.80	0.84
2.5	2.50	0.72	0.76
3.5	2.44	0.66	0.69
4.5	2.39	0.61	0.64
5.5	2.35	0.57	0.60
10.5	2.21	0.43	0.45
15.5	2.12	0.34	0.36
20.5	2.06	0.28	0.29
25.5	2.03	0.25	0.26



Hvorslev method 
$$k = \frac{A}{FT}$$

Velocity graph method 
$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case\*  D

**RESULTS**

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m <sup>2</sup>	Cross sectional area of access tube, A	0.0020 m <sup>2</sup>
Intake factor*, F	13.167 m	Intake factor*, F	13.167 m
Time lag, T	600 s	Variable head, H <sub>1</sub>	0.57 m at time, t <sub>1</sub> 330 s
		Variable head, H <sub>2</sub>	0.34 m at time, t <sub>2</sub> 930 s
<b>Permeability, k</b>	<b>2.5E-07 ms<sup>-1</sup></b>	<b>Permeability, k</b>	<b>1.3E-07 ms<sup>-1</sup></b>

REMARKS Test Operator: BT

CONTRACT	CHECKED
<b>35560</b>	<b>JH</b>

BT, BT \* See intake factors key sheet

# PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012



CLIENT HIGHWAYS ENGLAND

BOREHOLE **DSRC301**

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A

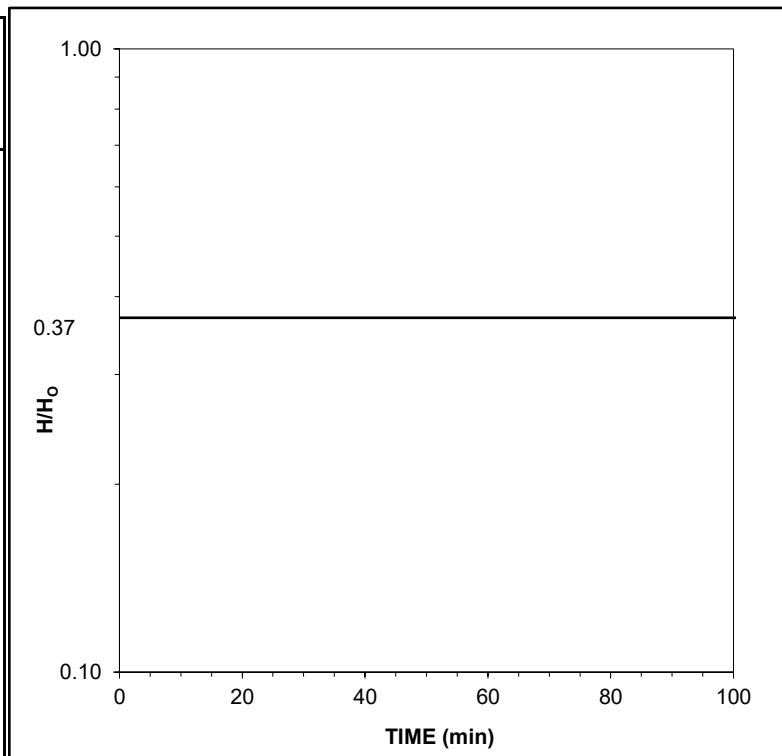
**Falling Head Test 1**

**DEPTH RECORD**

BASE OF FILTER	29.50 m	BOREHOLE DIAMETER IN TEST SECTION	0.17 m
TOP OF FILTER	7.40 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	22.10 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	-0.10 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	28.20 m	DATE	18/11/2020

**TEST RECORD**

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H <sub>0</sub>
4.50	26.22		
5.00	26.17		
6.00	26.04		
7.00	26.00		
8.00	25.97		
9.00	25.95		
10.00	25.92		
15.00	25.88		
20.00	25.85		
25.00	25.83		
30.00	25.82		
40.00	25.81		
50.00	25.81		
60.00	25.81		



Hvorslev method

$$k = \frac{A}{FT}$$

Velocity graph method

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case\*  D

**RESULTS**

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m <sup>2</sup>	Cross sectional area of access tube, A	0.0020 m <sup>2</sup>
Intake factor*, F	m	Intake factor*, F	m
Time lag, T	0 s	Variable head, H <sub>1</sub>	0.00 m at time, t <sub>1</sub> 0 s
		Variable head, H <sub>2</sub>	0.00 m at time, t <sub>2</sub> 0 s
<b>Permeability, k</b>	<b>-- ms<sup>-1</sup></b>	<b>Permeability, k</b>	<b>-- ms<sup>-1</sup></b>

**REMARKS**

Measured water level (28.20m bgl) is close to sump (29.00-28.50m bgl) at base of well.  
 100 litres of water added, water level rising, records likely show drainage of filter pack.  
 Unable to determine intake factor, test within slotted section.

Test Operator: BT

CONTRACT	CHECKED
<b>35560</b>	<b>JH</b>

\* See intake factors key sheet

BT, BT



# PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT HIGHWAYS ENGLAND

BOREHOLE **DSRC301**

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A



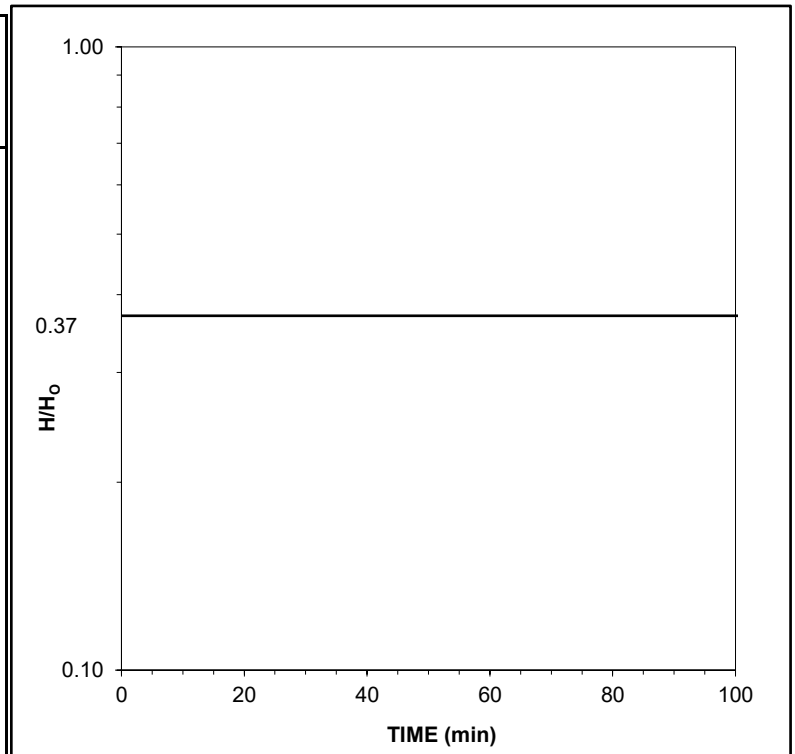
## Falling Head Test 2

### DEPTH RECORD

BASE OF FILTER	29.50 m	BOREHOLE DIAMETER IN TEST SECTION	0.17 m
TOP OF FILTER	7.40 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	22.10 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	-0.10 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	28.20 m	DATE	18/11/2020

### TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H <sub>0</sub>
0.50	25.87		
1.00	25.65		
1.50	25.53		
2.00	25.44		
2.50	25.37		
3.00	25.31		
3.50	25.27		
4.00	25.24		
4.50	25.23		
5.00	25.21		
6.00	25.19		
7.00	25.18		
8.00	25.17		
9.00	25.16		
10.00	25.15		
15.00	25.14		
20.00	25.13		
25.00	25.13		
30.00	25.14		



Hvorslev method

$$k = \frac{A}{FT}$$

Velocity graph method

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case\*  D

### RESULTS

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m <sup>2</sup>	Cross sectional area of access tube, A	0.0020 m <sup>2</sup>
Intake factor*, F	24.918 m	Intake factor*, F	24.918 m
Time lag, T	0 s	Variable head, H <sub>1</sub>	0.00 m at time, t <sub>1</sub> 0 s
		Variable head, H <sub>2</sub>	0.00 m at time, t <sub>2</sub> 0 s
<b>Permeability, k</b>	<b>-- ms<sup>-1</sup></b>	<b>Permeability, k</b>	<b>-- ms<sup>-1</sup></b>

### REMARKS

Measured water level 25.81m bgl prior to addition of water.  
 100 litres of water added, water level rising, records likely show drainage of filter pack.  
 Unable to determine intake factor, test within slotted section.

\* See intake factors key sheet

Test Operator: BT

CONTRACT	CHECKED
<b>35560</b>	<b>JH</b>

BT, BT

# PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT HIGHWAYS ENGLAND

BOREHOLE **DSRC302**

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A



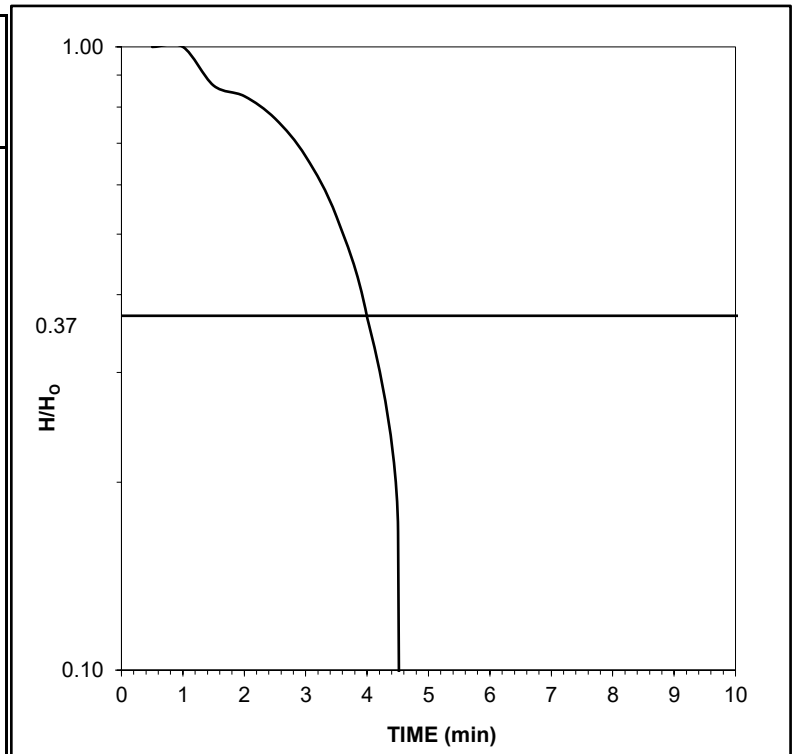
## Falling Head Test 1

### DEPTH RECORD

BASE OF FILTER	26.50 m	BOREHOLE DIAMETER IN TEST SECTION	0.15 m
TOP OF FILTER	15.00 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	11.50 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	25.92 m	DATE	18/11/2020

### TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	$\frac{H}{H_0}$
0.50	25.62	0.30	1.00
1.00	25.62	0.30	1.00
1.50	25.66	0.26	0.87
2.00	25.67	0.25	0.83
2.50	25.69	0.23	0.77
3.00	25.72	0.20	0.67
3.50	25.76	0.16	0.53
4.00	25.81	0.11	0.37
4.50	25.87	0.05	0.17
5.00	25.92	0.00	0.00



Hvorslev method

$$k = \frac{A}{FT}$$

Velocity graph method

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case\*  D

### RESULTS

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m <sup>2</sup>	Cross sectional area of access tube, A	0.0020 m <sup>2</sup>
Intake factor*, F	m	Intake factor*, F	m
Time lag, T	0 s	Variable head, H <sub>1</sub>	0.00 m at time, t <sub>1</sub> 0 s
		Variable head, H <sub>2</sub>	0.00 m at time, t <sub>2</sub> 0 s
<b>Permeability, k</b>	-- ms <sup>-1</sup>	<b>Permeability, k</b>	-- ms <sup>-1</sup>

### REMARKS

100 litres water added.  
Unable to determine intake factor, test within slotted section.

Test Operator: BT

CONTRACT	CHECKED
<b>35560</b>	<b>JH</b>

\* See intake factors key sheet

BT/BT

# PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT HIGHWAYS ENGLAND

BOREHOLE **DSRC302**

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A



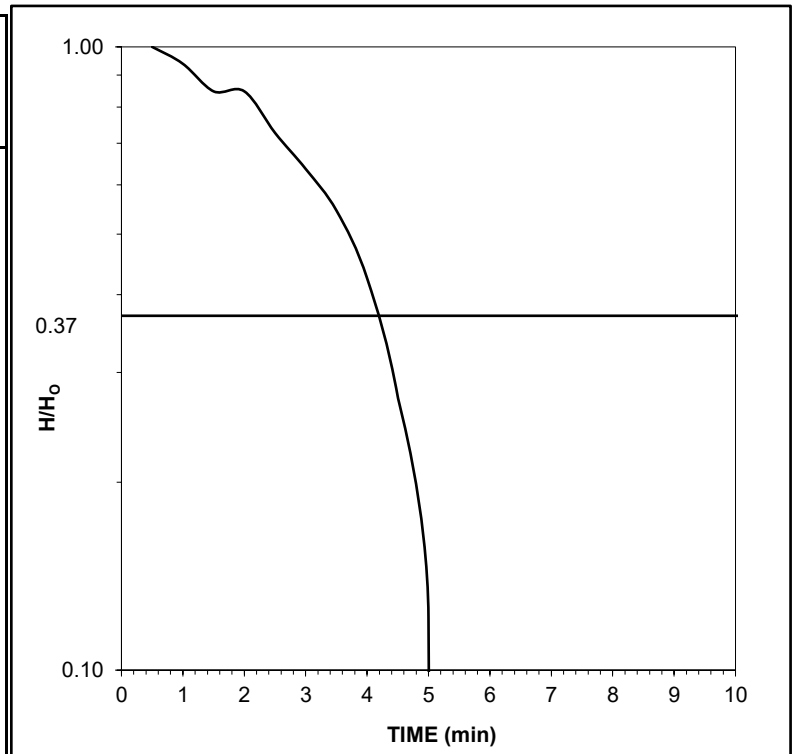
## Falling Head Test 2

### DEPTH RECORD

BASE OF FILTER	26.50 m	BOREHOLE DIAMETER IN TEST SECTION	0.14 m
TOP OF FILTER	15.00 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	11.50 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	25.92 m	DATE	18/11/2020

### TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H <sub>0</sub>
0.50	25.59	0.33	1.00
1.00	25.61	0.31	0.94
1.50	25.64	0.28	0.85
2.00	25.64	0.28	0.85
2.50	25.68	0.24	0.73
3.00	25.71	0.21	0.64
3.50	25.74	0.18	0.55
4.00	25.78	0.14	0.42
4.50	25.83	0.09	0.27
5.00	25.88	0.04	0.12
5.50	25.92	0.00	0.00



Hvorslev method

$$k = \frac{A}{FT}$$

Velocity graph method

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case\*  D

### RESULTS

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m <sup>2</sup>	Cross sectional area of access tube, A	0.0020 m <sup>2</sup>
Intake factor*, F	m	Intake factor*, F	m
Time lag, T	0 s	Variable head, H <sub>1</sub>	0.00 m at time, t <sub>1</sub> 0 s
		Variable head, H <sub>2</sub>	0.00 m at time, t <sub>2</sub> 0 s
<b>Permeability, k</b>	-- ms <sup>-1</sup>	<b>Permeability, k</b>	-- ms <sup>-1</sup>

### REMARKS

100 litres water added.  
Unable to determine intake factor, test within slotted section.

Test Operator: BT

CONTRACT	CHECKED
<b>35560</b>	<b>JH</b>

\* See intake factors key sheet

BT/BT

# PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT HIGHWAYS ENGLAND

BOREHOLE **DSRC302**

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A



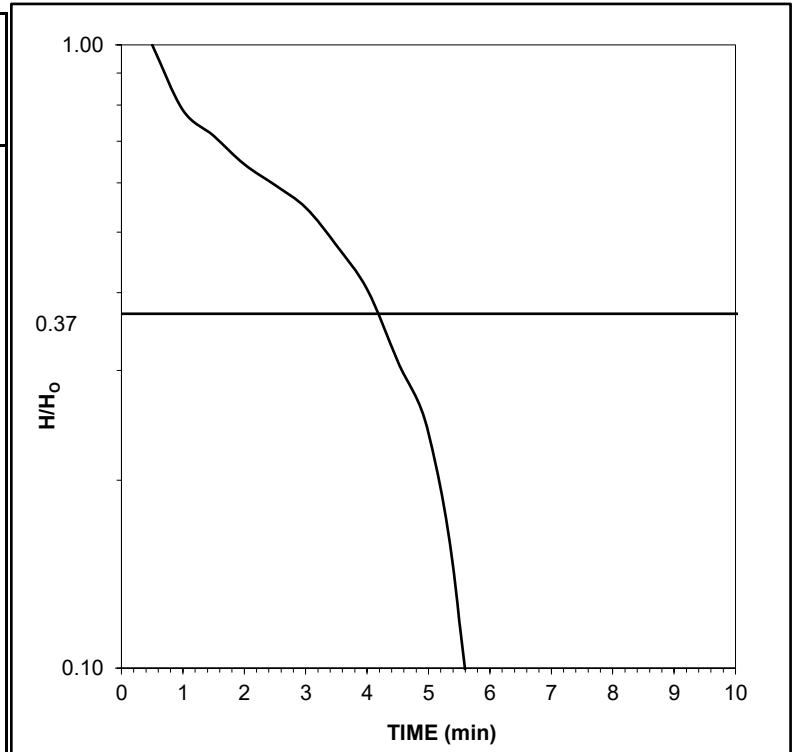
## Falling Head Test 3

### DEPTH RECORD

BASE OF FILTER	26.50 m	BOREHOLE DIAMETER IN TEST SECTION	0.14 m
TOP OF FILTER	15.00 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	11.50 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.00 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	25.92 m	DATE	18/11/2020

### TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	$\frac{H}{H_0}$
0.50	25.50	0.42	1.00
1.00	25.59	0.33	0.79
1.50	25.62	0.30	0.71
2.00	25.65	0.27	0.64
2.50	25.67	0.25	0.60
3.00	25.69	0.23	0.55
3.50	25.72	0.20	0.48
4.00	25.75	0.17	0.40
4.50	25.79	0.13	0.31
5.00	25.82	0.10	0.24
5.50	25.87	0.05	0.12
6.00	25.91	0.01	0.02
6.50	25.92	0.00	0.00



Hvorslev method

$$k = \frac{A}{FT}$$

Velocity graph method

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case\*  D

### RESULTS

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m <sup>2</sup>	Cross sectional area of access tube, A	0.0020 m <sup>2</sup>
Intake factor*, F	m	Intake factor*, F	m
Time lag, T	0 s	Variable head, H <sub>1</sub>	0.00 m at time, t <sub>1</sub> 0 s
		Variable head, H <sub>2</sub>	0.00 m at time, t <sub>2</sub> 0 s
<b>Permeability, k</b>	-- ms <sup>-1</sup>	<b>Permeability, k</b>	-- ms <sup>-1</sup>

### REMARKS

100 litres water added.  
Unable to determine intake factor, test within slotted section.

Test Operator: BT

CONTRACT	CHECKED
<b>35560</b>	<b>JH</b>

\* See intake factors key sheet

BT/BT

# PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012



CLIENT HIGHWAYS ENGLAND

BOREHOLE **DSRC317**

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A

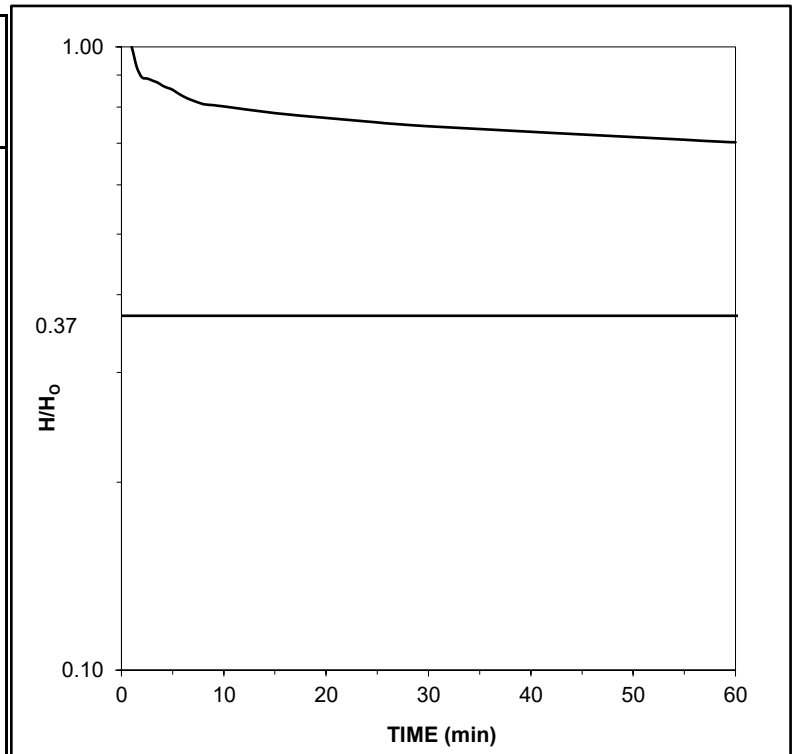
## Falling Head Test 1

### DEPTH RECORD

BASE OF FILTER	4.30 m	BOREHOLE DIAMETER IN TEST SECTION	0.17 m
TOP OF FILTER	1.00 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	3.30 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.22 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	3.47 m	DATE	16/11/2020

### TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	$\frac{H}{H_0}$
1.00	0.48	2.99	1.00
1.50	0.70	2.77	0.93
2.00	0.80	2.67	0.89
2.50	0.81	2.66	0.89
3.00	0.83	2.64	0.88
3.50	0.85	2.62	0.88
4.00	0.88	2.59	0.87
4.50	0.90	2.57	0.86
5.00	0.92	2.55	0.85
6.00	0.98	2.49	0.83
7.00	1.02	2.45	0.82
8.00	1.05	2.42	0.81
9.00	1.06	2.41	0.81
10.00	1.07	2.40	0.80
15.00	1.13	2.34	0.78
20.00	1.17	2.30	0.77
25.00	1.21	2.26	0.76
30.00	1.24	2.23	0.75
55.00	1.35	2.12	0.71
60.00	1.37	2.10	0.70



Hvorslev method

$$k = \frac{A}{FT}$$

Velocity graph method

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case\*  D

### RESULTS

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m <sup>2</sup>	Cross sectional area of access tube, A	0.0020 m <sup>2</sup>
Intake factor*, F	m	Intake factor*, F	m
Time lag, T	0 s	Variable head, H <sub>1</sub>	0.00 m at time, t <sub>1</sub> 0 s
		Variable head, H <sub>2</sub>	0.00 m at time, t <sub>2</sub> 0 s
<b>Permeability, k</b>	-- ms <sup>-1</sup>	<b>Permeability, k</b>	-- ms <sup>-1</sup>

### REMARKS

Unable to determine intake factor, test within slotted section.

Test Operator: BT

CONTRACT	CHECKED
<b>35560</b>	<b>JH</b>

\* See intake factors key sheet

BT, BT

# PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012



CLIENT HIGHWAYS ENGLAND

BOREHOLE **DSRC401**

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A

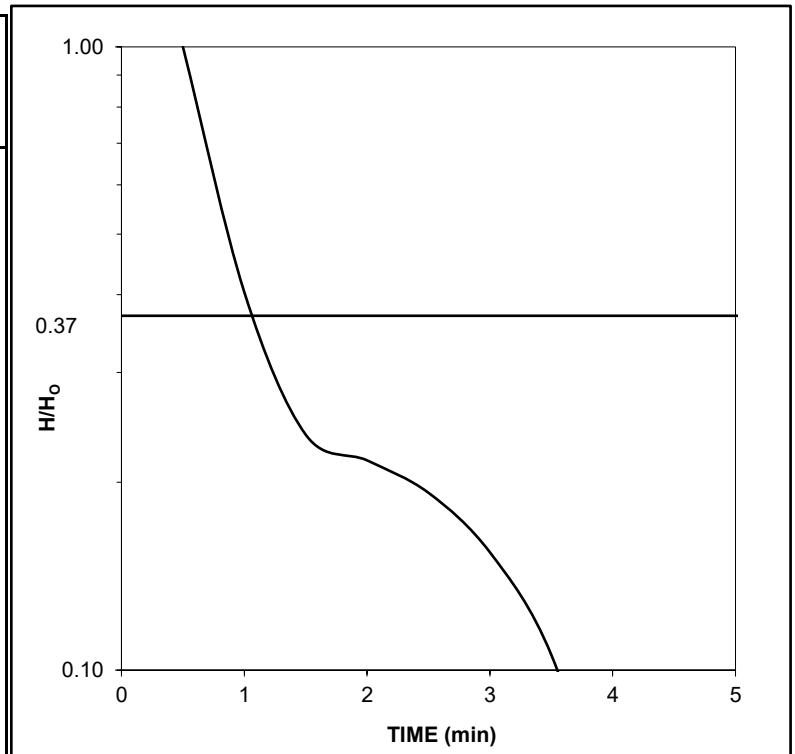
**Falling Head Test 1**

**DEPTH RECORD**

BASE OF FILTER	8.70 m	BOREHOLE DIAMETER IN TEST SECTION	0.17 m
TOP OF FILTER	4.80 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	3.90 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.10 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	6.59 m	DATE	17/11/2020

**TEST RECORD**

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H <sub>0</sub>
0.50	2.90	3.69	1.00
1.00	5.10	1.49	0.40
1.50	5.71	0.88	0.24
2.00	5.79	0.80	0.22
2.50	5.88	0.71	0.19
3.00	6.02	0.57	0.15
3.50	6.20	0.39	0.11
4.00	6.40	0.19	0.05
4.50	6.50	0.09	0.02
5.00	6.52	0.07	0.02
6.00	6.53	0.06	0.02
7.00	6.54	0.05	0.01
8.00	6.54	0.05	0.01
9.00	6.54	0.05	0.01
10.00	6.54	0.05	0.01
15.00	6.54	0.05	0.01
20.00	6.54	0.05	0.01
25.00	6.55	0.04	0.01
30.00	6.55	0.04	0.01



Hvorslev method

$$k = \frac{A}{FT}$$

Velocity graph method

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case\*  D

**RESULTS**

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m <sup>2</sup>	Cross sectional area of access tube, A	0.0020 m <sup>2</sup>
Intake factor*, F	m	Intake factor*, F	m
Time lag, T	0 s	Variable head, H <sub>1</sub>	0.00 m at time, t <sub>1</sub> 0 s
		Variable head, H <sub>2</sub>	0.00 m at time, t <sub>2</sub> 0 s
<b>Permeability, k</b>	-- ms <sup>-1</sup>	<b>Permeability, k</b>	-- ms <sup>-1</sup>

**REMARKS**

Unable to determine intake factor, test within slotted section.

Test Operator: BT

CONTRACT	CHECKED
<b>35560</b>	<b>JH</b>

\* See intake factors key sheet

# PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012

CLIENT HIGHWAYS ENGLAND

BOREHOLE **DSRC401**

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A



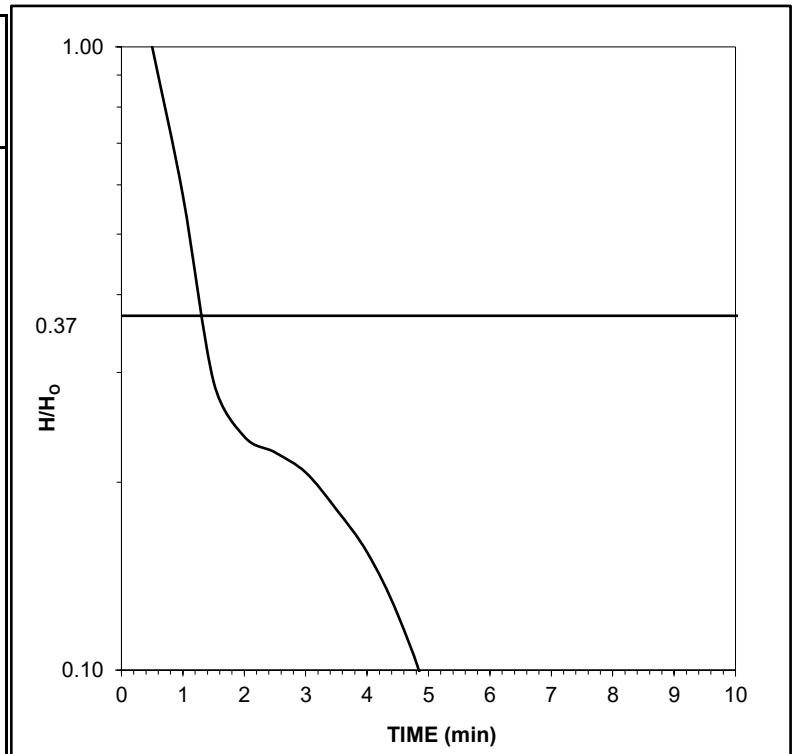
## Falling Head Test 2

### DEPTH RECORD

BASE OF FILTER	8.70 m	BOREHOLE DIAMETER IN TEST SECTION	0.17 m
TOP OF FILTER	4.80 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	3.90 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.10 m	TYPE OF TEST	FALLING
DEPTH TO STANDING WATER BELOW DATUM	6.59 m	DATE	17/11/2020

### TEST RECORD

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H <sub>0</sub>
0.50	2.83	3.76	1.00
1.00	4.42	2.17	0.58
1.50	5.50	1.09	0.29
2.00	5.70	0.89	0.24
2.50	5.75	0.84	0.22
3.00	5.81	0.78	0.21
3.50	5.91	0.68	0.18
4.00	6.01	0.58	0.15
4.50	6.13	0.46	0.12
5.00	6.26	0.33	0.09
6.00	6.48	0.11	0.03
7.00	6.49	0.10	0.03
8.00	6.50	0.09	0.02
9.00	6.50	0.09	0.02
10.00	6.50	0.09	0.02
15.00	6.50	0.09	0.02
20.00	6.51	0.08	0.02
25.00	6.51	0.08	0.02
30.00	6.51	0.08	0.02



Hvorslev method

$$k = \frac{A}{FT}$$

Velocity graph method

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case\*  D

### RESULTS

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m <sup>2</sup>	Cross sectional area of access tube, A	0.0020 m <sup>2</sup>
Intake factor*, F	m	Intake factor*, F	m
Time lag, T	0 s	Variable head, H <sub>1</sub>	0.00 m at time, t <sub>1</sub> 0 s
		Variable head, H <sub>2</sub>	0.00 m at time, t <sub>2</sub> 0 s
<b>Permeability, k</b>	-- ms <sup>-1</sup>	<b>Permeability, k</b>	-- ms <sup>-1</sup>

### REMARKS

Measured water level 6.55m prior to test.  
Unable to determine intake factor, test within slotted section.

Test Operator: BT

CONTRACT	CHECKED
<b>35560</b>	<b>JH</b>

\* See intake factors key sheet

# PERMEABILITY TEST - VARIABLE HEAD

BS EN ISO 22282-2:2012



CLIENT HIGHWAYS ENGLAND

BOREHOLE **DSRC401**

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A

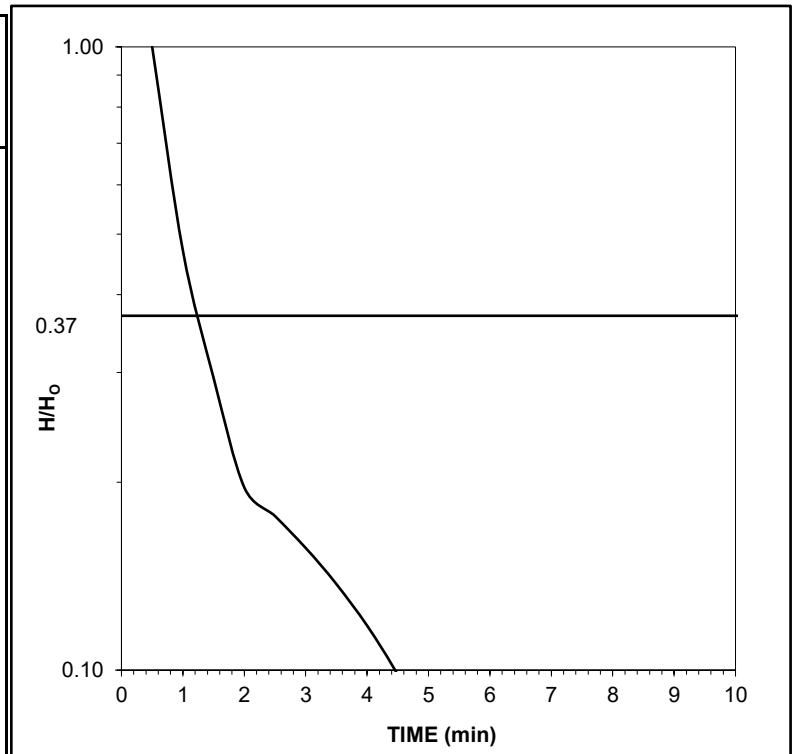
**Rising Head Test 1**

**DEPTH RECORD**

BASE OF FILTER	8.70 m	BOREHOLE DIAMETER IN TEST SECTION	0.17 m
TOP OF FILTER	4.80 m	DIAMETER OF ACCESS TUBE	0.05 m
TEST INTERVAL	3.90 m	FILTER MEDIUM	Gravel
HEIGHT OF DATUM ABOVE GROUND LEVEL	0.10 m	TYPE OF TEST	RISING
DEPTH TO STANDING WATER BELOW DATUM	6.59 m	DATE	17/11/2020

**TEST RECORD**

ELAPSED TIME (min)	DEPTH TO WATER BELOW DATUM (m)	HEAD (m) H	H/H <sub>0</sub>
0.50	7.10	0.51	1.00
1.00	6.83	0.24	0.47
1.50	6.74	0.15	0.29
2.00	6.69	0.10	0.20
2.50	6.68	0.09	0.18
3.00	6.67	0.08	0.16
3.50	6.66	0.07	0.14
4.00	6.65	0.06	0.12
4.50	6.64	0.05	0.10
5.00	6.63	0.04	0.08
6.00	6.62	0.03	0.06
7.00	6.62	0.03	0.06
8.00	6.62	0.03	0.06
9.00	6.62	0.03	0.06
10.00	6.61	0.02	0.04
15.00	6.61	0.02	0.04
20.00	6.61	0.02	0.04
25.00	6.60	0.01	0.02
30.00	6.60	0.01	0.02



Hvorslev method

$$k = \frac{A}{FT}$$

Velocity graph method

$$k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

Intake factor based on case\*  D

**RESULTS**

Hvorslev method		Velocity graph method	
Cross sectional area of access tube, A	0.0020 m <sup>2</sup>	Cross sectional area of access tube, A	0.0020 m <sup>2</sup>
Intake factor*, F	m	Intake factor*, F	m
Time lag, T	0 s	Variable head, H <sub>1</sub>	0.00 m at time, t <sub>1</sub> 0 s
		Variable head, H <sub>2</sub>	0.00 m at time, t <sub>2</sub> 0 s
<b>Permeability, k</b>	-- ms <sup>-1</sup>	<b>Permeability, k</b>	-- ms <sup>-1</sup>

**REMARKS**

Measured water level 6.51m prior to test.  
Unable to determine intake factor, test within slotted section.

Test Operator: BT

CONTRACT	CHECKED
<b>35560</b>	<b>JH</b>

\* See intake factors key sheet

BT/BT





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# **APPENDIX E**

## LABORATORY TESTING



2718



GEOTECHNICAL ENGINEERING LIMITED

For the attention of David Owen/Ed Crimp

Version No. 2

Page No. 1 of 22

Date of Issue 06/04/2020

### TEST REPORT

PROJECT/SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-PHASE 2A (987)	Samples received	08/05/2019
GEL REPORT NUMBER	35102	Schedule received	08/05/2019
Test report refers to	All Schedules	Testing commenced	10/05/2019
		Status	Final

### SUMMARY OF RESULTS ATTACHED

TEST METHOD & DESCRIPTION	QUANTITY	ACCREDITED TEST
BS EN ISO 17892-1: 2014:5. Water Content	9	YES
BS1377: Part 2: 1990:4.2-4.4&5.2-5.4, Liquid & Plastic Limits	9	YES
BS EN ISO 17892-4: 2016: 5.2, Particle Size Distribution - Wet Sieve	8	YES
BS EN ISO 17892-4: 2016: 5.4, Particle Size Distribution - Pipette	8	YES
ISRM: 2007: Water Content of Rock	13	NO
ISRM: Suggested Methods: 2007: Uniaxial Compressive Strength of Rock	11	YES
ISRM: 2007: Point Load Strength Test	59	YES
BRE SD1 Reduced Suite: pH, Sulphate - water and acid soluble, sulphur (Subcontracted)	1	YES
Organic Matter Content (Subcontracted)	2	YES

Remarks This report may not be partially reproduced without written permission from this laboratory.	Approved Signatories: <b>T Best (Deputy Laboratory Manager)</b> E Crimp (Senior Engineer) J Hanson (Director) N Parry (Director)
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Doc TR01 Rev No. 22 Revision date 02/01/2020 DC:JH

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Payments: Geotechnical Engineering Limited

Sort code: 16-22-11 Bank account: 11125135

# LIQUID AND PLASTIC LIMITS

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (987)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
DSRC110	35D	34.80	34.80	21.5	BXE	4	43	22	21	Brown mottled orange slightly gravelly slightly sandy silty CLAY
DSRC110	36D	35.40	35.40	14.4	BXE	0	43	20	23	Grey slightly sandy silty CLAY
DSRC110	46D	44.70	44.70	14.2	BXE	0	40	19	21	Grey slightly sandy silty CLAY
DSRC110	49D	48.00	48.00	14.6	BXE	1	31	22	9	Grey slightly sandy silty CLAY
DSRC302	37D	29.30	29.30	16.4	BXE	0	36	23	13	Grey slightly sandy silty CLAY
DSRC302	39D	33.50	33.50	16.2	BYE	0	33	NP		Grey slightly sandy SILT
DSRC303	32D	33.35	33.35	24.5	BYE	1	38	NP		Grey slightly sandy SILT
DSRC303	35D	35.40	35.40	16.5	BYE	0	33	NP		Grey slightly sandy SILT
DSRC303	39D	38.70	38.70	17.1	BXE	2	34	21	13	Grey slightly gravelly slightly sandy silty CLAY

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

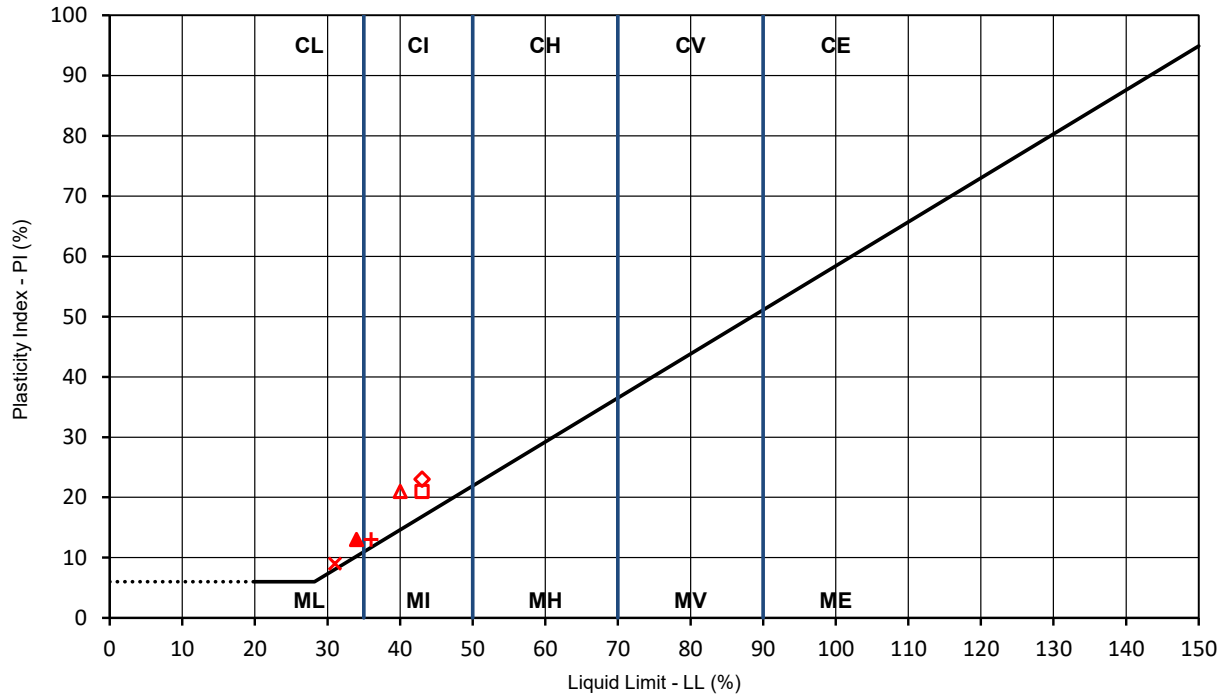
specimen preparation	test method	CONTRACT	CHECKED
A - as received	D - oven dried (60oC)	<b>35102</b>	<b>TB</b>
B - washed on 0.425mm sieve	E - oven dried (105oC)		
C - air dried	F - not known		
	X - cone penetrometer (test 4.3)		
	Y - cone penetrometer (test 4.4)		
	Z - casagrande apparatus (test 4.5)		

Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (987)



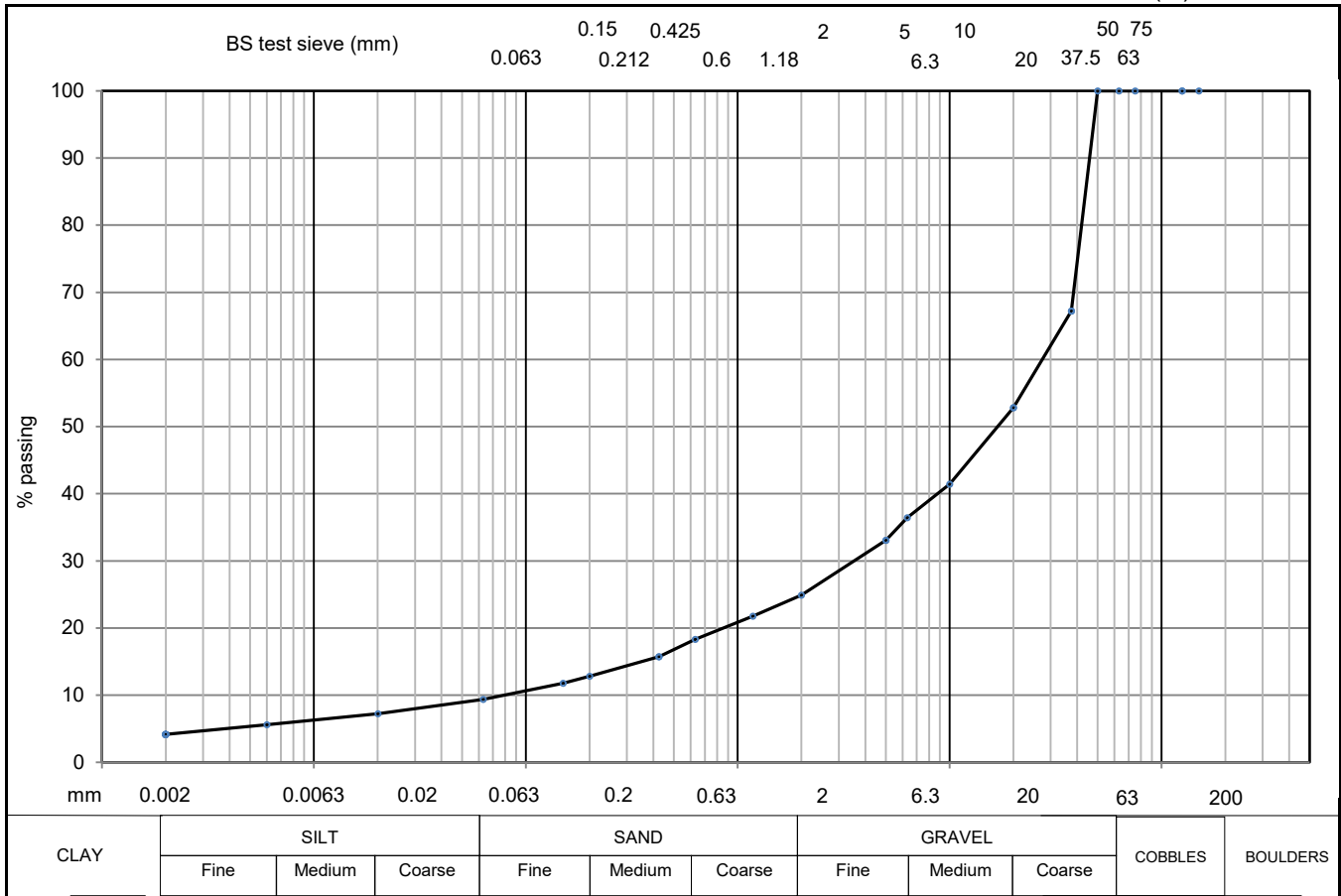
BH/TP No.	depth (m)	LL	PL	PI	remarks
□ DSRC110	34.80	43	22	21	
◇ DSRC110	35.40	43	20	23	
△ DSRC110	44.70	40	19	21	
× DSRC110	48.00	31	22	9	
+ DSRC302	29.30	36	23	13	
	DSRC302	33.50	33	NP	
	DSRC303	33.35	38	NP	
	DSRC303	35.40	33	NP	
▲ DSRC303	38.70	34	21	13	

CONTRACT	CHECKED
<b>35102</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC110
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (987)	SAMPLE No./TYPE	2D
DESCRIPTION	Orangish brown clayey sandy GRAVEL	SAMPLE DEPTH (m)	0.06
		SPECIMEN TOP (m)	0.06
		SPECIMEN BASE (m)	0.30



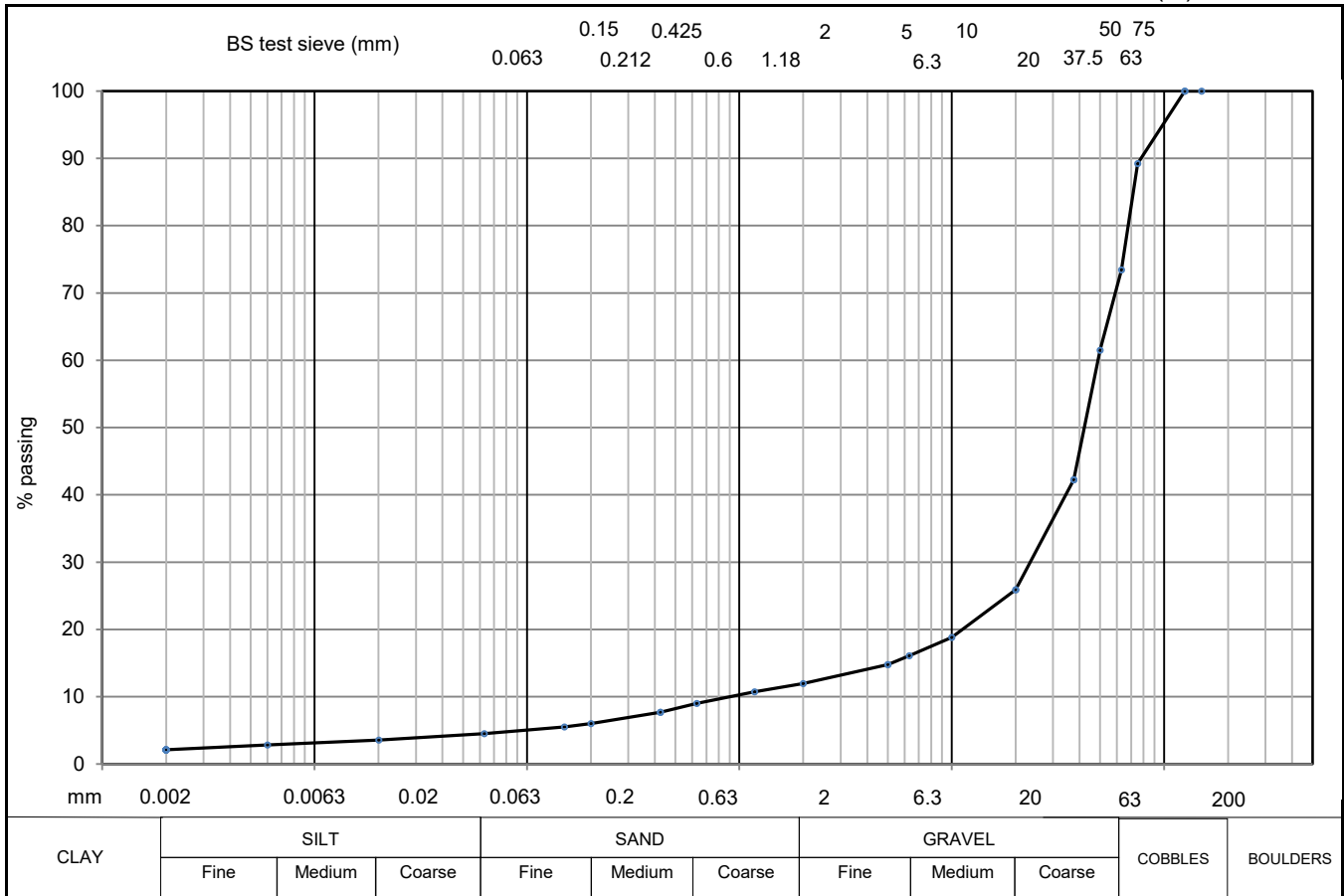
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	4						
SILT	5	150		5	33	20	7
SILT & CLAY	9						
SAND	16	75		2	25	6	6
GRAVEL	75						
COBBLE & BOULDER	0	63		1.18	22	2	4
test method(s)	5.2# & 5.4	50	100	0.63	18		
test method		37.5	67	0.425	16		
5.2 - sieving		20	53	0.2	13		
5.3 - sedimentation by hydrometer		10	41	0.15	12		
5.4 - sedimentation by pipette		6.3	36	0.063	9		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>35102</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC110
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (987)	SAMPLE No./TYPE	7B
DESCRIPTION	Orangish brown slightly clayey sandy GRAVEL with high cobble content	SAMPLE DEPTH (m)	1.00
		SPECIMEN TOP (m)	1.00
		SPECIMEN BASE (m)	1.10



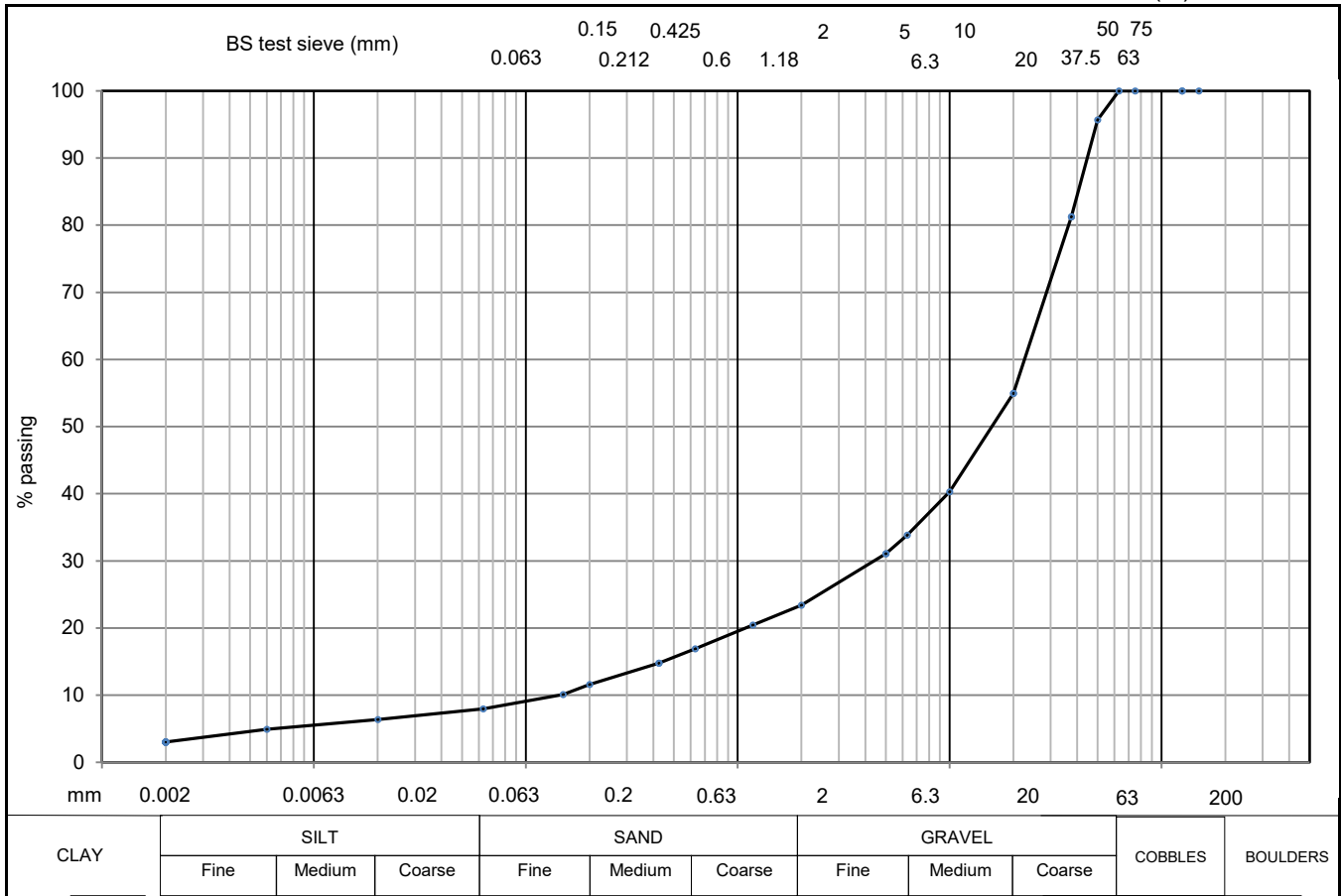
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	2						
SILT	2	150	100	5	15	20	4
SILT & CLAY	4						
SAND	7	75	89	2	12	6	3
GRAVEL	61						
COBBLE & BOULDER	27	63	73	1.18	11	2	2
test method(s)	5.2# & 5.4	50	61	0.63	9		
test method		37.5	42	0.425	8		
5.2 - sieving		20	26	0.2	6		
5.3 - sedimentation by hydrometer		10	19	0.15	6		
5.4 - sedimentation by pipette		6.3	16	0.063	4		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>35102</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC302
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (987)	SAMPLE No./TYPE	3B
DESCRIPTION	Brown clayey sandy GRAVEL	SAMPLE DEPTH (m)	0.30
		SPECIMEN TOP (m)	0.30
		SPECIMEN BASE (m)	0.50



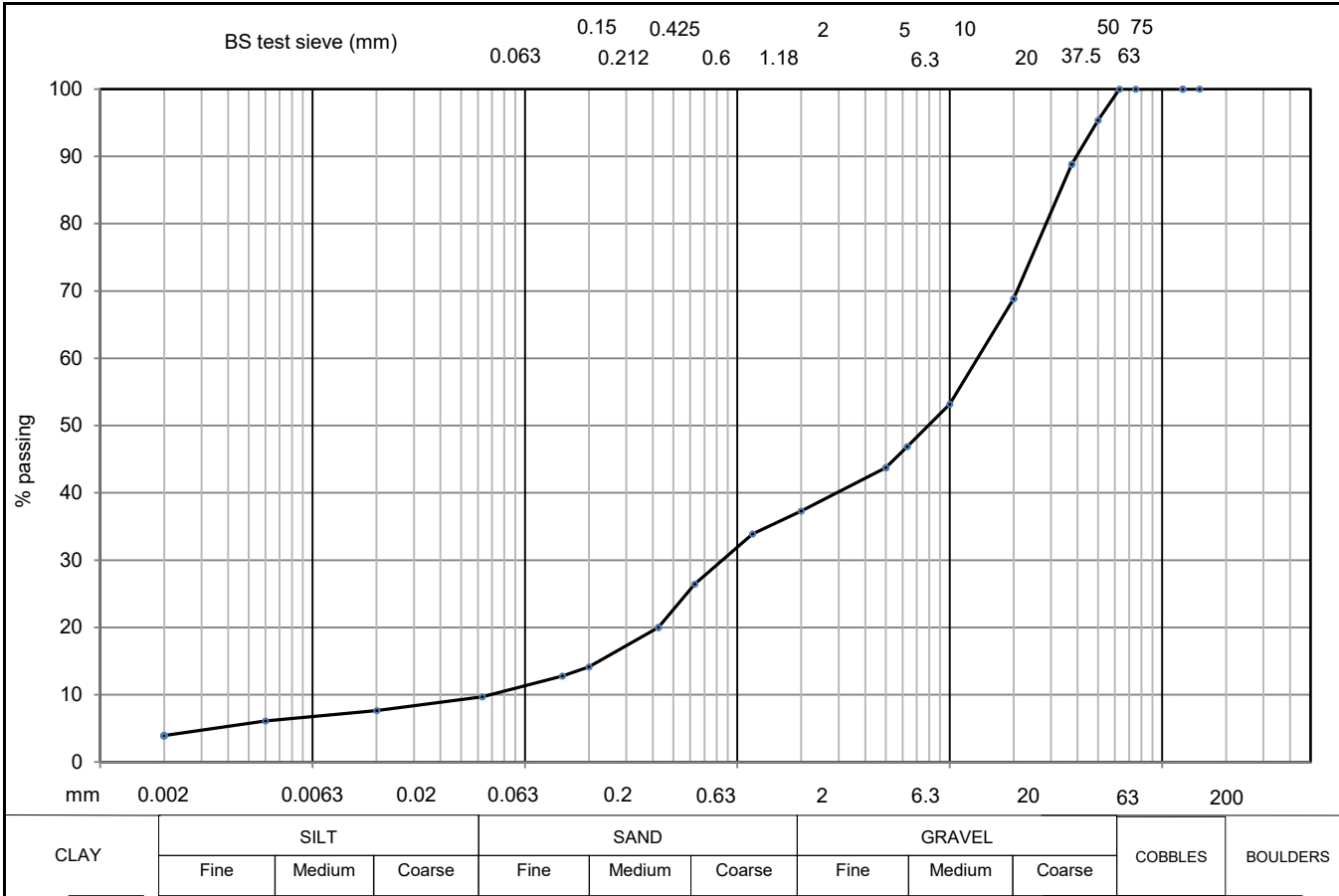
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	3						
SILT	5	150		5	31	20	6
SILT & CLAY	8						
SAND	15	75		2	23	6	5
GRAVEL	77						
COBBLE & BOULDER	0	63	100	1.18	20	2	3
test method(s)	5.2 & 5.4	50	96	0.63	17		
test method		37.5	81	0.425	15		
5.2 - sieving		20	55	0.2	12		
5.3 - sedimentation by hydrometer		10	40	0.15	10		
5.4 - sedimentation by pipette		6.3	34	0.063	8		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>35102</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC302
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (987)	SAMPLE No./TYPE	7B
DESCRIPTION	Yellowish brown clayey very sandy GRAVEL	SAMPLE DEPTH (m)	0.90
		SPECIMEN TOP (m)	0.90
		SPECIMEN BASE (m)	1.20



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	4						
SILT	6	150		5	44	20	8
SILT & CLAY	10						
SAND	28	75		2	37	6	6
GRAVEL	63						
COBBLE & BOULDER	0	63	100	1.18	34	2	4
test method(s)	5.2 & 5.4	50	95	0.63	26		
test method		37.5	89	0.425	20		
5.2 - sieving		20	69	0.2	14		
5.3 - sedimentation by hydrometer		10	53	0.15	13		
5.4 - sedimentation by pipette		6.3	47	0.063	10		

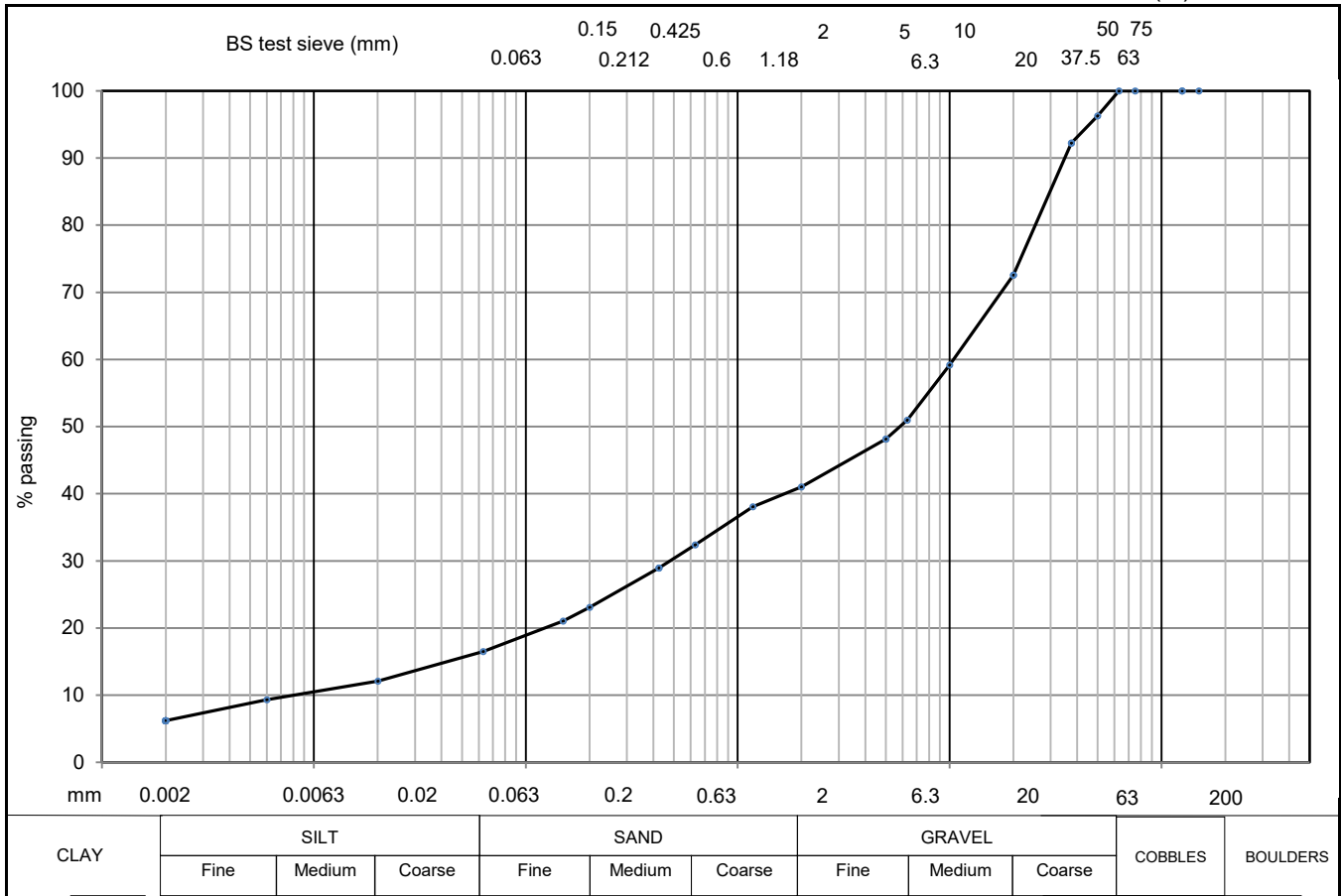
remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35102</b>	<b>CHECKED</b> <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC303
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (987)	SAMPLE No./TYPE	3B
DESCRIPTION	Orangish brown clayey very sandy GRAVEL	SAMPLE DEPTH (m)	0.30
		SPECIMEN TOP (m)	0.30
		SPECIMEN BASE (m)	0.50



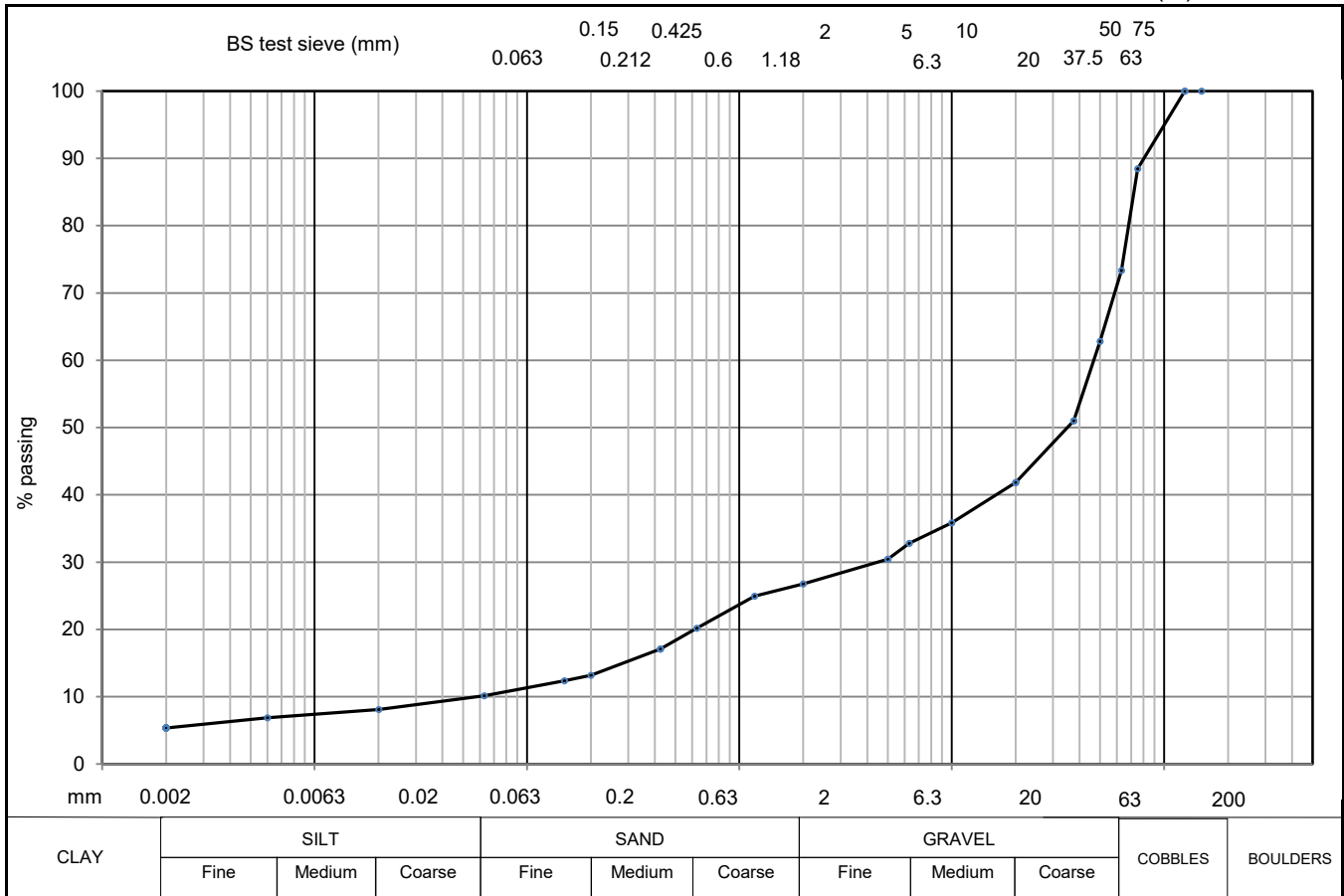
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	6						
SILT	10	150		5	48	20	12
SILT & CLAY	17						
SAND	25	75		2	41	6	9
GRAVEL	59						
COBBLE & BOULDER	0	63	100	1.18	38	2	6
test method(s)	5.2 & 5.4	50	96	0.63	32		
test method		37.5	92	0.425	29		
5.2 - sieving		20	73	0.2	23		
5.3 - sedimentation by hydrometer		10	59	0.15	21		
5.4 - sedimentation by pipette		6.3	51	0.063	17		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>CONTRACT</b> <b>35102</b>	<b>CHECKED</b> <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC303
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (987)	SAMPLE No./TYPE	6B
DESCRIPTION	Orangish brown clayey sandy GRAVEL with high cobble content	SAMPLE DEPTH (m)	1.00
		SPECIMEN TOP (m)	1.00
		SPECIMEN BASE (m)	1.20



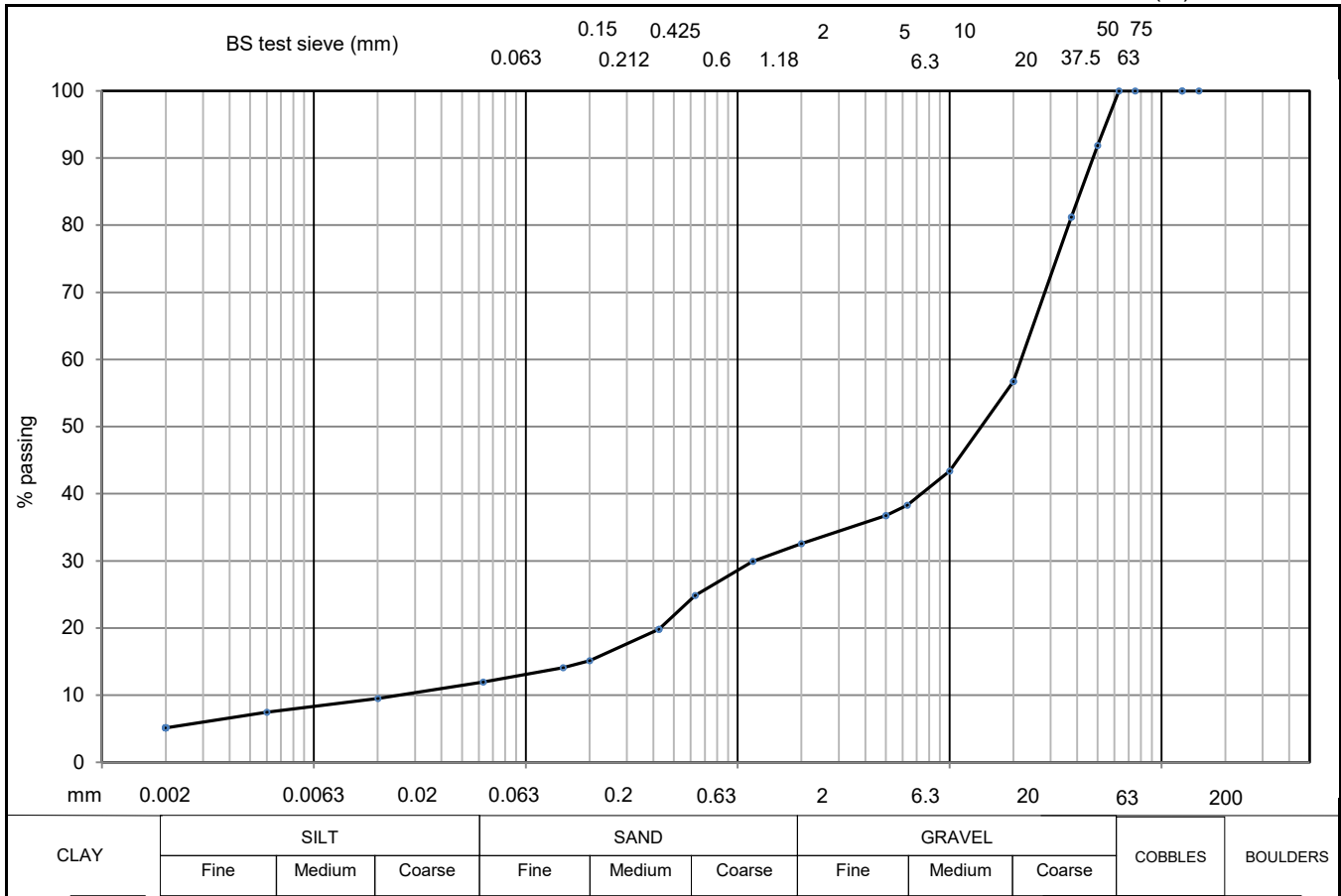
soil type	% fraction	SILT			SAND			GRAVEL			COBBLES	BOULDERS
		Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		
CLAY	5											
SILT	5											
SILT & CLAY	10											
SAND	17											
GRAVEL	47											
COBBLE & BOULDER	27											
test method(s)	5.2# & 5.4											
test method												
5.2 - sieving												
5.3 - sedimentation by hydrometer												
5.4 - sedimentation by pipette												

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>35102</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	RC508
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (987)	SAMPLE No./TYPE	5B
DESCRIPTION	Orangish brown clayey very sandy GRAVEL	SAMPLE DEPTH (m)	0.80
		SPECIMEN TOP (m)	0.80
		SPECIMEN BASE (m)	1.00



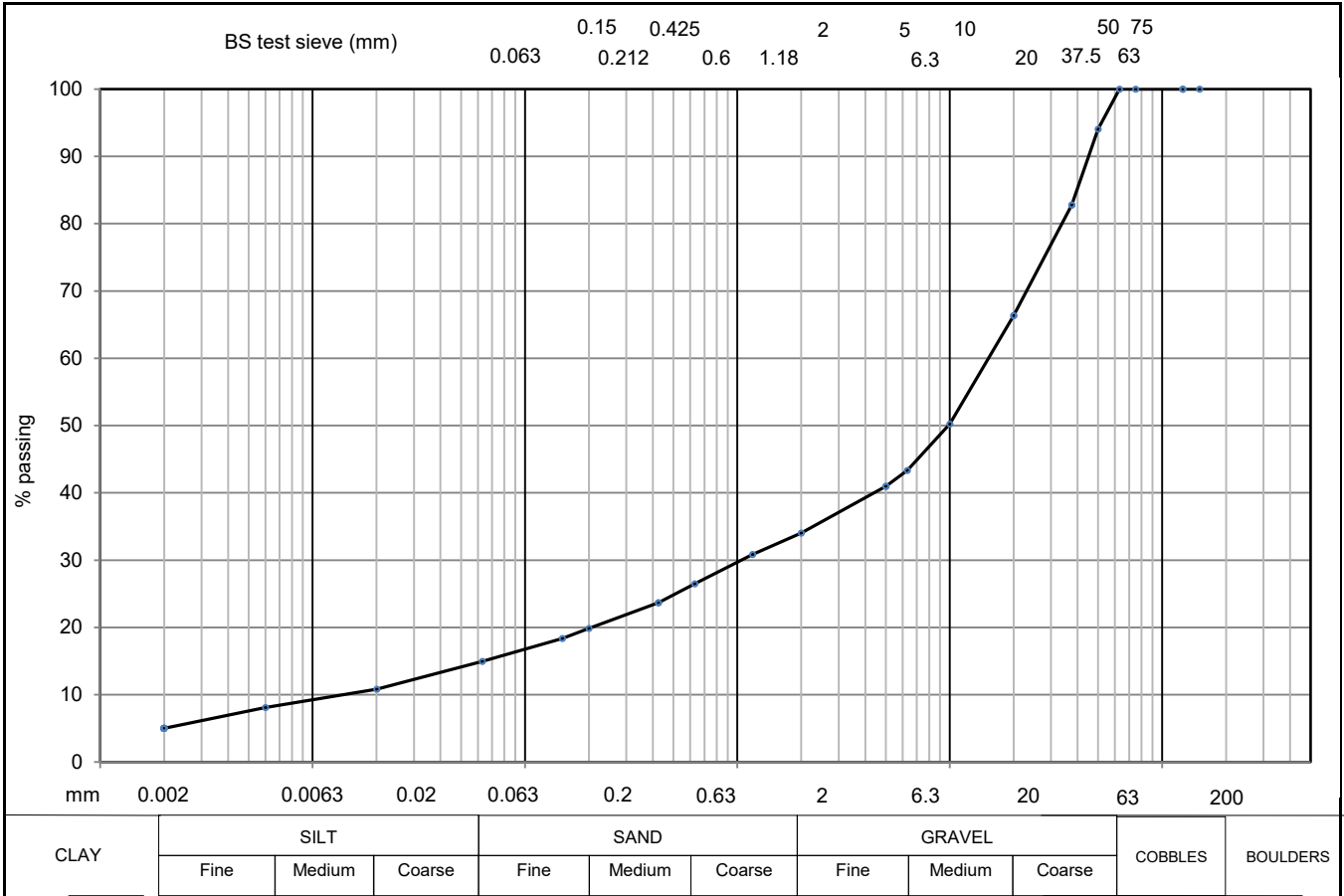
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	5						
SILT	7	150		5	37	20	9
SILT & CLAY	12						
SAND	21	75		2	33	6	7
GRAVEL	67						
COBBLE & BOULDER	0	63	100	1.18	30	2	5
test method(s)	5.2 & 5.4	50	92	0.63	25		
test method		37.5	81	0.425	20		
5.2 - sieving		20	57	0.2	15		
5.3 - sedimentation by hydrometer		10	43	0.15	14		
5.4 - sedimentation by pipette		6.3	38	0.063	12		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>35102</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	RC509
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (987)	SAMPLE No./TYPE	5B
DESCRIPTION	Brown clayey sandy GRAVEL	SAMPLE DEPTH (m)	0.50
		SPECIMEN TOP (m)	0.50
		SPECIMEN BASE (m)	0.60



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	5						
SILT	10	150		5	41	20	11
SILT & CLAY	15						
SAND	19	75		2	34	6	8
GRAVEL	66						
COBBLE & BOULDER	0	63	100	1.18	31	2	5
test method(s)	5.2# & 5.4	50	94	0.63	27		
test method		37.5	83	0.425	24		
5.2 - sieving		20	66	0.2	20		
5.3 - sedimentation by hydrometer		10	50	0.15	18		
5.4 - sedimentation by pipette		6.3	43	0.063	15		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>CONTRACT</b> <b>35102</b>	<b>CHECKED</b> <b>TB</b>
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**ROCK WATER CONTENT**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (987)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	description and remarks
	no./type	depth (m)			
DSRC110	17C	10.70	12.00	2.1	Orangish brown LIMESTONE
DSRC110	22C	18.20	18.80	8.7	Orangish brown LIMESTONE
DSRC110	28C	27.20	29.10	5.1	Orangish brown LIMESTONE
DSRC302	13C	3.70	4.70	6.1	Orangish brown LIMESTONE
DSRC302	17C	9.70	10.80	11	Orangish brown LIMESTONE
DSRC302	26C	21.70	22.20	8	Orangish brown LIMESTONE
RC508	12C	8.70	8.85	2.1	Yellowish brown LIMESTONE
RC508	23C	23.70	24.25	8.8	Orangish brown LIMESTONE
RC508	33C	35.70	36.50	8.2	Orangish brown LIMESTONE
RC509	14C	7.20	7.60	7.7	Orangish brown LIMESTONE
RC509	27C	22.20	23.10	2	Yellowish brown LIMESTONE
RC509	41C	35.70	37.00	3.3	Orangish brown LIMESTONE
RC509	47C	43.20	43.55	6.3	Orangish brown LIMESTONE
general remarks natural water content determined unless otherwise specified					
test method samples oven dried at 105°C				CONTRACT <b>35102</b>	CHECKED <b>TB</b>

**UNIAXIAL COMPRESSIVE STRENGTH OF ROCK**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (987)

borehole /trial pit no.	sample		specimen depth (m)	diameter D (mm)	height H (mm)	H/D	moisture content (%)	bulk density (Mg/m3)	loading rate (kN/min)	time to failure (min:sec)	UCS (MPa)	description, codes and remarks
	no./type	depth (m)										
DSRC110	31Cs	31.15	31.15	101.8	270.1	2.65	5	2.45	20	05:53	14.57	Yellowish brown LIMESTONE, N, AxCa
DSRC110	38Cs	36.65	36.65	100.9	276.8	2.74	8.2	2.40	10	08:36	10.79	Grey SILTSTONE, N, AxCa
DSRC302	27Cs	22.05	22.05	101.5	260.3	2.56	6.3	2.45	10	07:04	8.80	Brown mottled grey LIMESTONE, N, AxCa
DSRC302	32Cs	28.20	28.23	101.2	265.5	2.62	7.8	2.45	20	07:28	18.47	Grey SILTSTONE, N, AxCa
DSRC303	42Cs	8.45	8.49	99.9	251.7	2.52	8.2	2.37	10	04:52	6.20	Yellowish brown LIMESTONE, N, AxCa
DSRC303	43Cs	21.15	21.18	100.5	247.0	2.46	8.4	2.35	5	06:43	4.28	Yellowish brown LIMESTONE, N, AxCa
RC508	20Cs	21.50	21.50	101.3	258.7	2.55	8	2.35	10	08:17	10.25	Yellowish brown LIMESTONE, N, AxCa
RC508	36Cs	38.20	38.20	101.1	279.4	2.76	6.5	2.46	20	06:34	16.61	Grey LIMESTONE, N, AxCa
RC509	13Cs	6.73	6.78	101.6	255.9	2.52	5.3	2.41	10	08:21	10.24	Yellowish brown LIMESTONE, N, AxCa
RC509	22Cs	16.55	16.55	101.7	286.1	2.81	2.8	2.56	25	08:34	26.81	Light grey LIMESTONE, N, AxCa
RC509	52Cs	47.70	47.70	101.7	292.8	2.88	5.4	2.55	10	09:40	11.87	Dark grey LIMESTONE, N, AxCa

## general remarks

sample obtained from vertically drilled core (unless specified), test machine - VJT6000

coding:	moisture condition	sample storage	failure mode
	N - natural moisture content	U - not wrapped	Ax - axial cleavage
	F - fully saturated	F - wrapped in cling film/foil	Ca - cataclasis
	S - soaked	W - waxed	Sh - shear
	P - air/partially dried	G - contained in sealed Geoline	Ex - explosive
			Ot - other

CONTRACT

**35102**

CHECKED

**TB**

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (987)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)	L (mm)						
DSRC110	6.90	A	X	P	105		75		7.68	100.13	0.77	1.37	1.05	Yellowish brown LIMESTONE
DSRC110	6.90	D	Y	P		70	105		8.61	105.00	0.78	1.40	1.09	Yellowish brown LIMESTONE
DSRC110	16.05	A	X	P	105		70		2.02	96.74	0.22	1.35	0.29	Orangish brown LIMESTONE and CLAY
DSRC110	16.05	D	Y	P		70	105		0.76	105.00	0.07	1.40	0.10	Orangish brown LIMESTONE and CLAY
DSRC110	24.60	A	X	P	105		70		7.86	96.74	0.84	1.35	1.13	Orangish brown LIMESTONE
DSRC110	24.60	D	Y	P		80	105		9.83	105.00	0.89	1.40	1.25	Orangish brown LIMESTONE
DSRC110	31.42	A	X	N	100		60		8.07	87.40	1.06	1.29	1.36	Yellowish brown LIMESTONE
DSRC110	31.42	D	Y	N		70	100		16.41	100.00	1.64	1.37	2.24	Yellowish brown LIMESTONE
DSRC110	36.93	A	X	N	100		50		1.23	79.79	0.19	1.23	0.24	Grey SILTSTONE
DSRC110	36.93	D	Y	N		50	100		2.09	100.00	0.21	1.37	0.29	Grey SILTSTONE
DSRC302	5.80	A	X	N	105		40		2.64	73.13	0.49	1.19	0.59	Orangish brown LIMESTONE
DSRC302	5.80	D	Y	N		40	105		6.87	105.00	0.62	1.40	0.87	Orangish brown LIMESTONE
DSRC302	22.05	A	Y	N	100		30		1.21	61.80	0.32	1.10	0.35	Orangish brown LIMESTONE
DSRC302	22.16	A	X	N	100		60		1.00	87.40	0.13	1.29	0.17	Orangish brown LIMESTONE
DSRC302	22.16	D	Y	N		50	100		2.50	100.00	0.25	1.37	0.34	Orangish brown LIMESTONE
DSRC302	22.22	A	X	N	100		40		5.63	71.36	1.11	1.17	1.30	Yellowish brown LIMESTONE
DSRC302	22.22	D	Y	N		30	100		7.47	100.00	0.75	1.37	1.02	Orangish brown LIMESTONE
DSRC302	22.34	A	X	N	100		20		2.16	50.46	0.85	1.00	0.85	Yellowish brown LIMESTONE
DSRC302	22.34	D	Y	N		20	100		10.94	100.00	1.09	1.37	1.49	Yellowish brown LIMESTONE
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02														
test type		test orientation relative to discontinuities				moisture condition				CONTRACT	CHECKED			
A - axial		X - perpendicular		U - unknown		N - natural moisture content				<b>35102</b>	<b>TB</b>			
D - diametral		Y - parallel		P - partially air dried										
I - irregular lump		Z - oblique		S - soaked										

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (987)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)								
DSRC302	22.36	A	X	N	100			20	2.76	50.46	1.08	1.00	1.09	Yellowish brown LIMESTONE
DSRC302	22.36	D	Y	N			20	100	3.05	100.00	0.31	1.37	0.42	Yellowish brown LIMESTONE
DSRC302	22.38	A	X	N	100			20	1.94	50.46	0.76	1.00	0.77	Yellowish brown LIMESTONE
DSRC302	28.20	A	X	N	100			30	0.99	61.80	0.26	1.10	0.29	Grey SILTSTONE
DSRC302	28.23	A	X	N	100			65	5.31	90.97	0.64	1.31	0.84	Grey SILTSTONE
DSRC302	28.23	D	Y	N			70	100	3.86	100.00	0.39	1.37	0.53	Grey SILTSTONE
DSRC302	28.50	A	X	N	100			45	1.96	75.69	0.34	1.21	0.41	Grey SILTSTONE
DSRC302	28.55	A	X	N	100			45	1.58	75.69	0.28	1.21	0.33	Grey SILTSTONE
DSRC302	28.61	A	X	N	100			45	1.16	75.69	0.20	1.21	0.24	Grey SILTSTONE
DSRC302	28.61	D	Y	N			40	100	1.36	100.00	0.14	1.37	0.19	Grey SILTSTONE
DSRC302	28.65	A	X	N	100			30	1.40	61.80	0.37	1.10	0.40	Grey SILTSTONE
DSRC303	8.45	A	X	N	100			45	1.13	75.69	0.20	1.21	0.24	Yellowish brown LIMESTONE
DSRC303	12.90	A	X	N	105			55	6.36	85.75	0.86	1.27	1.10	Yellowish brown LIMESTONE
DSRC303	12.90	D	Y	P			60	105	9.07	105.00	0.82	1.40	1.15	Yellowish brown LIMESTONE
DSRC303	21.15	A	X	N	100			30	1.01	61.80	0.26	1.10	0.29	Yellowish brown LIMESTONE
DSRC303	21.38	A	X	N	100			35	2.14	66.76	0.48	1.14	0.55	Yellowish brown LIMESTONE
DSRC303	21.38	D	Y	N			40	100	1.60	100.00	0.16	1.37	0.22	Yellowish brown LIMESTONE
DSRC303	21.42	A	X	N	100			40	1.96	71.36	0.38	1.17	0.45	Yellowish brown LIMESTONE
DSRC303	25.60	A	X	P	105			100	20.00	115.62	1.50	1.46	2.18	Orangish brown LIMESTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35102</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		



**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (987)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)	L (mm)						
DSRC303	25.60	D	Y	P		110	105	5.66	105.00	0.51	1.40	0.72	Orangish brown LIMESTONE	
DSRC303	34.80	A	X	P	105		55	0.19	85.75	0.03	1.27	0.03	Grey SILT	
DSRC303	34.80	D	Y	P		60	105	0.11	105.00	0.01	1.40	0.01	Grey SILT	
DSRC303	36.70	A	X	P	105		50	0.19	81.76	0.03	1.25	0.04	Grey SILT	
DSRC303	36.70	D	Y	P		50	105	0.16	105.00	0.01	1.40	0.02	Grey SILT	
RC508	21.77	A	X	N	100		35	5.13	66.76	1.15	1.14	1.31	Yellowish brown LIMESTONE	
RC508	21.77	D	Y	N		30	100	3.56	100.00	0.36	1.37	0.49	Yellowish brown LIMESTONE	
RC508	26.85	A	X	N	100		40	5.69	71.36	1.12	1.17	1.31	Yellowish brown LIMESTONE	
RC508	26.85	D	Y	N		40	100	11.01	100.00	1.10	1.37	1.50	Yellowish brown LIMESTONE	
RC508	26.90	A	X	N	100		35	4.53	66.76	1.02	1.14	1.16	Yellowish brown LIMESTONE	
RC508	26.94	A	X	N	100		30	4.17	61.80	1.09	1.10	1.20	Yellowish brown LIMESTONE	
RC508	26.98	A	X	N	100		25	3.84	56.42	1.21	1.06	1.27	Yellowish brown LIMESTONE	
RC508	27.01	A	X	N	100		25	2.94	56.42	0.92	1.06	0.98	Yellowish brown LIMESTONE	
RC508	27.04	A	X	N	100		30	5.60	61.80	1.47	1.10	1.61	Yellowish brown LIMESTONE	
RC508	27.08	A	X	N	100		35	5.91	66.76	1.33	1.14	1.51	Yellowish brown LIMESTONE	
RC508	27.13	A	X	N	100		50	5.21	79.79	0.82	1.23	1.01	Yellowish brown LIMESTONE	
RC508	38.50	A	X	N	100		75	7.22	97.72	0.76	1.35	1.02	Grey LIMESTONE	
RC508	38.50	D	Y	N		70	100	6.94	100.00	0.69	1.37	0.95	Grey LIMESTONE	
RC509	6.73	A	X	N	100		50	4.11	79.79	0.65	1.23	0.80	Yellowish brown LIMESTONE	
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02														
test type		test orientation relative to discontinuities				moisture condition				CONTRACT	CHECKED			
A - axial		X - perpendicular		U - unknown		N - natural moisture content				<b>35102</b>	<b>TB</b>			
D - diametral		Y - parallel		P - partially air dried										
I - irregular lump		Z - oblique		S - soaked										

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (987)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)	L (mm)						
RC509	7.03	A	X	N	100		30		2.93	61.80	0.77	1.10	0.84	Yellowish brown LIMESTONE
RC509	7.03	D	Y	N		40	100		5.16	100.00	0.52	1.37	0.70	Yellowish brown LIMESTONE
RC509	7.07	A	X	N	100		30		4.19	61.80	1.10	1.10	1.21	Yellowish brown LIMESTONE
RC509	7.60	A	X	N	105		100		15.34	115.62	1.15	1.46	1.67	Yellowish brown LIMESTONE
RC509	7.60	D	Y	N		100	105		15.73	105.00	1.43	1.40	1.99	Yellowish brown LIMESTONE
RC509	20.20	A	X	N	100		40		0.99	71.36	0.19	1.17	0.23	Light brown LIMESTONE
RC509	20.24	A	X	N	100		25		1.41	56.42	0.44	1.06	0.47	Light brown LIMESTONE
RC509	20.24	D	Y	N		20	100		1.36	100.00	0.14	1.37	0.19	Light brown LIMESTONE
RC509	20.26	A	X	N	100		25		1.65	56.42	0.52	1.06	0.55	Light brown LIMESTONE
RC509	20.29	A	X	N	100		35		1.81	66.76	0.41	1.14	0.46	Light brown LIMESTONE
RC509	20.33	A	X	N	100		60		4.26	87.40	0.56	1.29	0.72	Light brown LIMESTONE
RC509	20.39	A	X	N	100		45		6.38	75.69	1.11	1.21	1.34	Light brown LIMESTONE
RC509	20.44	A	X	N	100		25		2.01	56.42	0.63	1.06	0.67	Light brown LIMESTONE
RC509	20.44	D	Y	N		30	100		0.96	100.00	0.10	1.37	0.13	Light brown LIMESTONE
RC509	20.70	A	X	N	100		30		1.86	61.80	0.49	1.10	0.54	Light brown LIMESTONE
RC509	24.20	A	X	N	105		70		26.90	96.74	2.87	1.35	3.87	Yellowish brown LIMESTONE
RC509	24.20	D	Y	N		80	105		23.10	105.00	2.10	1.40	2.93	Yellowish brown LIMESTONE
RC509	30.30	A	X	N	105		100		7.87	115.62	0.59	1.46	0.86	Orangish brown LIMESTONE
RC509	30.30	D	Y	N		100	105		13.16	105.00	1.19	1.40	1.67	Orangish brown LIMESTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35102</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (987)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks	
					W (mm)	L (mm)	D (mm)	L (mm)							
RC509	38.20	A	X	N	105		80		13.96	103.42	1.31	1.39	1.81	Orangish brown LIMESTONE	
RC509	38.20	D	Y	N		70	105		6.67	105.00	0.60	1.40	0.84	Orangish brown LIMESTONE	
RC509	44.76	A	X	N	100		30		0.17	61.80	0.04	1.10	0.05	Orangish brown LIMESTONE	
RC509	44.80	A	X	N	100		30		0.41	61.80	0.11	1.10	0.12	Orangish brown LIMESTONE	
RC509	44.83	A	X	N	100		40		1.39	71.36	0.27	1.17	0.32	Orangish brown LIMESTONE	
RC509	44.87	A	X	N	100		45		1.10	75.69	0.19	1.21	0.23	Orangish brown LIMESTONE	
RC509	44.92	A	X	N	100		40		1.20	71.36	0.24	1.17	0.28	Orangish brown LIMESTONE	
RC509	44.96	A	X	N	100		40		0.92	71.36	0.18	1.17	0.21	Orangish brown LIMESTONE	
RC509	45.00	A	X	N	100		40		1.19	71.36	0.23	1.17	0.27	Orangish brown LIMESTONE	
RC509	45.04	A	X	N	100		50		0.94	79.79	0.15	1.23	0.18	Orangish brown LIMESTONE	
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02															
test type		test orientation relative to discontinuities				moisture condition				CONTRACT	CHECKED				
A - axial		X - perpendicular		U - unknown		N - natural moisture content				<b>35102</b>	<b>TB</b>				
D - diametral		Y - parallel		P - partially air dried											
I - irregular lump		Z - oblique		S - soaked											



## Final Report

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**Report No.:** 19-16184-1

**Initial Date of Issue:** 20-May-2019

**Client:** Geotechnical Engineering Ltd

**Client Address:** Centurion House  
Olympus Park  
Quedgeley  
Gloucester  
Gloucestershire  
GL2 4NF

**Contact(s):** GEL  
Wendy Jones

**Project:** 35102 - HE551505 A417 Missing Link  
Ground Invest

**Quotation No.:** **Date Received:** 13-May-2019

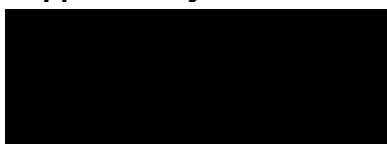
**Order No.:** 35102/W **Date Instructed:** 13-May-2019

**No. of Samples:** 3

**Turnaround (Wkdays):** 5 **Results Due:** 17-May-2019

**Date Approved:** 20-May-2019

**Approved By:**



**Details:** Glynn Harvey, Laboratory Manager

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**Project: 35102 - HE551505 A417 Missing Link Ground Invest**

<b>Client: Geotechnical Engineering Ltd</b>	<b>Chemtest Job No.:</b>				19-16184	19-16184	19-16184
Quotation No.:	<b>Chemtest Sample ID.:</b>				825535	825536	825537
	Client Sample ID.:				4D	4D	8D
	Sample Location:				DSRC110	RC509	RC509
	Sample Type:				SOIL	SOIL	SOIL
	Top Depth (m):				0.30	0.30	1.00
	Bottom Depth (m):				0.50	0.40	1.10
	Date Sampled:				09-May-2019	09-May-2019	09-May-2019
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>			
Moisture	N	2030	%	0.020	12	12	5.9
pH	U	2010		N/A		8.5	
Sulphate (2:1 Water Soluble) as SO <sub>4</sub>	U	2120	g/l	0.010		0.014	
Total Sulphur	U	2175	%	0.010		0.042	
Sulphate (Total)	U	2430	%	0.010		0.035	
Organic Matter	U	2625	%	0.40	2.9		7.1

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.

## **Report Information**

### **Key**

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- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

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- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



2718

GEOTECHNICAL ENGINEERING LIMITED



For the attention of David Owen/ Ed Crimp

Version No. 4  
Page No. 1 of 123  
Date of Issue 30/04/2020

**TEST REPORT**

PROJECT/SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-PHASE 2A (1077)	Samples received	24/02/2020
GEL REPORT NUMBER	35205	Schedule received	24/02/2020
Test report refers to	All Schedules	Testing commenced	27/02/2020
		Status	Final

**SUMMARY OF RESULTS ATTACHED**

TEST METHOD & DESCRIPTION	QUANTITY	ACCREDITED TEST
BS EN ISO 17892-1: 2014:5. Water Content	100	YES
BS1377: Part 2: 1990:4.2-4.4&5.2-5.4, Liquid & Plastic Limits	97	YES
BS1377: Part 2: 1990:4.5-4.6&5.2-5.4, Liquid (Casagrande Method) & Plastic Limits	2	NO
BS EN ISO 17892-4: 2016: 5.2, Particle Size Distribution - Wet Sieve	27	YES
BS EN ISO 17892-4: 2016: 5.4, Particle Size Distribution - Pipette	26	YES
BS1377: Part 4: 1990:3, Dry Density/Moisture Content Relationship	1	YES
BS1377: Part 4: 1990:7, California Bearing Ratio (CBR)	1	YES
BS1377: Part 5: 1990:3, Consolidation	2	YES
BS1377: Part 7: 1990:4.5, Determination of Shear Strength by Direct Shear	11	YES
BS1377: Part 7: 1990:6, Residual Strength by Ring Shear	8	NO
BS1377: Part 7: 1990:8&9, Undrained Triaxial Compression	3	YES
BS1377: Part 8: 1990: Effective Stress Testing	4	YES
ISRM: Suggested Methods: 2007: Uniaxial Compressive Strength of Rock	4	YES
ISRM: 2007: Point Load Strength Test	30	YES

Remarks This report may not be partially reproduced without written permission from this laboratory.  The results reported relate to samples received in the laboratory	Approved Signatories: <b>T Best (Deputy Laboratory Manager)</b> E Crimp (Senior Engineer) J Hanson (Director) N Parry (Director)
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Doc TR01 Rev No. 22 Revision date 02/01/20 DC:JH

**Geotechnical Engineering Ltd**

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Olympus Park, Quedgeley  
Gloucester GL2 4NF

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VAT Number: 682 5857 89

Payments: Geotechnical Engineering Limited  
Sort code: 16-22-11 Bank account: 11125135





2718

GEOTECHNICAL ENGINEERING LIMITED



For the attention of David Owen/ Ed Crimp

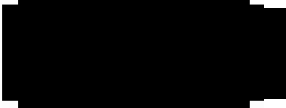
Version No. 4  
Page No. 2 of 123  
Date of Issue 30/04/2020

### TEST REPORT

PROJECT/SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-PHASE 2A (1077)	Samples received	24/02/2020
GEL REPORT NUMBER	35205	Schedule received	24/02/2020
Test report refers to	All Schedules	Testing commenced	27/02/2020
		Status	Final

### SUMMARY OF RESULTS ATTACHED

TEST METHOD & DESCRIPTION	QUANTITY	ACCREDITED TEST
BRE SD1 Suite (Subcontracted)	14	YES/NO
BRE SD1 Suite B (Subcontracted)	3	YES
Organic Matter Content (Subcontracted)	1	YES

Remarks This report may not be partially reproduced without written permission from this laboratory.  The results reported relate to samples received in the laboratory	Approved Signatories: <b>T Best (Deputy Laboratory Manager)</b> E Crimp (Senior Engineer) J Hanson (Director) N Parry (Director) 
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Doc TR01 Rev No. 22 Revision date 02/01/20 DC:JH

### Geotechnical Engineering Ltd

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Sort code: 16-22-11 Bank account: 11125135

# LIQUID AND PLASTIC LIMITS

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
CP105	7D	1.20	1.20	15.8	BXE	3	45	25	20	Yellowish brown slightly gravelly slightly sandy silty CLAY
CP105	23D	5.80	5.80	16.1	BXE	3	34	20	14	Orangish brown mottled grey slightly gravelly slightly sandy silty CLAY
CP105	32D	11.90	11.90	23.9	BXE	1	46	21	25	Grey mottled brown slightly sandy silty CLAY
CP105	37D	14.60	14.60	22.7	BXE	13	48	24	24	Brown mottled grey and orange slightly sandy slightly gravelly silty CLAY
CP105	42Cs	17.20	17.20	19.8	BXE	0	44	24	20	Greyish brown slightly sandy silty CLAY
CP106	10UT	3.00	3.00	40.7	BXE	5	67	29	38	Brown mottled orange and grey slightly gravelly slightly sandy silty CLAY
CP106	26L	7.00	7.50	17	BXE	0	48	22	26	Greyish brown slightly sandy silty CLAY
CP106	44Cs	16.40	16.40	22.4	BXE	1	55	26	29	Grey slightly sandy silty CLAY
CP106	50Cs	19.25	19.25	19.8	BXE	1	54	24	30	Grey slightly sandy silty CLAY
CP106	57Cs	22.80	22.80	23.8	BXE	0	52	22	30	Brown mottled grey slightly sandy silty CLAY
CP206	13D	3.00	3.00	24.8	BXE	7	38	22	16	Brown mottled grey and orange slightly gravelly slightly sandy silty CLAY
CP206	55UT	5.00	5.10	23.2	BXE	0	41	23	18	Brown mottled grey sandy silty CLAY
CP206	28D	7.00	7.00	31.5	BXE	2	41	22	19	Brown slightly gravelly slightly sandy silty CLAY
CP206	34D	9.00	9.00	16.3	BYE	22	39	20	19	Brown slightly sandy slightly gravelly silty CLAY
CP206	39D	10.40	10.40	22.5	BXE	3	53	22	31	Greyish brown slightly gravelly slightly sandy silty CLAY
CP206	43D	12.80	12.80	16.9	BXE	54	33	20	13	Orangish brown sandy very clayey GRAVEL
CP208	7D	2.00	2.00	21.4	BXE	4	39	20	19	Light brown mottled orange slightly gravelly slightly sandy silty CLAY
CP208	16L	5.00	5.60	4.3	BXE	1	41	21	20	Light grey and yellowish brown slightly sandy silty CLAY
CP208	19D	7.00	7.00	18.2	BXE	38	34	20	14	Brown slightly sandy slightly gravelly silty CLAY

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

specimen preparation

A - as received

B - washed on 0.425mm sieve

C - air dried

D - oven dried (60oC)

E - oven dried (105oC)

F - not known

test method

X - cone penetrometer (test 4.3)

Y - cone penetrometer (test 4.4)

Z - casagrande apparatus (test 4.5)

CONTRACT

**35205**

CHECKED

**TB**

# LIQUID AND PLASTIC LIMITS

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
CP208	26L	9.00	9.50	9.5	BXE	13	38	20	18	Light brown slightly gravelly slightly sandy silty CLAY
CP208	32D	13.70	13.70	20.2	BXE	0	35	20	15	Brown slightly sandy silty CLAY
CP208	36Cs	16.10	16.10	15.8	BXE	0	42	20	22	Greenish grey slightly sandy silty CLAY with rare shell fragments
CP208	41Cs	22.55	22.55	18.2	BXE	0	42	25	17	Greenish grey slightly sandy silty CLAY
CP209	17D	9.10	9.10	24.1	BYE	2	33	NP		Yellowish brown slightly gravelly slightly sandy SILT
CP209	21D	11.40	11.40	18.2	BXE	0	56	29	27	Greyish brown slightly sandy silty CLAY
CP209	25Cs	14.50	14.50	15.2	BXE	0	46	23	23	Dark grey slightly sandy silty CLAY
CP209	28Cs	16.90	16.90	16.3	BXE	0	48	26	22	Grey slightly sandy silty CLAY
CP212	4D	1.20	1.20	9.6	BYE	61	30	18	12	Yellowish brown slightly sandy gravelly silty CLAY
CP212	10D	2.80	2.80	9.2	BXE	77	31	20	11	Orangish brown sandy very clayey GRAVEL
CP212	24Cs	12.00	12.10	23.2	BXE	0	53	23	30	Brown mottled orange slightly sandy silty CLAY
CP212	27Cs	13.90	13.90	21.1	BXE	9	49	24	25	Greyish brown slightly gravelly slightly sandy silty CLAY
CP216	6D	1.65	1.65	20.4	BXE	0	37	20	17	Orangish brown slightly sandy silty CLAY
CP216	11D	3.65	3.65	20.4	BXE	58	41	22	19	Yellowish brown sandy very clayey GRAVEL
CP216	16D	6.20	6.20	22.8	BXE	14	35	20	15	Orangish brown mottled grey slightly sandy slightly gravelly silty CLAY
CP216	22D	8.20	8.20	14.3	BXE	29	33	20	13	Orangish and yellowish brown slightly sandy slightly gravelly silty CLAY
CP216	27Cs	9.85	9.85	25	BXE	4	46	23	23	Greyish brown mottled orange slightly gravelly slightly sandy silty CLAY
CP216	31D	12.60	12.60	18.2	BXE	1	52	26	26	Brown mottled orange slightly sandy silty CLAY
CP216	36Cs	16.60	16.60	14.6	BXE	0	40	25	15	Grey slightly sandy silty CLAY

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

specimen preparation

A - as received

B - washed on 0.425mm sieve

C - air dried

D - oven dried (60oC)

E - oven dried (105oC)

F - not known

test method

X - cone penetrometer (test 4.3)

Y - cone penetrometer (test 4.4)

Z - casagrande apparatus (test 4.5)

CONTRACT

**35205**

CHECKED

**TB**

# LIQUID AND PLASTIC LIMITS

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
CP223	6UT	2.00	2.15	26	AXE	0	54	23	31	Greyish brown mottled grey and orange slightly sandy silty CLAY
CP223	13D	4.85	4.85	23.5	BXE	4	55	24	31	Grey slightly gravelly slightly sandy silty CLAY
CP223	18Cs	7.10	7.10	20.6	BXE	5	37	22	15	Grey mottled orangish brown slightly gravelly slightly sandy silty CLAY
CP223	22Cs	9.99	9.99	21.2	BXE	2	53	24	29	Grey slightly gravelly slightly sandy silty CLAY
CP223	24Cs	11.25	11.25	18.9	BXE	1	55	25	30	Grey slightly sandy silty CLAY
CP223	30C	15.00	16.20	3.1	BXE	3	45	24	21	Light brown slightly gravelly slightly sandy silty CLAY
CP223	34Cs	18.98	18.98	14.4	BXE	1	51	24	27	Grey slightly sandy silty CLAY
CP230	16D	6.80	6.80	20.6	BXE	2	33	18	15	Light brown mottled orange slightly gravelly slightly sandy silty CLAY
CP230	23D	10.90	10.90	20.2	BXE	1	48	24	24	Greyish brown slightly sandy silty CLAY
CP230	26D	14.20	14.20	23.9	BXE	0	53	23	30	Brown slightly sandy silty CLAY
DSRC107	19D	5.20	5.20	13.6	BZE	65	45	19	26	Yellowish brown sandy very clayey GRAVEL
DSRC107	23D	7.00	7.00	19.7	BXE	1	39	20	19	Greyish brown slightly sandy silty CLAY
DSRC107	31Cs	10.00	10.30	14.8	BXE	1	44	22	22	Dark grey slightly sandy silty CLAY
DSRC107	35Cs	12.50	12.80	15	BXE	1	47	21	26	Greyish brown slightly sandy silty CLAY with rare shell fragments
DSRC107	40Cs	15.95	15.95	9.7	BXE	1	55	25	30	Greyish brown slightly sandy silty CLAY
DSRC107	45Cs	18.60	18.60	15.9	BXE	1	48	23	25	Grey slightly sandy silty CLAY
DSRC107	51Cs	22.20	22.20	17.5	BXE	1	51	26	25	Grey slightly sandy silty CLAY
DSRC107	57Cs	26.70	26.70	14	BXE	0	48	24	24	Grey slightly sandy silty CLAY
DSRC108	6D	1.70	1.70	18.2	BXE	64	45	25	20	Orangish brown slightly sandy gravelly silty CLAY

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

specimen preparation

A - as received

B - washed on 0.425mm sieve

C - air dried

D - oven dried (60oC)

E - oven dried (105oC)

F - not known

test method

X - cone penetrometer (test 4.3)

Y - cone penetrometer (test 4.4)

Z - casagrande apparatus (test 4.5)

CONTRACT

**35205**

CHECKED

**TB**

# LIQUID AND PLASTIC LIMITS

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
DSRC108	10D	3.20	3.20	19.9	BXE	28	40	23	17	Orangish brown slightly sandy slightly gravelly silty CLAY
DSRC108	11L	3.20	3.90	3.2	BXE	3	36	20	16	Light brown slightly gravelly slightly sandy silty CLAY
DSRC108	15D	4.70	4.70	19.5	BXE	0	37	23	14	Brownish grey mottled orange slightly sandy silty CLAY
DSRC108	17UT	5.20	5.20	29.9	BXE	19	40	30	10	Orangish brown slightly sandy slightly gravelly clayey SILT
DSRC108	23D	7.40	7.40	21.2	BXE	1	39	27	12	Grey mottled orange slightly sandy clayey SILT
DSRC108	24C	7.50	8.50	13.7	BXE	0	36	20	16	Greyish brown slightly sandy silty CLAY
DSRC108	29C	10.50	11.00	13.6	BXE	3	46	21	25	Grey slightly gravelly slightly sandy silty CLAY
DSRC108	30D	10.90	10.90	13.4	BXE	2	42	22	20	Grey slightly sandy slightly silty CLAY
DSRC108	35D	13.90	13.90	13.6	BXE	5	42	19	23	Grey slightly gravelly slightly sandy slightly silty CLAY
DSRC108	36Cs	14.20	14.30	13.3	BXE	6	47	23	24	Grey slightly gravelly slightly sandy silty CLAY
DSRC108	46Cs	22.55	22.55	13.2	BXE	0	45	22	23	Grey slightly sandy silty CLAY
DSRC207	4D	1.20	1.20	19	BXE	21	39	23	16	Orangish brown slightly sandy slightly gravelly silty CLAY
DSRC207	8D	2.20	2.20	12.9	BZE	59	36	20	16	Orangish brown sandy very clayey GRAVEL
DSRC207	25Cs	12.00	12.00	19.5	BXE	0	43	21	22	Dark grey slightly sandy silty CLAY
DSRC207	31Cs	15.45	15.50	16.5	BXE	1	45	22	23	Brown mottled grey slightly gravelly slightly sandy silty CLAY
DSRC207	34Cs	17.60	17.60	18.3	BXE	1	44	20	24	Grey and brown slightly sandy silty CLAY
DSRC207	39Cs	20.00	20.00	21	BXE	1	55	25	30	Grey slightly sandy silty CLAY
DSRC224	13D	4.20	4.20	22.7	BYE	0	33	NP		Light brown slightly sandy SILT
DSRC224	17D	6.20	6.20	20.7	E					Yellowish brown slightly sandy clayey SILT

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

specimen preparation

A - as received

B - washed on 0.425mm sieve

C - air dried

D - oven dried (60oC)

E - oven dried (105oC)

F - not known

test method

X - cone penetrometer (test 4.3)

Y - cone penetrometer (test 4.4)

Z - casagrande apparatus (test 4.5)

CONTRACT

**35205**

CHECKED

**WJ**

# LIQUID AND PLASTIC LIMITS

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
DSRC224	18L	6.20	6.90	2.1	BXE	1	32	22	10	Yellowish brown slightly sandy silty CLAY
DSRC224	22D	8.50	8.50	21.2	BXE	0	34	19	15	Light brown mottled grey slightly sandy silty CLAY
DSRC224	26C	10.00	10.50	7.6	BXE	0	34	20	14	Yellowish brown slightly sandy silty CLAY
DSRC224	31C	13.00	13.60	12.9	BXE	1	36	22	14	Yellowish and orangish brown slightly sandy silty CLAY
DSRC224	34C	14.50	15.00	15.3	BYE	2	35	NP		Orangish brown slightly gravelly slightly sandy SILT
DSRC224	37D	17.00	17.00	19.2	BXE	0	37	19	18	Grey mottled brown slightly sandy silty CLAY
DSRC224	40Cs	18.50	18.50	16.9	AXE	0	39	21	18	Grey mottled brown and orange slightly sandy silty CLAY
DSRC224	45Cs	22.20	22.20	14.8	BXE	1	53	25	28	Dark grey silty CLAY
DSRC224	49Cs	27.00	27.05	16.2	BXE	0	49	24	25	Grey slightly sandy silty CLAY
DSRC224	53Cs	31.45	31.50	14.3	BXE	3	49	22	27	Grey slightly gravelly slightly sandy silty CLAY
DSRC224	55C	34.00	34.40	4.4	BXE	3	45	21	24	Light grey slightly gravelly slightly sandy silty CLAY
DSRC224	57Cs	36.45	36.45	15.8	BXE	0	47	22	25	Grey slightly sandy silty CLAY
TP204	4D	0.90	0.90	26.8	BXE	9	46	22	24	Orangish brown slightly gravelly slightly sandy silty CLAY
TP204	7D	2.00	2.00	20	BXE	22	37	20	17	Yellowish brown slightly sandy slightly gravelly silty CLAY
TP204	10D	3.20	3.20	21.5	BXE	4	40	21	19	Brown and yellowish brown slightly gravelly slightly sandy silty CLAY
TP204	13BLK	4.80	4.95	18.7	BXE	8	36	23	13	Brown mottled grey and orange slightly gravelly slightly sandy silty CLAY
TP205	3D	0.50	0.50	22.8	BXE	2	35	20	15	Orangish brown slightly gravelly slightly sandy silty CLAY
TP205	6D	1.60	1.60	29.6	BXE	0	65	27	38	Brown mottled orange slightly sandy silty CLAY
TP205	8D	2.40	2.40	23.8	BXE	29	50	21	29	Orangish brown slightly sandy slightly gravelly silty CLAY

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

specimen preparation

A - as received

B - washed on 0.425mm sieve

C - air dried

D - oven dried (60oC)

E - oven dried (105oC)

F - not known

test method

X - cone penetrometer (test 4.3)

Y - cone penetrometer (test 4.4)

Z - casagrande apparatus (test 4.5)

CONTRACT

**35205**

CHECKED

**TB**

# LIQUID AND PLASTIC LIMITS

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
TP207	3D	0.50	0.50	17.9	BXE	48	46	23	23	Orangish brown slightly sandy gravelly silty CLAY
TP207	4D	0.90	0.90	18.5	BXE	37	42	20	22	Orangish brown slightly sandy slightly gravelly silty CLAY
TP207	12BLK	3.90	3.95	21	BXE	1	57	24	33	Greyish brown slightly sandy silty CLAY with rare shell fragments
TP601	7D	2.70	2.70	22.8	BXE	42	48	26	22	Brown mottled orange slightly sandy slightly gravelly silty CLAY
TP601	10D	4.00	4.00	25.5	BXE	41	47	24	23	Brown mottled orange slightly sandy slightly gravelly silty CLAY

general remarks  
 natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)  
 NP denotes non plastic  
 # denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

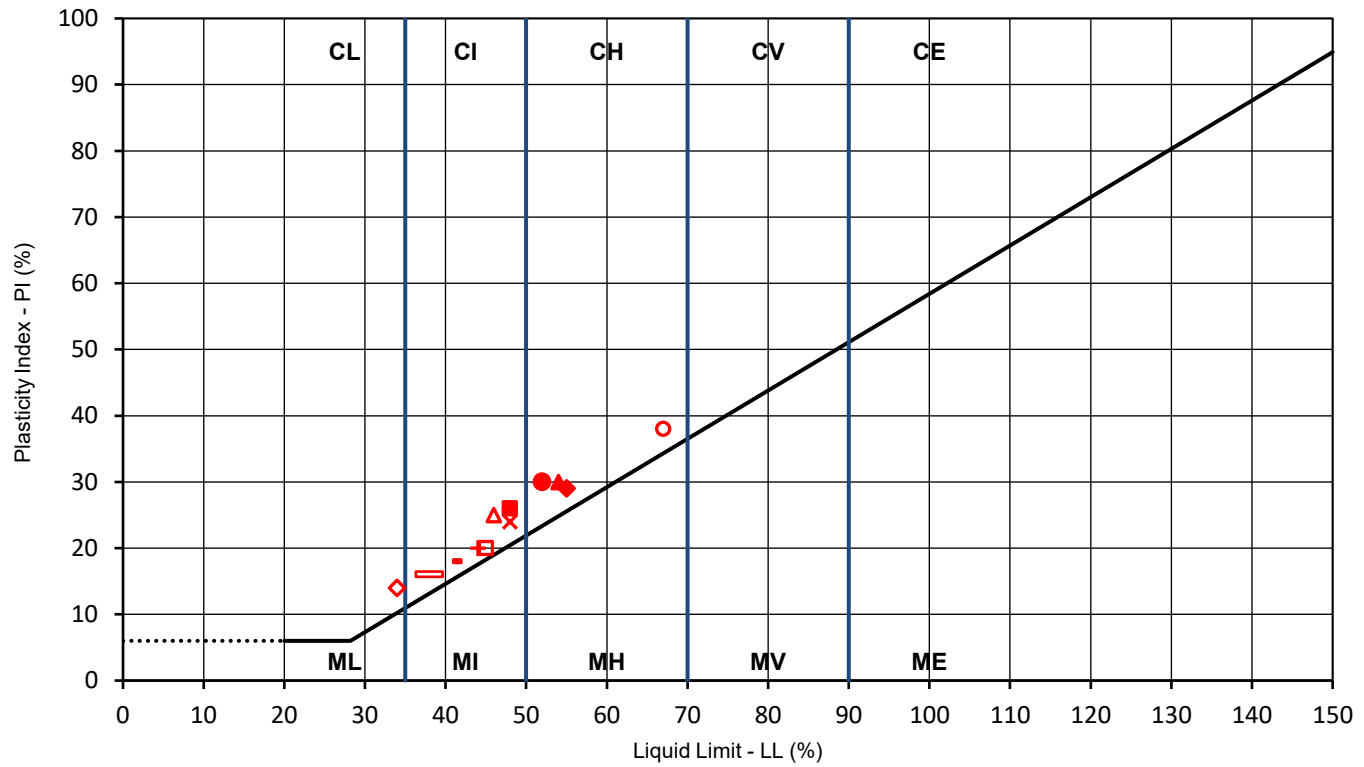
specimen preparation	test method	CONTRACT	CHECKED
A - as received	X - cone penetrometer (test 4.3)	<b>35205</b>	<b>TB</b>
B - washed on 0.425mm sieve	Y - cone penetrometer (test 4.4)		
C - air dried	Z - casagrande apparatus (test 4.5)		
D - oven dried (60oC)			
E - oven dried (105oC)			
F - not known			

Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	CP105	1.20	45	25	20	
◇	CP105	5.80	34	20	14	
△	CP105	11.90	46	21	25	
×	CP105	14.60	48	24	24	
+	CP105	17.20	44	24	20	
○	CP106	3.00	67	29	38	
■	CP106	7.50	48	22	26	
◆	CP106	16.40	55	26	29	
▲	CP106	19.25	54	24	30	
●	CP106	22.80	52	22	30	
▣	CP206	3.00	38	22	16	
-	CP206	5.10	41	23	18	

CONTRACT	CHECKED
<b>35205</b>	<b>TB</b>

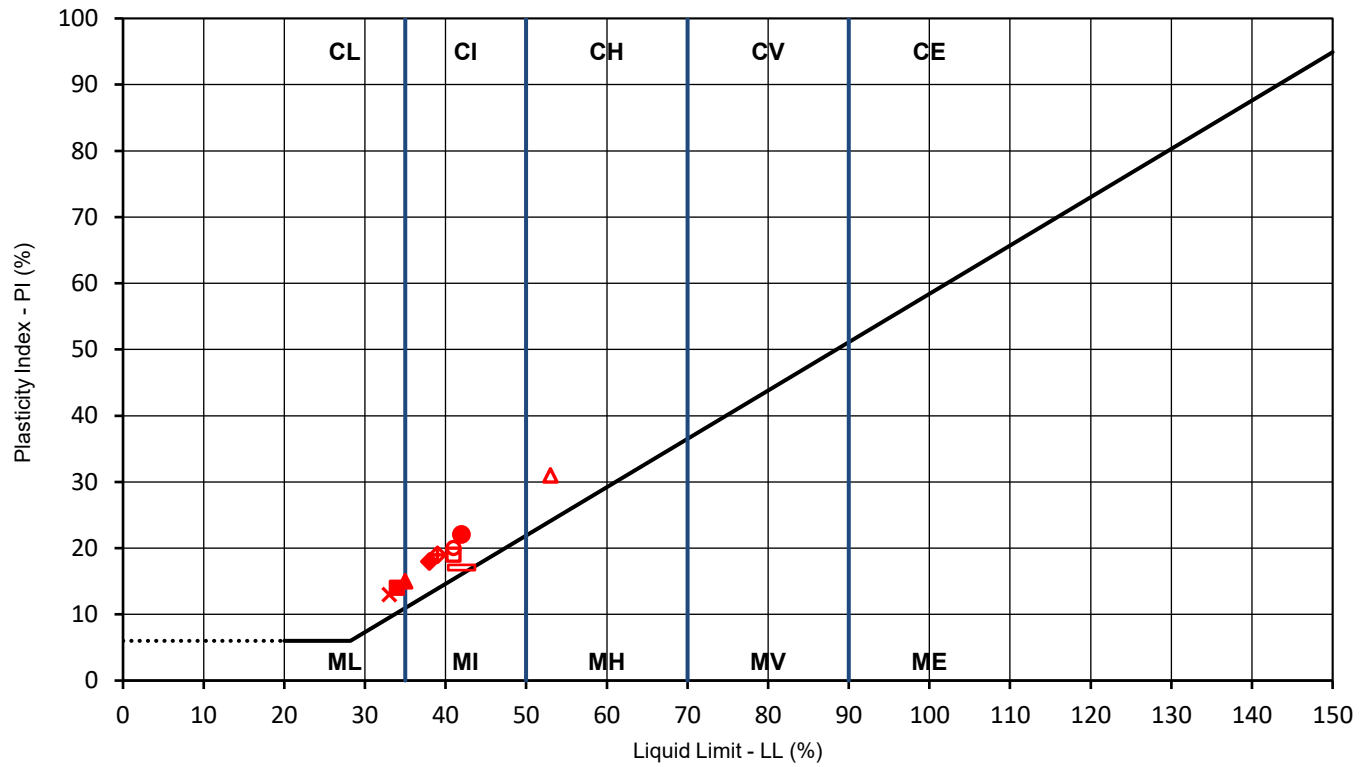


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**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	CP206	7.00	41	22	19	
◇	CP206	9.00	39	20	19	
△	CP206	10.40	53	22	31	
×	CP206	12.80	33	20	13	
+	CP208	2.00	39	20	19	
○	CP208	5.60	41	21	20	
■	CP208	7.00	34	20	14	
◆	CP208	9.50	38	20	18	
▲	CP208	13.70	35	20	15	
●	CP208	16.10	42	20	22	
▣	CP208	22.55	42	25	17	
	CP209	9.10	33	NP		

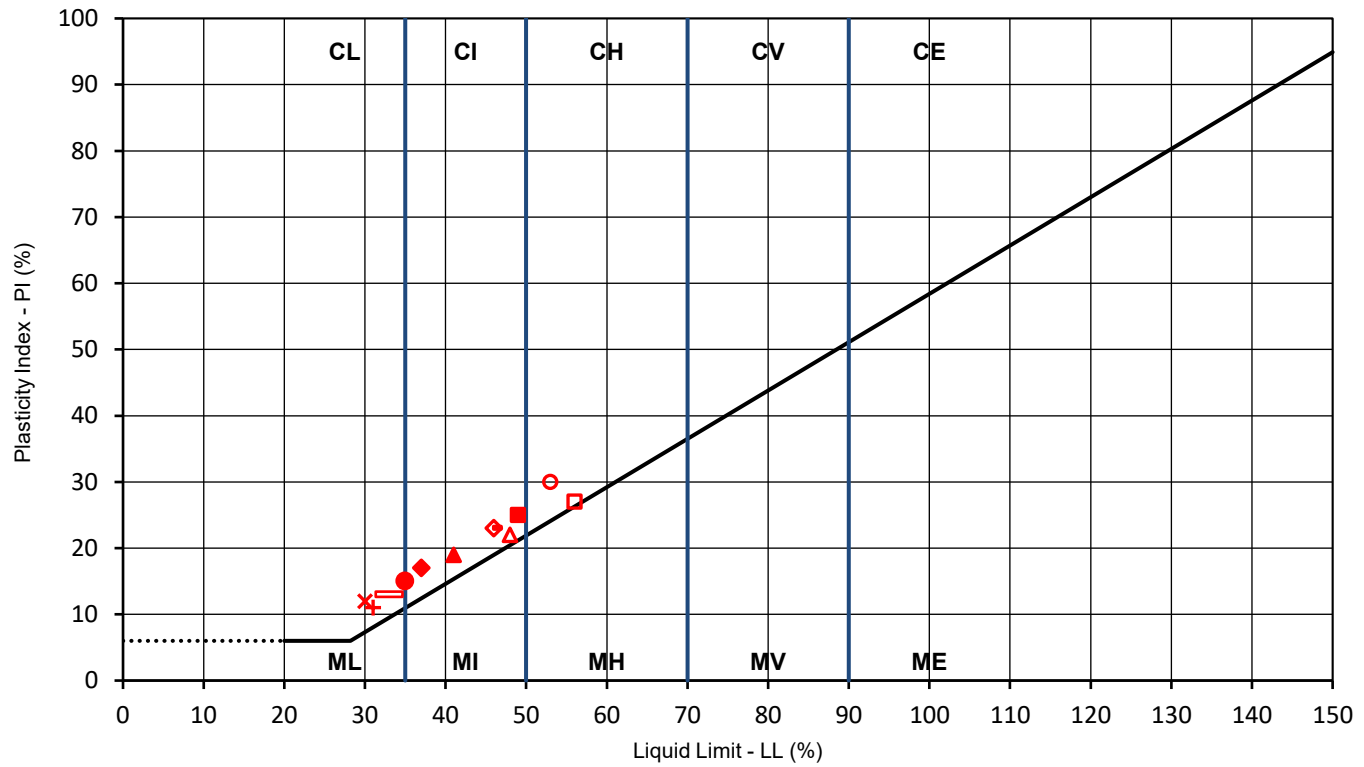
CONTRACT	CHECKED
<b>35205</b>	<b>TB</b>

Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	CP209	11.40	56	29	27	
◇	CP209	14.50	46	23	23	
△	CP209	16.90	48	26	22	
×	CP212	1.20	30	18	12	
+	CP212	2.80	31	20	11	
○	CP212	12.10	53	23	30	
■	CP212	13.90	49	24	25	
◆	CP216	1.65	37	20	17	
▲	CP216	3.65	41	22	19	
●	CP216	6.20	35	20	15	
▣	CP216	8.20	33	20	13	
▪	CP216	9.85	46	23	23	

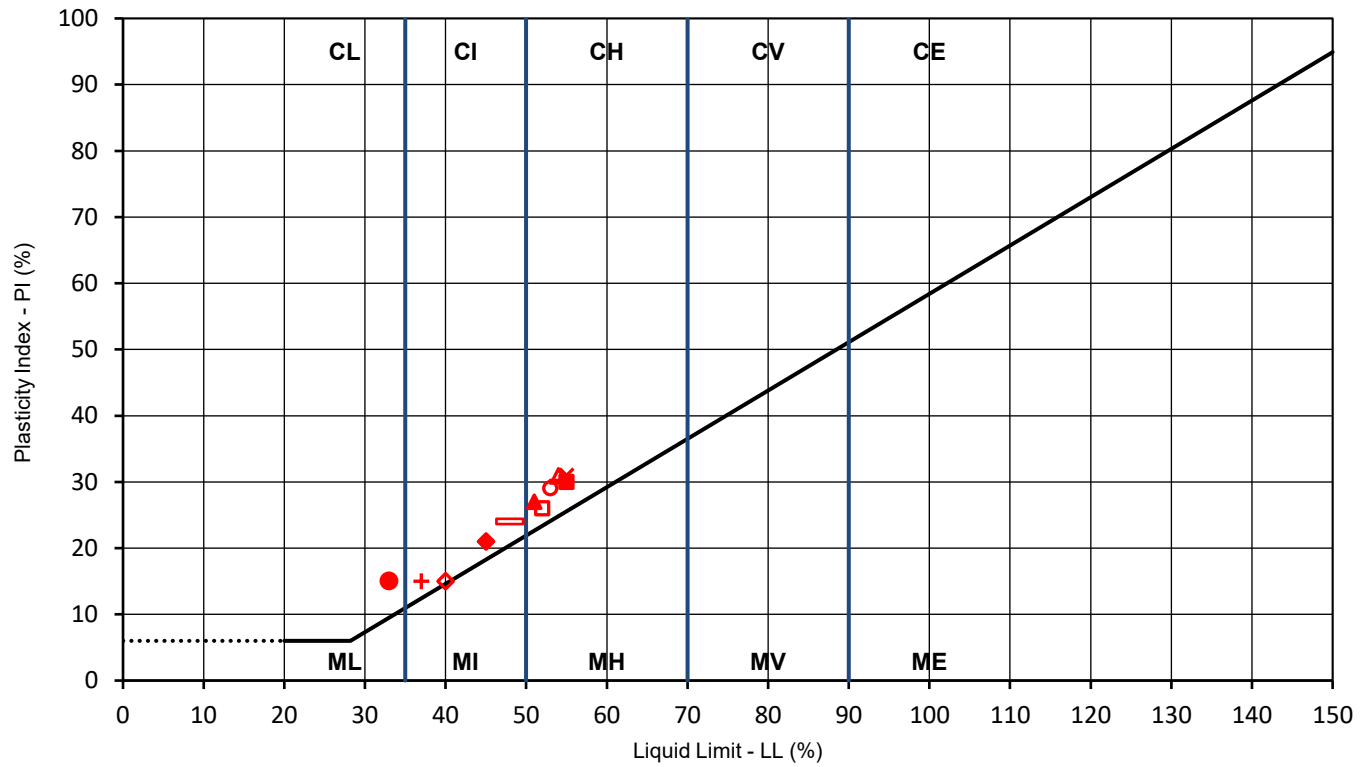
CONTRACT	CHECKED
<b>35205</b>	<b>TB</b>

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**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	CP216	12.60	52	26	26	
◇	CP216	16.60	40	25	15	
△	CP223	2.15	54	23	31	
×	CP223	4.85	55	24	31	
+	CP223	7.10	37	22	15	
○	CP223	9.99	53	24	29	
■	CP223	11.25	55	25	30	
◆	CP223	16.20	45	24	21	
▲	CP223	18.98	51	24	27	
●	CP230	6.80	33	18	15	
▢	CP230	10.90	48	24	24	
▪	CP230	14.20	53	23	30	

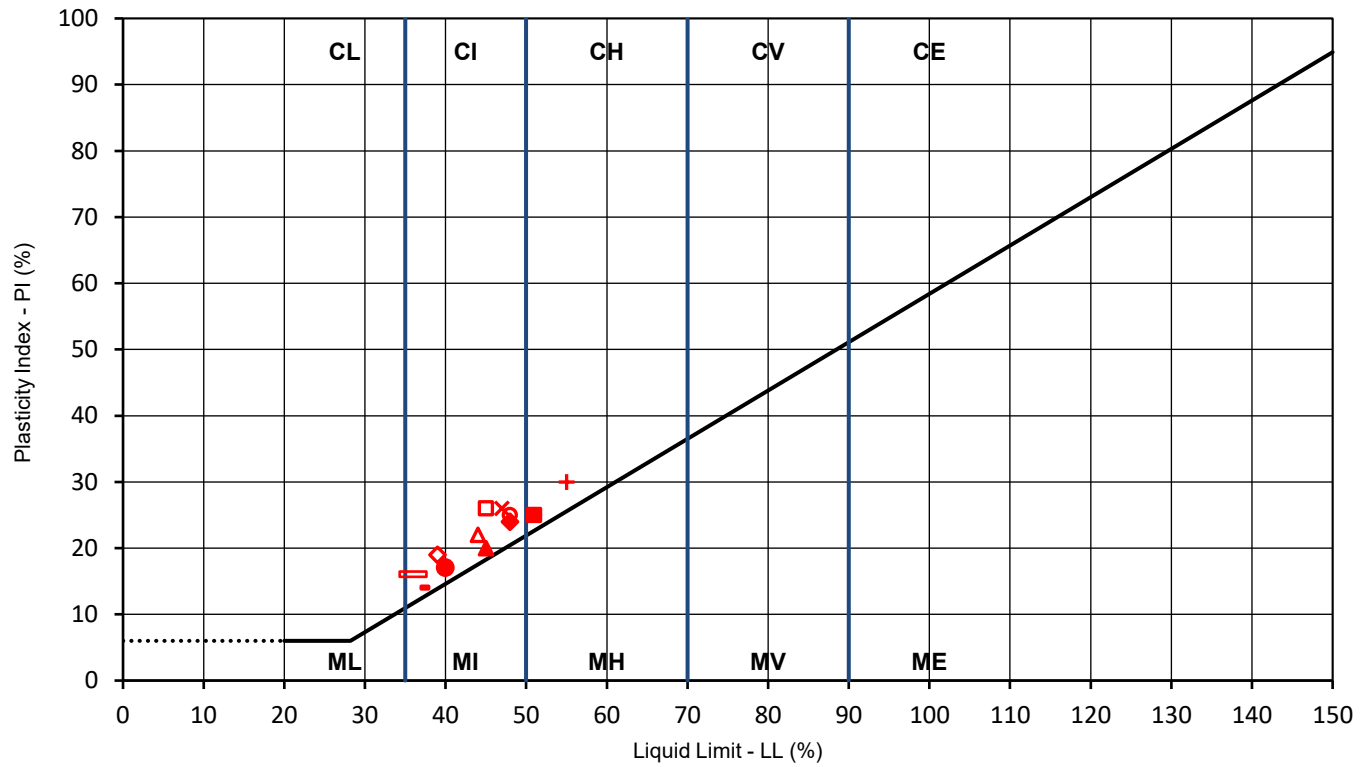
CONTRACT	CHECKED
<b>35205</b>	<b>TB</b>

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**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	DSRC107	5.20	45	19	26	
◇	DSRC107	7.00	39	20	19	
△	DSRC107	10.30	44	22	22	
×	DSRC107	12.80	47	21	26	
+	DSRC107	15.95	55	25	30	
○	DSRC107	18.60	48	23	25	
■	DSRC107	22.20	51	26	25	
◆	DSRC107	26.70	48	24	24	
▲	DSRC108	1.70	45	25	20	
●	DSRC108	3.20	40	23	17	
▣	DSRC108	3.90	36	20	16	
▪	DSRC108	4.70	37	23	14	

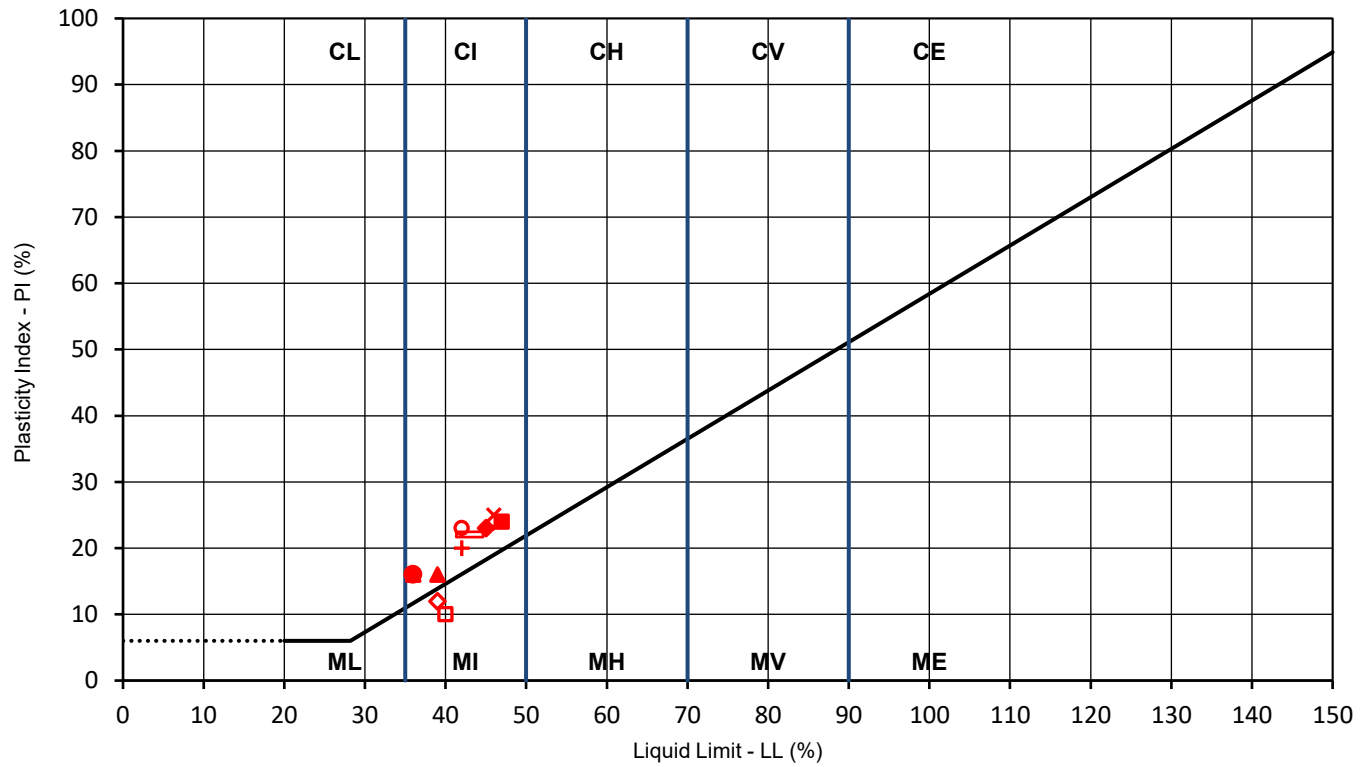
CONTRACT	CHECKED
<b>35205</b>	<b>TB</b>

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**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	DSRC108	5.20	40	30	10	
◇	DSRC108	7.40	39	27	12	
△	DSRC108	8.50	36	20	16	
×	DSRC108	11.00	46	21	25	
+	DSRC108	10.90	42	22	20	
○	DSRC108	13.90	42	19	23	
■	DSRC108	14.30	47	23	24	
◆	DSRC108	22.55	45	22	23	
▲	DSRC207	1.20	39	23	16	
●	DSRC207	2.20	36	20	16	
◻	DSRC207	12.00	43	21	22	
▪	DSRC207	15.50	45	22	23	

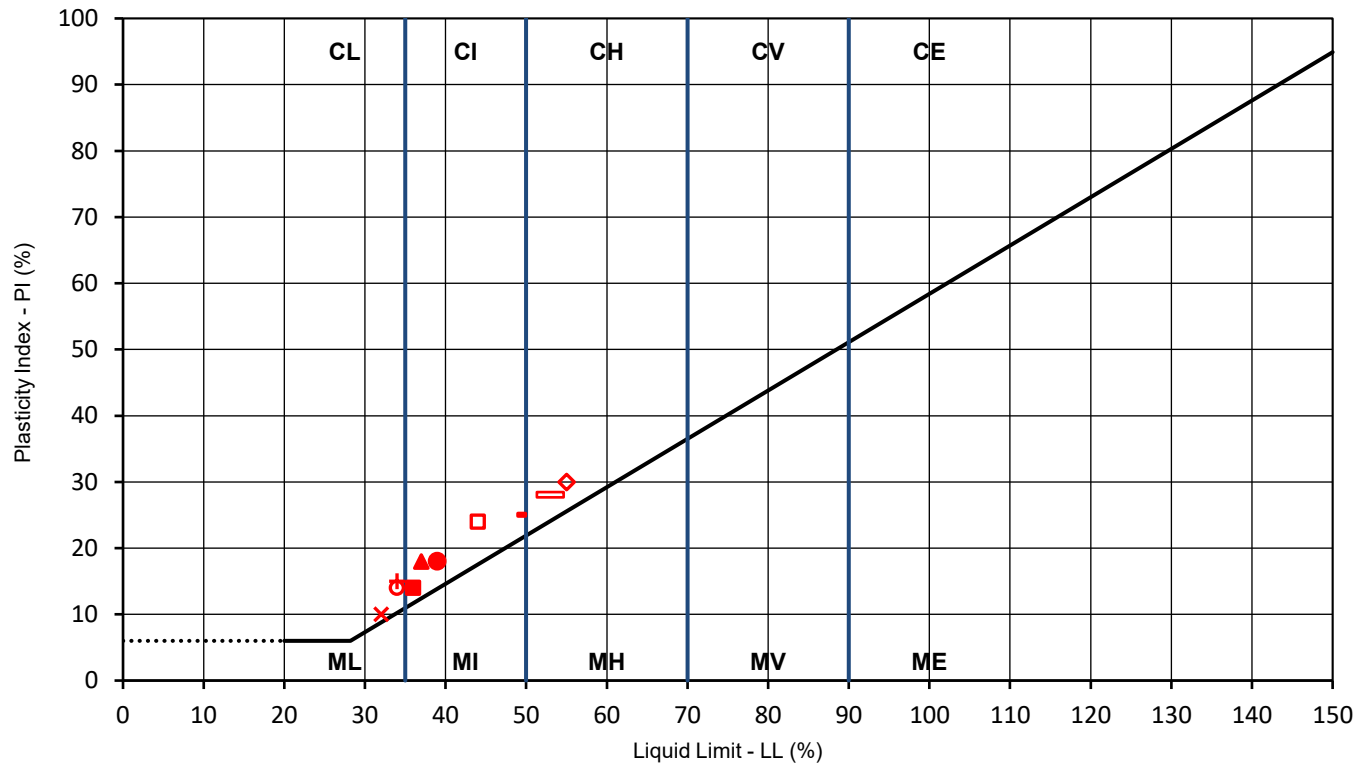
CONTRACT	CHECKED
<b>35205</b>	<b>TB</b>

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**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	DSRC207	17.60	44	20	24	
◇	DSRC207	20.00	55	25	30	
	DSRC224	4.20	33	NP		
×	DSRC224	6.90	32	22	10	
+	DSRC224	8.50	34	19	15	
○	DSRC224	10.50	34	20	14	
■	DSRC224	13.60	36	22	14	
	DSRC224	15.00	35	NP		
▲	DSRC224	17.00	37	19	18	
●	DSRC224	18.50	39	21	18	
▣	DSRC224	22.20	53	25	28	
▪	DSRC224	27.05	49	24	25	

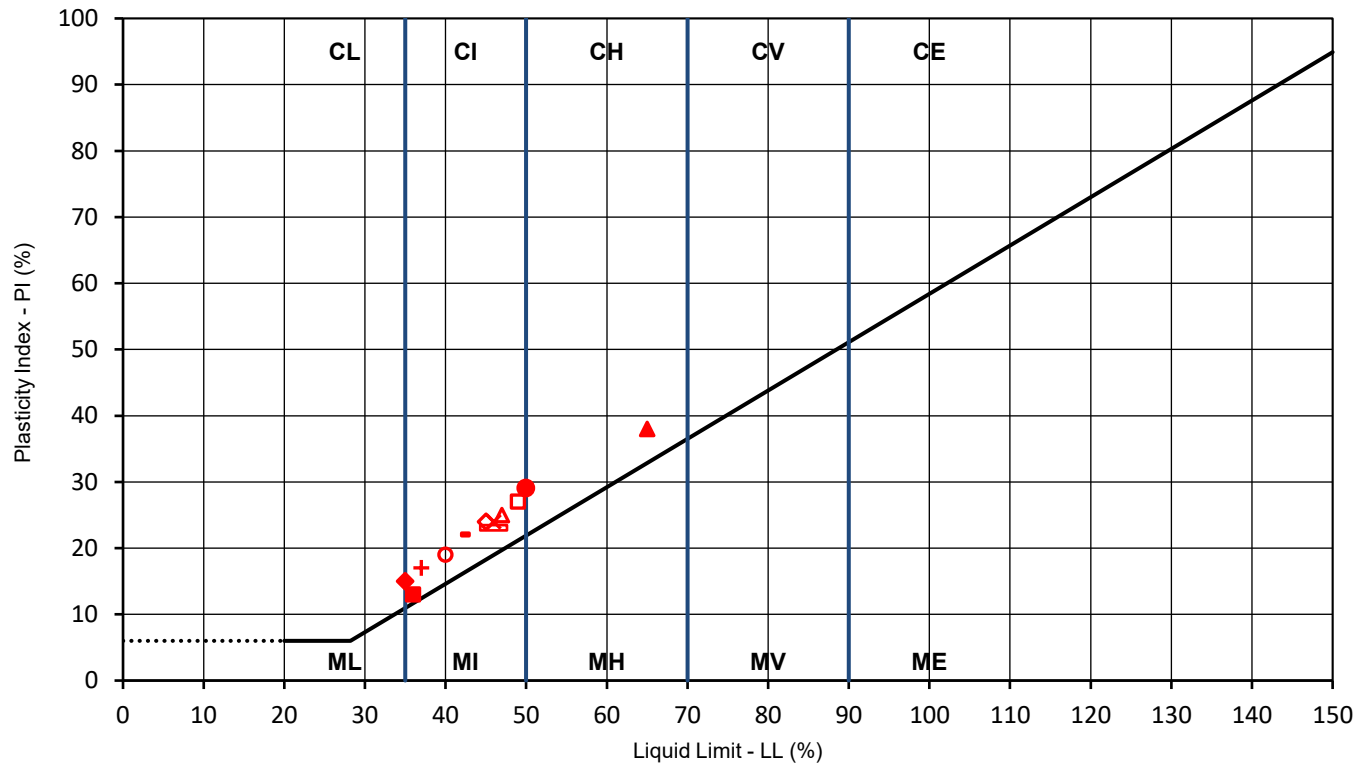
CONTRACT	CHECKED
<b>35205</b>	<b>TB</b>

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**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	DSRC224	31.50	49	22	27	
◇	DSRC224	34.40	45	21	24	
△	DSRC224	36.45	47	22	25	
×	TP204	0.90	46	22	24	
+	TP204	2.00	37	20	17	
○	TP204	3.20	40	21	19	
■	TP204	4.95	36	23	13	
◆	TP205	0.50	35	20	15	
▲	TP205	1.60	65	27	38	
●	TP205	2.40	50	21	29	
▣	TP207	0.50	46	23	23	
▪	TP207	0.90	42	20	22	

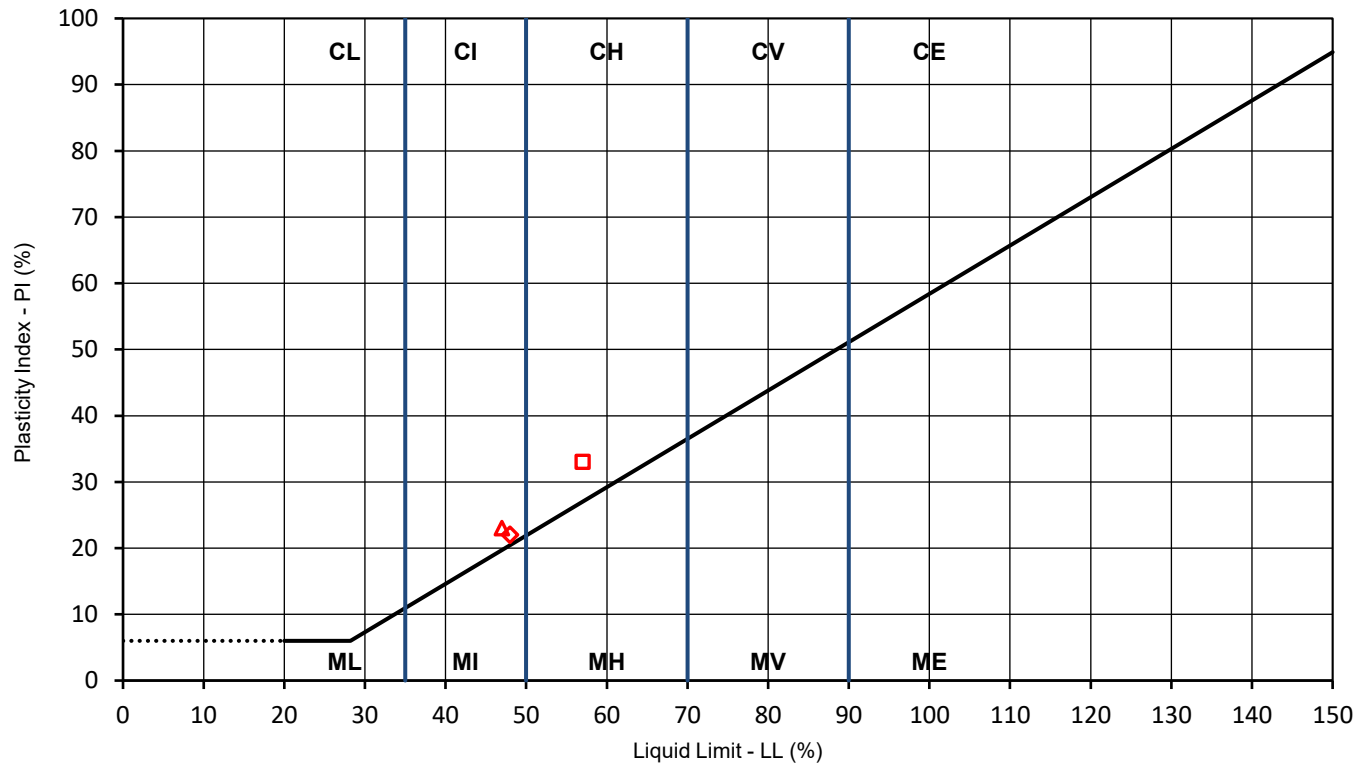
CONTRACT	CHECKED
<b>35205</b>	<b>TB</b>

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**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)



BH/TP No.	depth (m)	LL	PL	PI	remarks
□ TP207	3.95	57	24	33	
◇ TP601	2.70	48	26	22	
△ TP601	4.00	47	24	23	

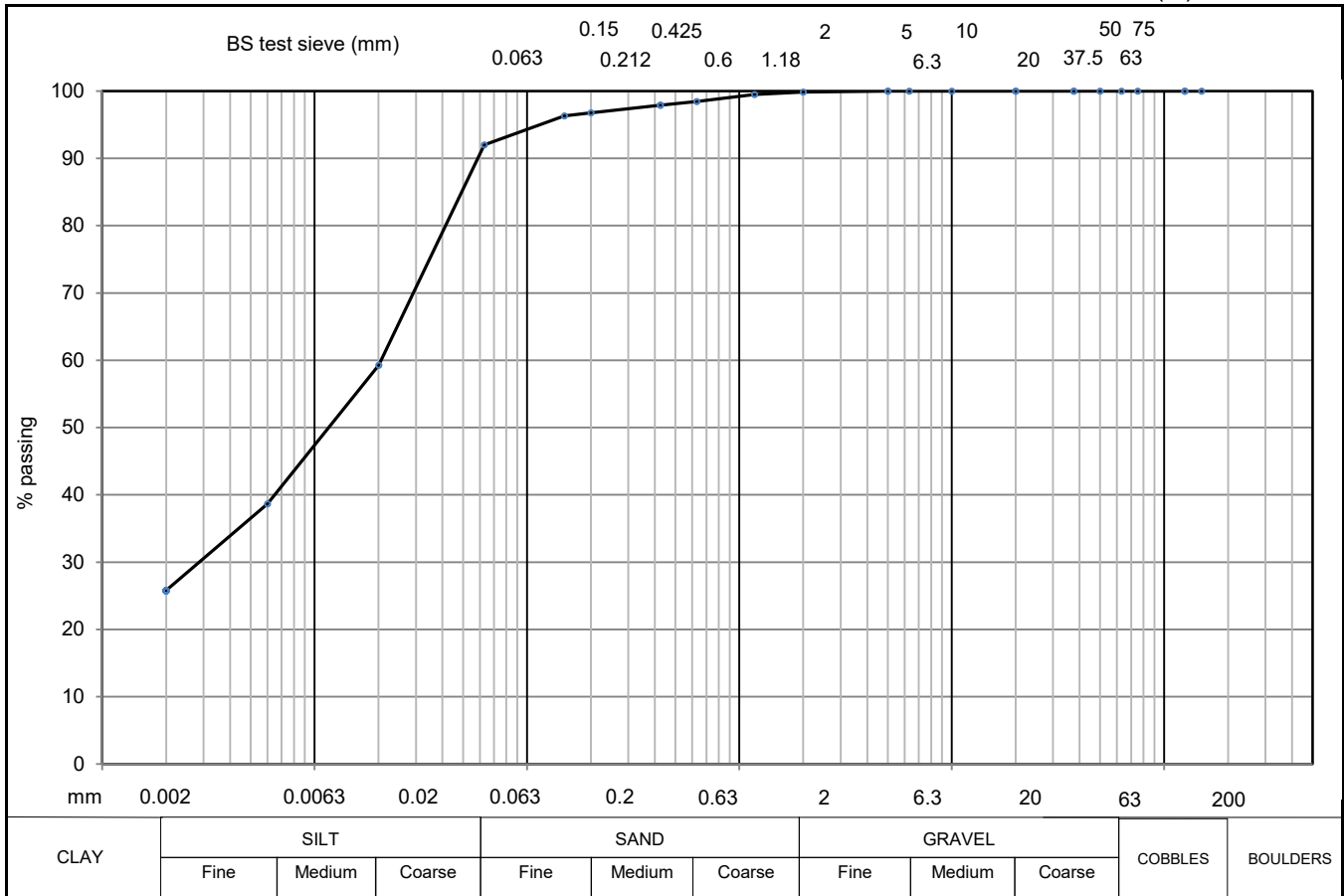
CONTRACT	CHECKED
<b>35205</b>	<b>TB</b>



Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP105
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	8L
DESCRIPTION	Light brown slightly sandy silty CLAY	SAMPLE DEPTH (m)	1.20
		SPECIMEN TOP (m)	1.20
		SPECIMEN BASE (m)	1.30



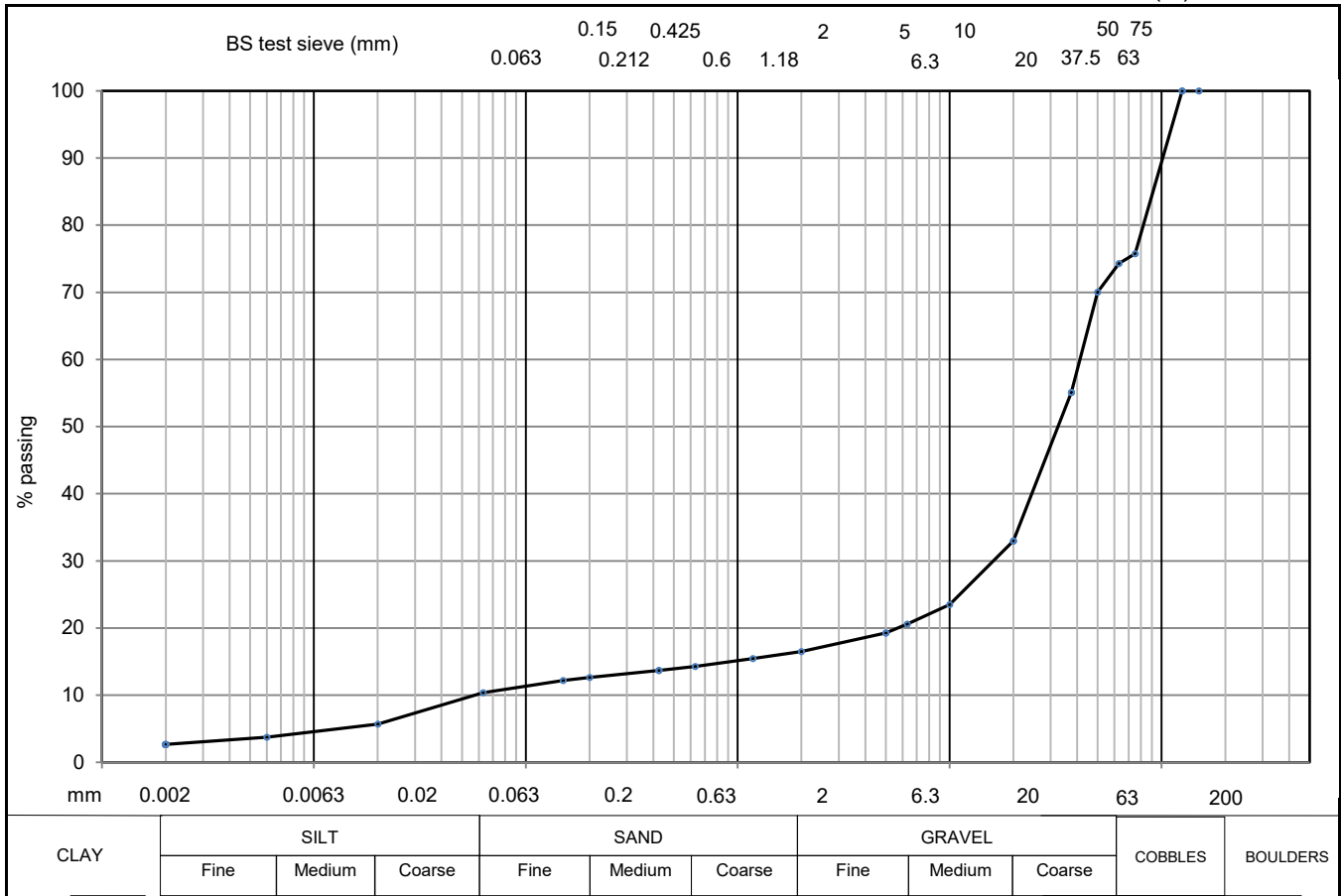
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	26						
SILT	66	150		5	100	20	59
SILT & CLAY	92						
SAND	8	75		2	100	6	39
GRAVEL	0						
COBBLE & BOULDER	0	63		1.18	99	2	26
test method(s)	5.2 & 5.4	50		0.63	98		
test method		37.5		0.425	98		
5.2 - sieving		20		0.2	97		
5.3 - sedimentation by hydrometer		10		0.15	96		
5.4 - sedimentation by pipette		6.3		0.063	92		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35205</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP105
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	24C
DESCRIPTION	Yellowish brown sandy silty GRAVEL with high cobble content	SAMPLE DEPTH (m)	6.00
		SPECIMEN TOP (m)	6.00
		SPECIMEN BASE (m)	9.00



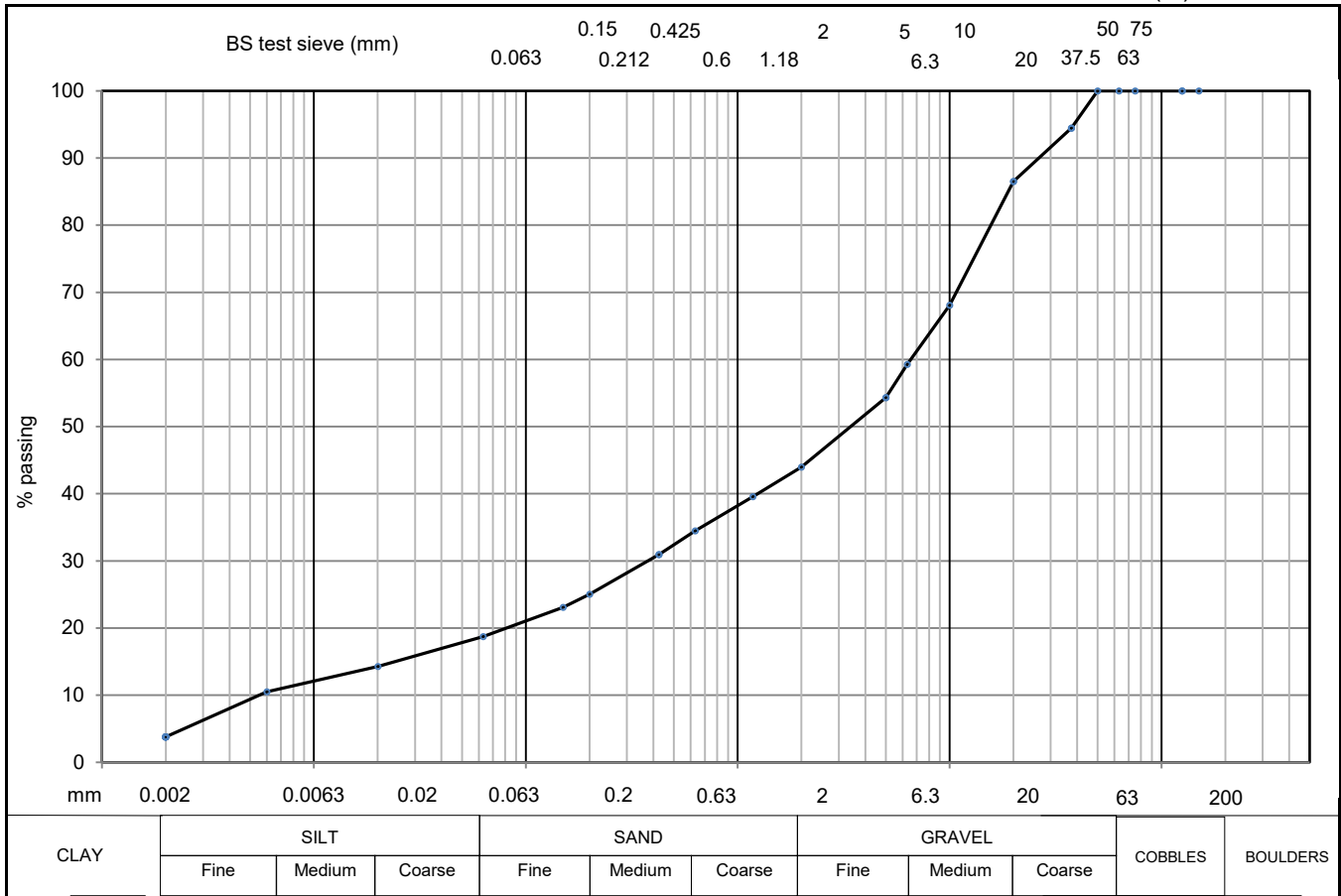
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	3						
SILT	8	150	100	5	19	20	6
SILT & CLAY	10						
SAND	6	75	76	2	16	6	4
GRAVEL	58						
COBBLE & BOULDER	26	63	74	1.18	15	2	3
test method(s)	5.2 & 5.4	50	70	0.63	14		
test method		37.5	55	0.425	14		
5.2 - sieving		20	33	0.2	13		
5.3 - sedimentation by hydrometer		10	23	0.15	12		
5.4 - sedimentation by pipette		6.3	21	0.063	10		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>35205</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP106
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	3B
DESCRIPTION	Light brown silty very sandy GRAVEL	SAMPLE DEPTH (m)	1.00
		SPECIMEN TOP (m)	1.00
		SPECIMEN BASE (m)	1.20



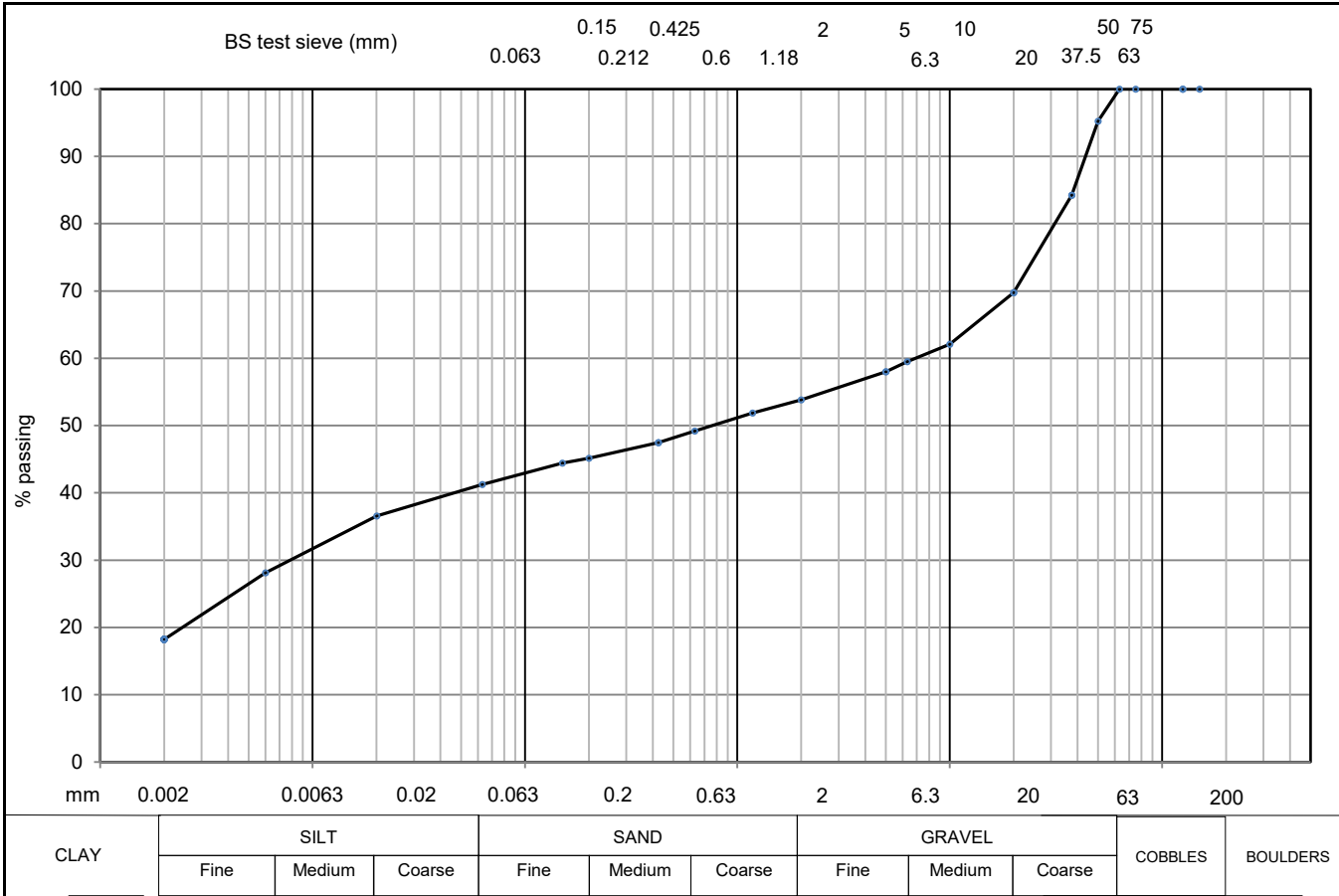
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	4						
SILT	15	150		5	54	20	14
SILT & CLAY	19						
SAND	25	75		2	44	6	11
GRAVEL	56						
COBBLE & BOULDER	0	63		1.18	40	2	4
test method(s)	5.2 & 5.4	50	100	0.63	34		
test method		37.5	94	0.425	31		
5.2 - sieving		20	87	0.2	25		
5.3 - sedimentation by hydrometer		10	68	0.15	23		
5.4 - sedimentation by pipette		6.3	59	0.063	19		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	CONTRACT <b>35205</b>	CHECKED <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP106
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	21L
DESCRIPTION	Light brown slightly sandy gravelly silty CLAY	SAMPLE DEPTH (m)	5.00
		SPECIMEN TOP (m)	5.50
		SPECIMEN BASE (m)	6.00



CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		

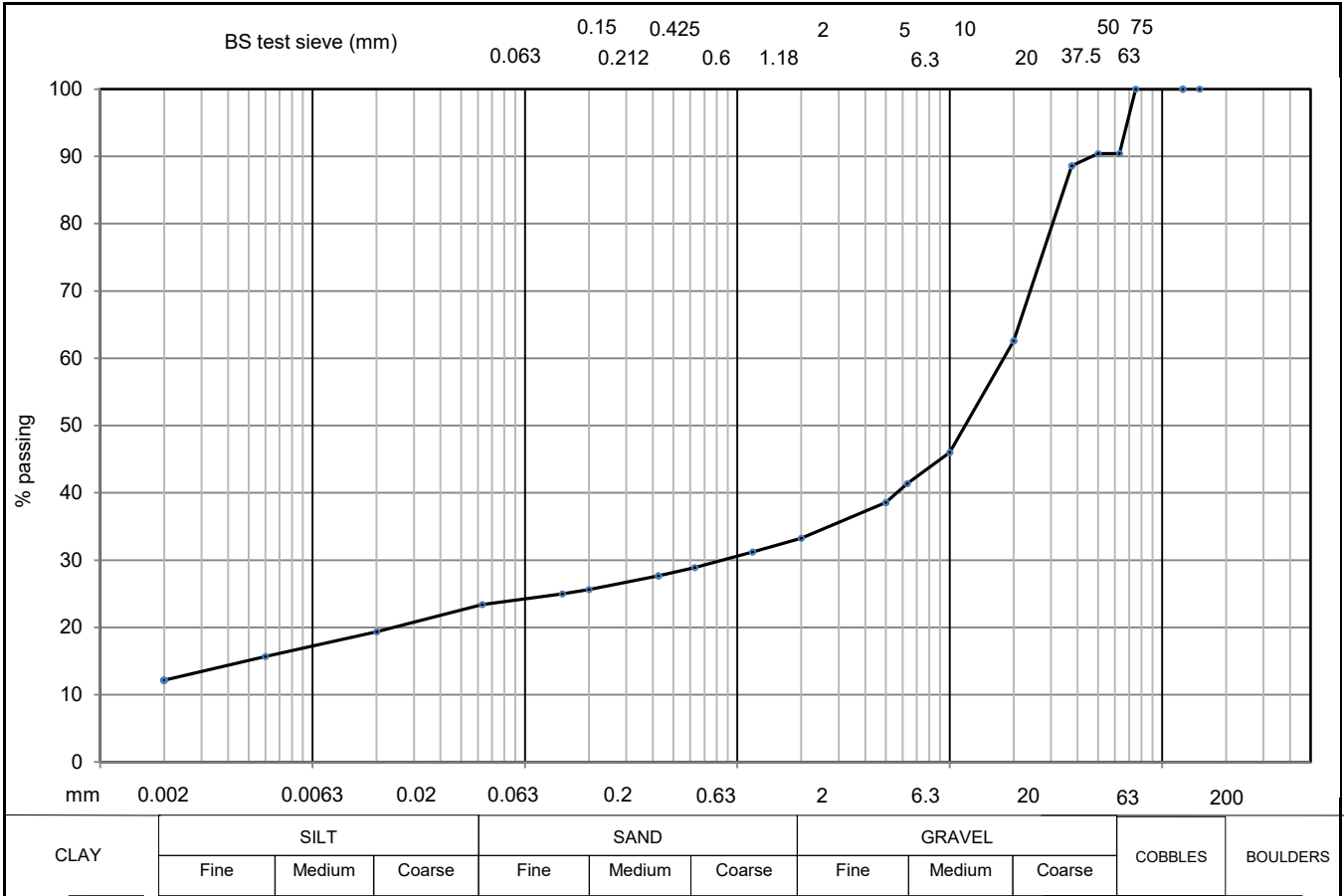
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	18						
SILT	23	150		5	58	20	37
SILT & CLAY	41						
SAND	13	75		2	54	6	28
GRAVEL	46						
COBBLE & BOULDER	0	63	100	1.18	52	2	18
test method(s)	5.2 & 5.4	50	95	0.63	49		
test method		37.5	84	0.425	47		
5.2 - sieving		20	70	0.2	45		
5.3 - sedimentation by hydrometer		10	62	0.15	44		
5.4 - sedimentation by pipette		6.3	60	0.063	41		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35205</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP206
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	3B
DESCRIPTION	Light brown sandy very clayey GRAVEL with medium cobble content	SAMPLE DEPTH (m)	0.80
		SPECIMEN TOP (m)	0.80
		SPECIMEN BASE (m)	1.00



CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		

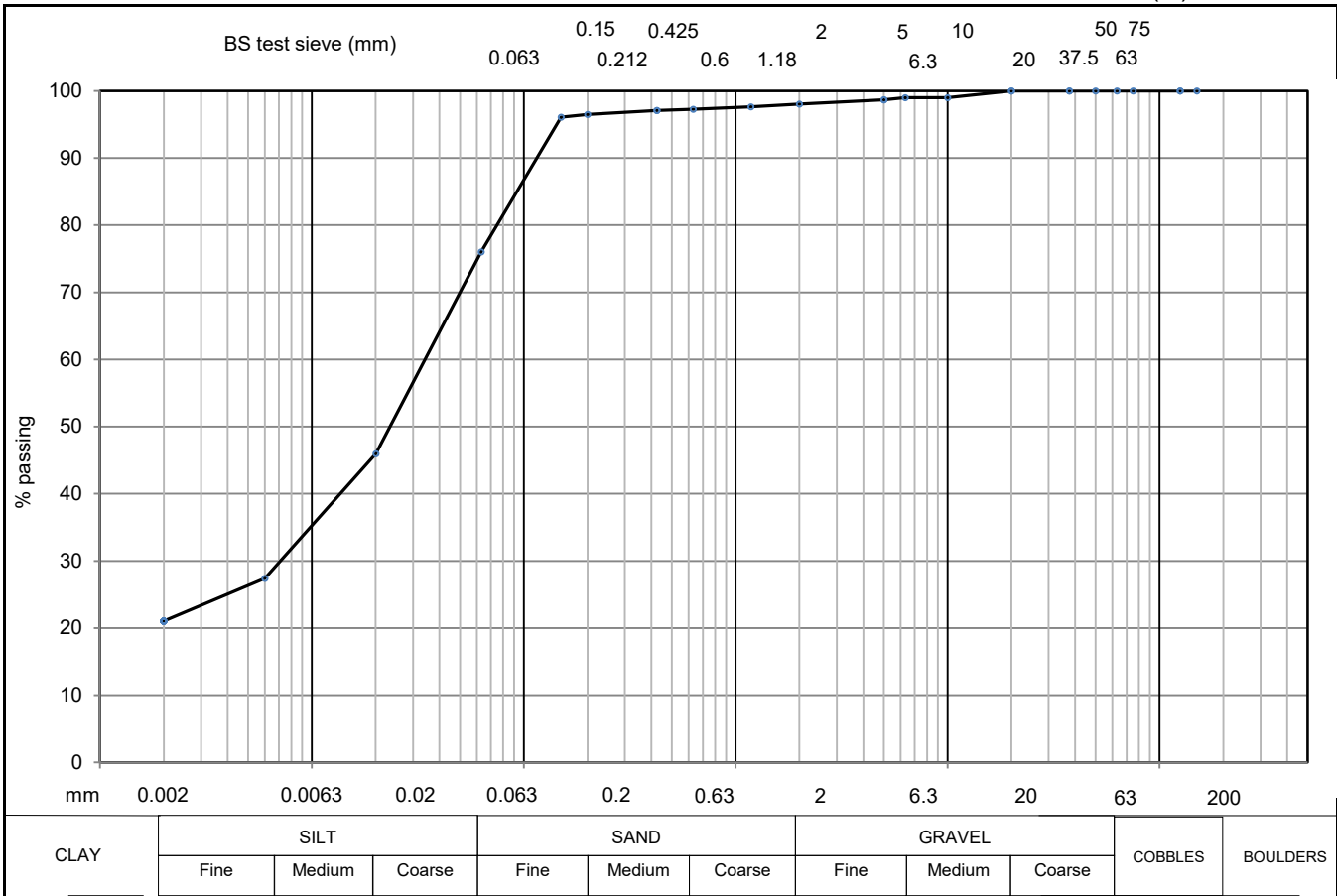
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	12						
SILT	11	150		5	39	20	19
SILT & CLAY	23						
SAND	10	75	100	2	33	6	16
GRAVEL	57						
COBBLE & BOULDER	10	63	90	1.18	31	2	12
test method(s)	5.2 & 5.4	50	90	0.63	29		
test method		37.5	89	0.425	28		
5.2 - sieving		20	63	0.2	26		
5.3 - sedimentation by hydrometer		10	46	0.15	25		
5.4 - sedimentation by pipette		6.3	41	0.063	23		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35205</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP206
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	18L
DESCRIPTION	Greyish brown slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	4.00
		SPECIMEN TOP (m)	4.00
		SPECIMEN BASE (m)	4.50



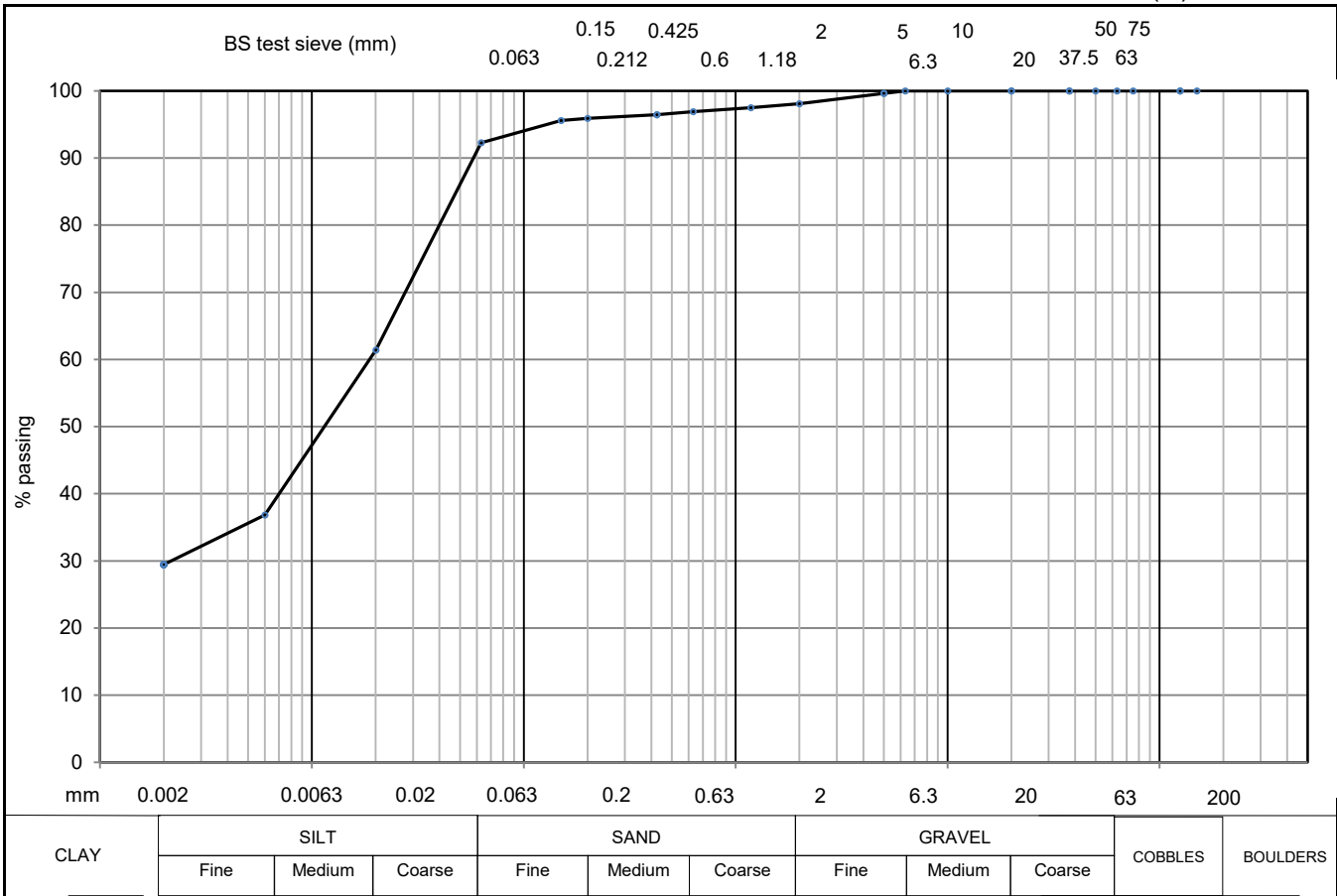
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	21						
SILT	55	150		5	99	20	46
SILT & CLAY	76						
SAND	22	75		2	98	6	27
GRAVEL	2						
COBBLE & BOULDER	0	63		1.18	98	2	21
test method(s)	5.2 & 5.4	50		0.63	97		
test method		37.5		0.425	97		
5.2 - sieving		20	100	0.2	96		
5.3 - sedimentation by hydrometer		10	99	0.15	96		
5.4 - sedimentation by pipette		6.3	99	0.063	76		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>CONTRACT</b> <b>35205</b>	<b>CHECKED</b> <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP208
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	13L
DESCRIPTION	Brown mottled grey slightly gravelly slightly sandy clayey SILT	SAMPLE DEPTH (m)	4.00
		SPECIMEN TOP (m)	4.40
		SPECIMEN BASE (m)	4.60



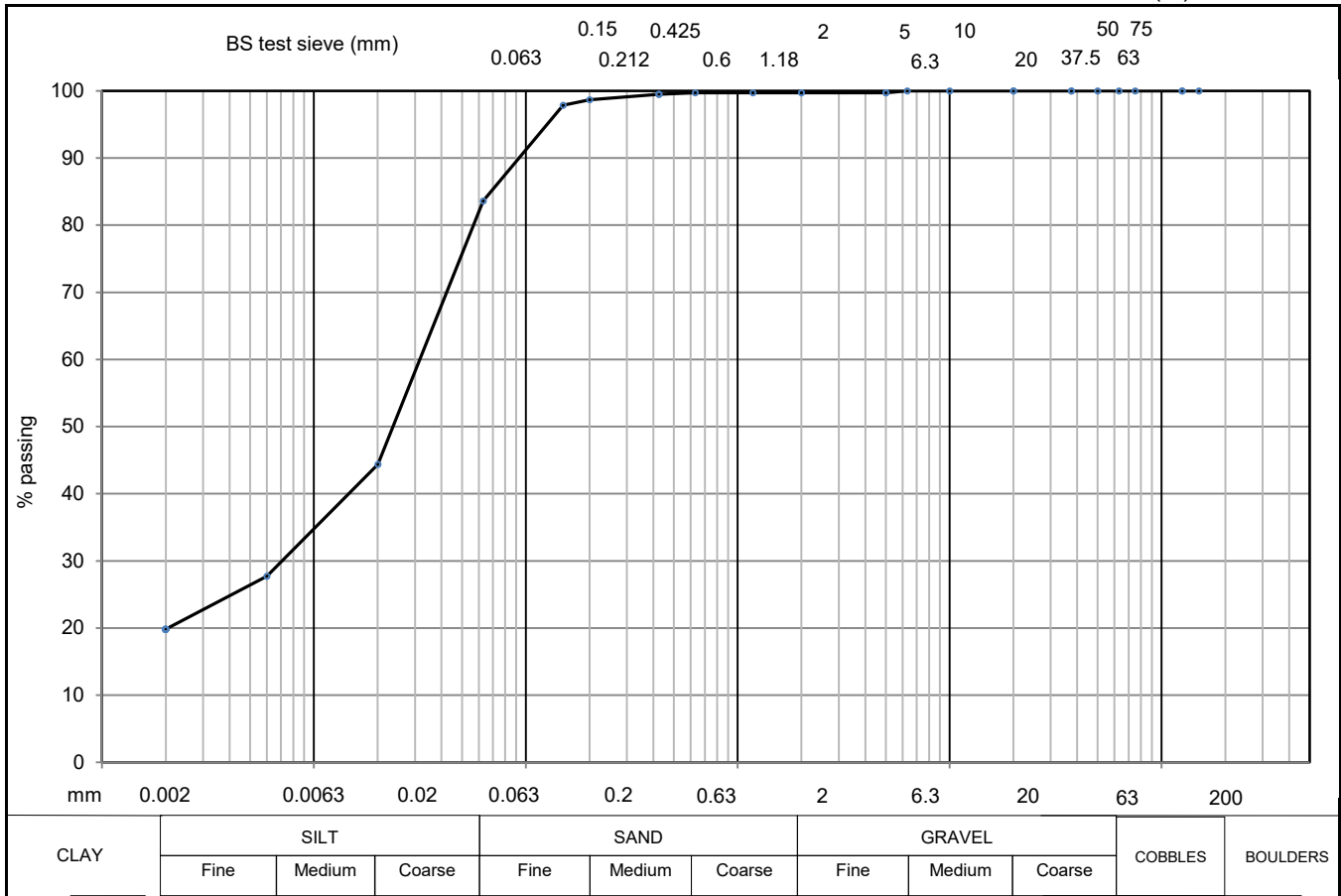
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	30						
SILT	63	150		5	100	20	61
SILT & CLAY	92						
SAND	6	75		2	98	6	37
GRAVEL	2						
COBBLE & BOULDER	0	63		1.18	97	2	29
test method(s)	5.2 & 5.4	50		0.63	97		
test method		37.5		0.425	96		
5.2 - sieving		20		0.2	96		
5.3 - sedimentation by hydrometer		10		0.15	96		
5.4 - sedimentation by pipette		6.3	100	0.063	92		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35205</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP208
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	31C
DESCRIPTION	Light brown slightly sandy clayey SILT	SAMPLE DEPTH (m)	13.00
		SPECIMEN TOP (m)	13.70
		SPECIMEN BASE (m)	14.00



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	20						
SILT	64	150		5	100	20	44
SILT & CLAY	84						
SAND	16	75		2	100	6	28
GRAVEL	0						
COBBLE & BOULDER	0	63		1.18	100	2	20
test method(s)	5.2 & 5.4	50		0.63	100		
test method		37.5		0.425	100		
5.2 - sieving		20		0.2	99		
5.3 - sedimentation by hydrometer		10		0.15	98		
5.4 - sedimentation by pipette		6.3	100	0.063	84		

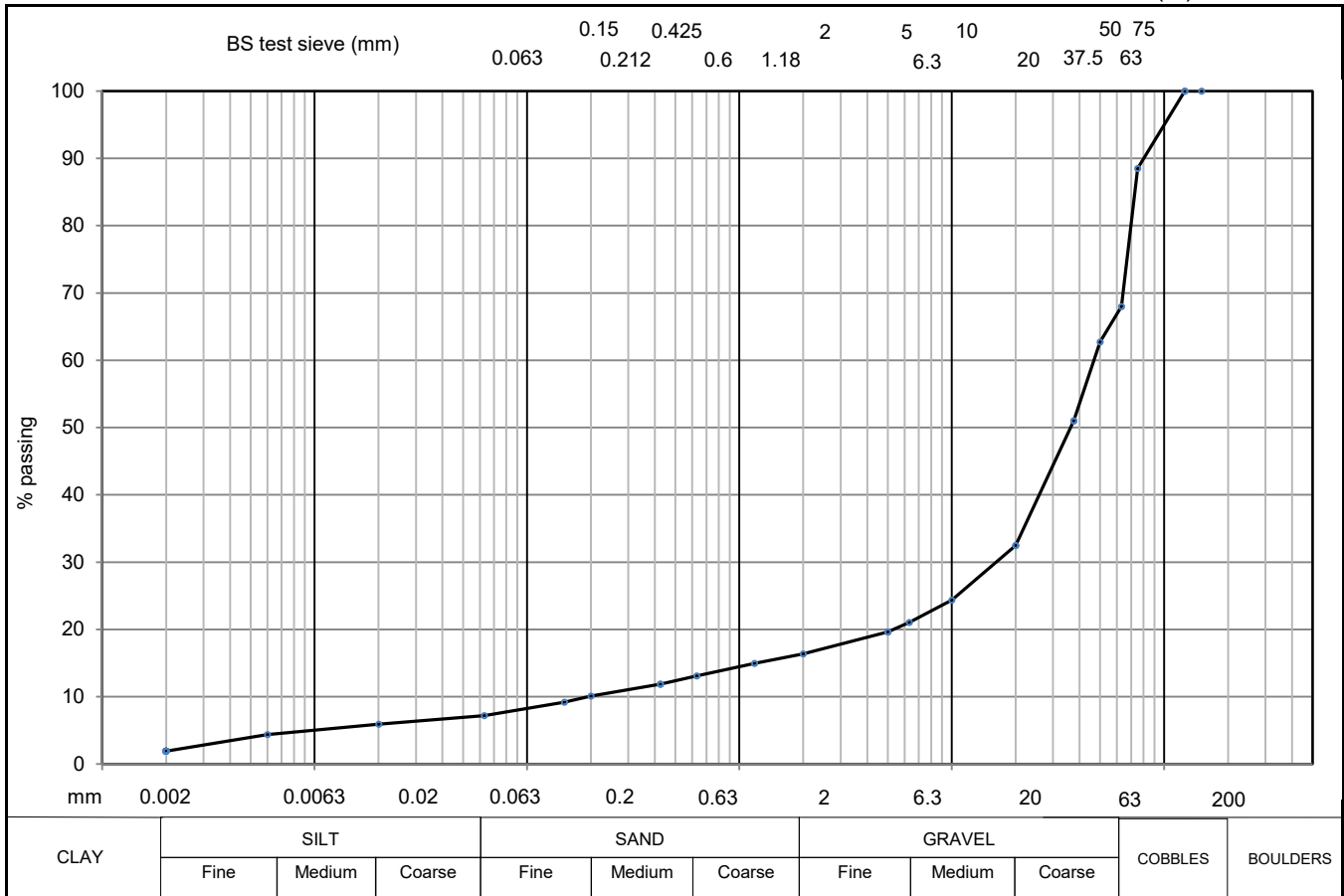
remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35205</b>	<b>TB</b>



Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP209
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	7C
DESCRIPTION	Yellowish brown silty sandy GRAVEL with high cobble content	SAMPLE DEPTH (m)	1.90
		SPECIMEN TOP (m)	1.90
		SPECIMEN BASE (m)	4.50



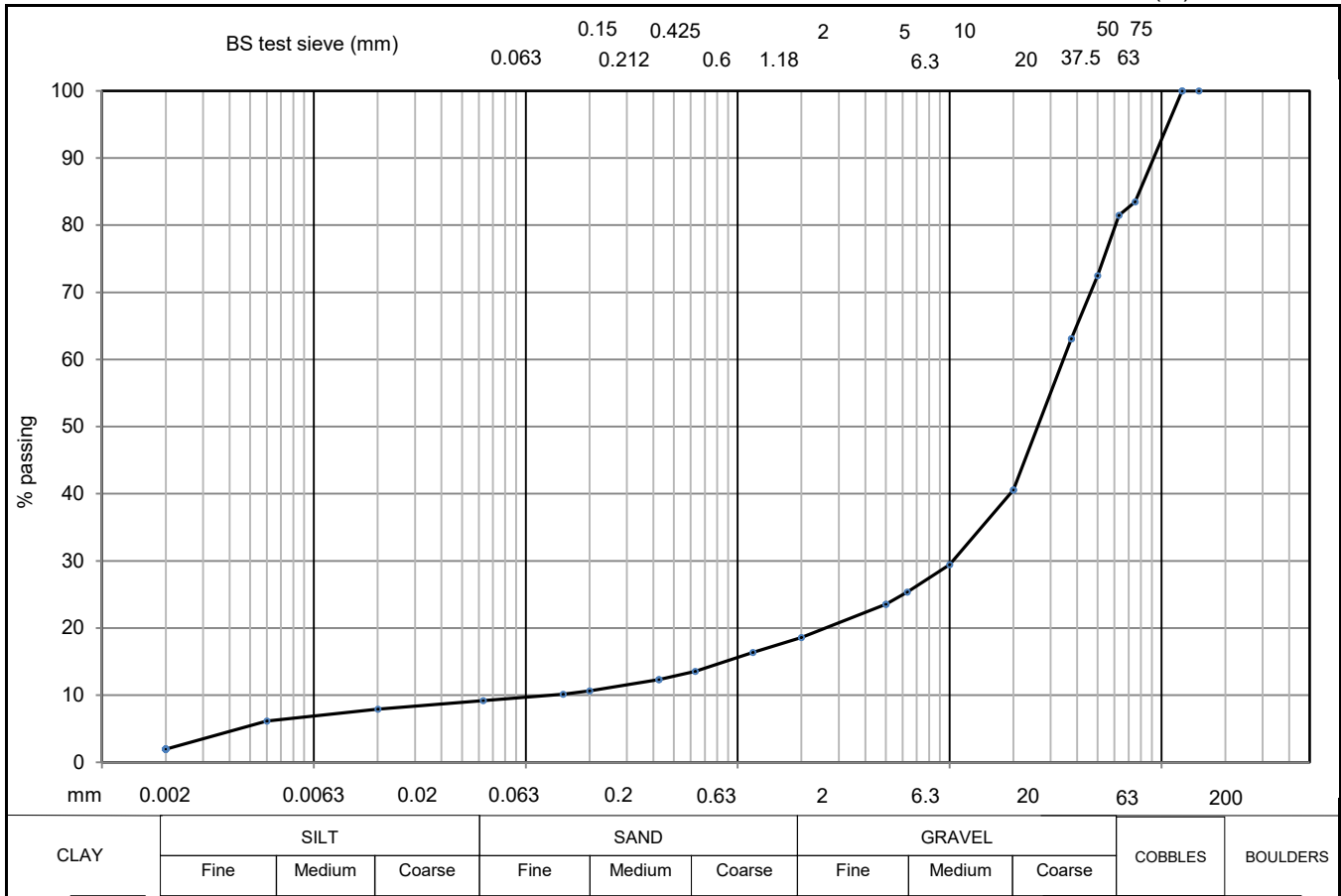
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
		CLAY	2				
SILT	5	150	100	5	20	20	6
SILT & CLAY	7						
SAND	9	75	88	2	16	6	4
GRAVEL	52						
COBBLE & BOULDER	32	63	68	1.18	15	2	2
test method(s)	5.2 & 5.4	50	63	0.63	13		
test method		37.5	51	0.425	12		
5.2 - sieving		20	32	0.2	10		
5.3 - sedimentation by hydrometer		10	24	0.15	9		
5.4 - sedimentation by pipette		6.3	21	0.063	7		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>35205</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP212
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-PHASE 2A (1077)	SAMPLE No./TYPE	18C
DESCRIPTION	Yellowish brown sandy clayey GRAVEL with medium cobble content	SAMPLE DEPTH (m)	6.70
		SPECIMEN TOP (m)	6.70
		SPECIMEN BASE (m)	8.20



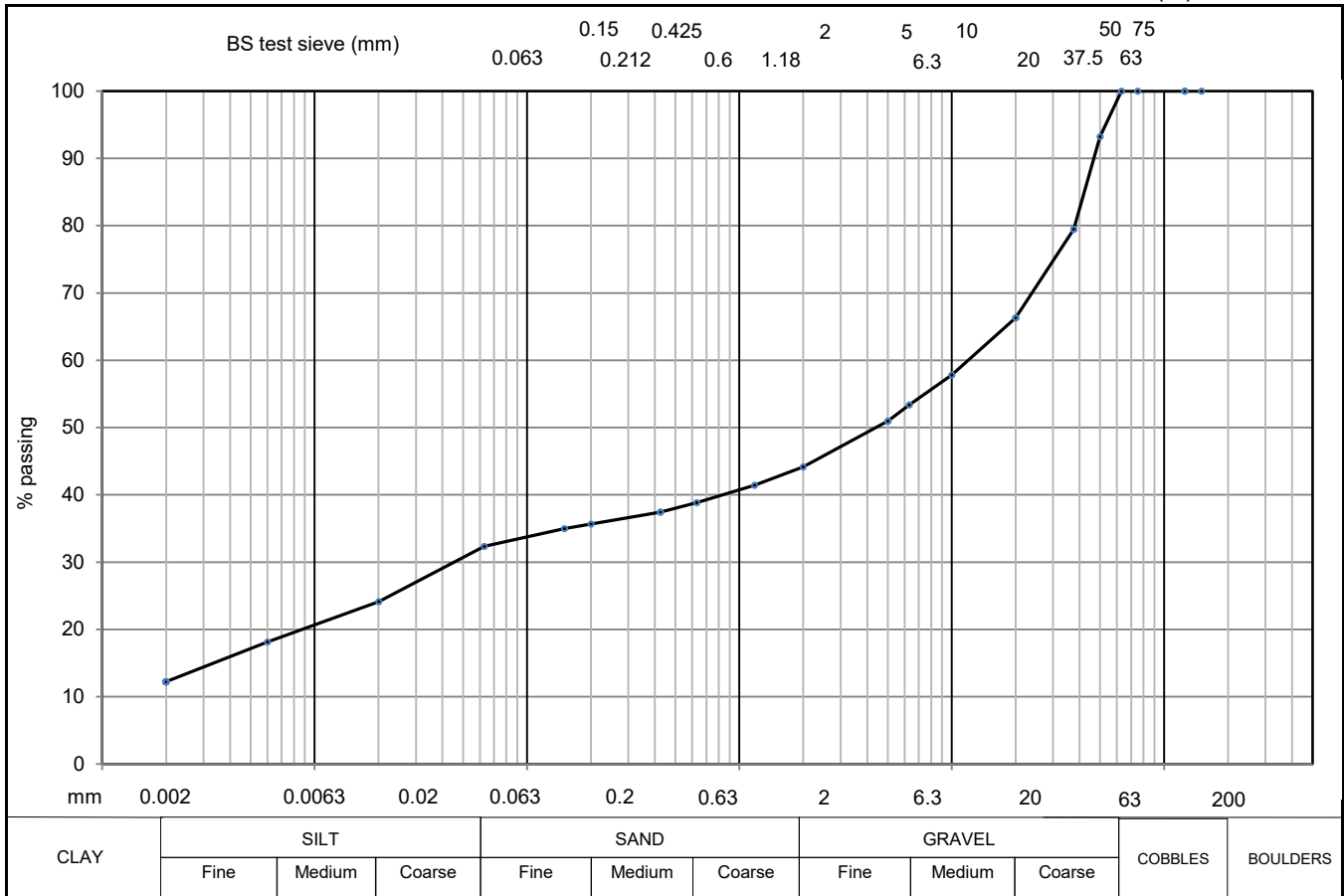
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	2						
SILT	7	150	100	5	24	20	8
SILT & CLAY	9						
SAND	9	75	83	2	19	6	6
GRAVEL	63						
COBBLE & BOULDER	19	63	81	1.18	16	2	2
test method(s)	5.2 & 5.4	50	72	0.63	14		
test method		37.5	63	0.425	12		
5.2 - sieving		20	41	0.2	11		
5.3 - sedimentation by hydrometer		10	29	0.15	10		
5.4 - sedimentation by pipette		6.3	25	0.063	9		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	CONTRACT <b>35205</b>	CHECKED <b>TB</b>
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**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP216
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	10L
DESCRIPTION	Yellowish brown sandy very clayey GRAVEL	SAMPLE DEPTH (m)	3.20
		SPECIMEN TOP (m)	3.20
		SPECIMEN BASE (m)	4.20



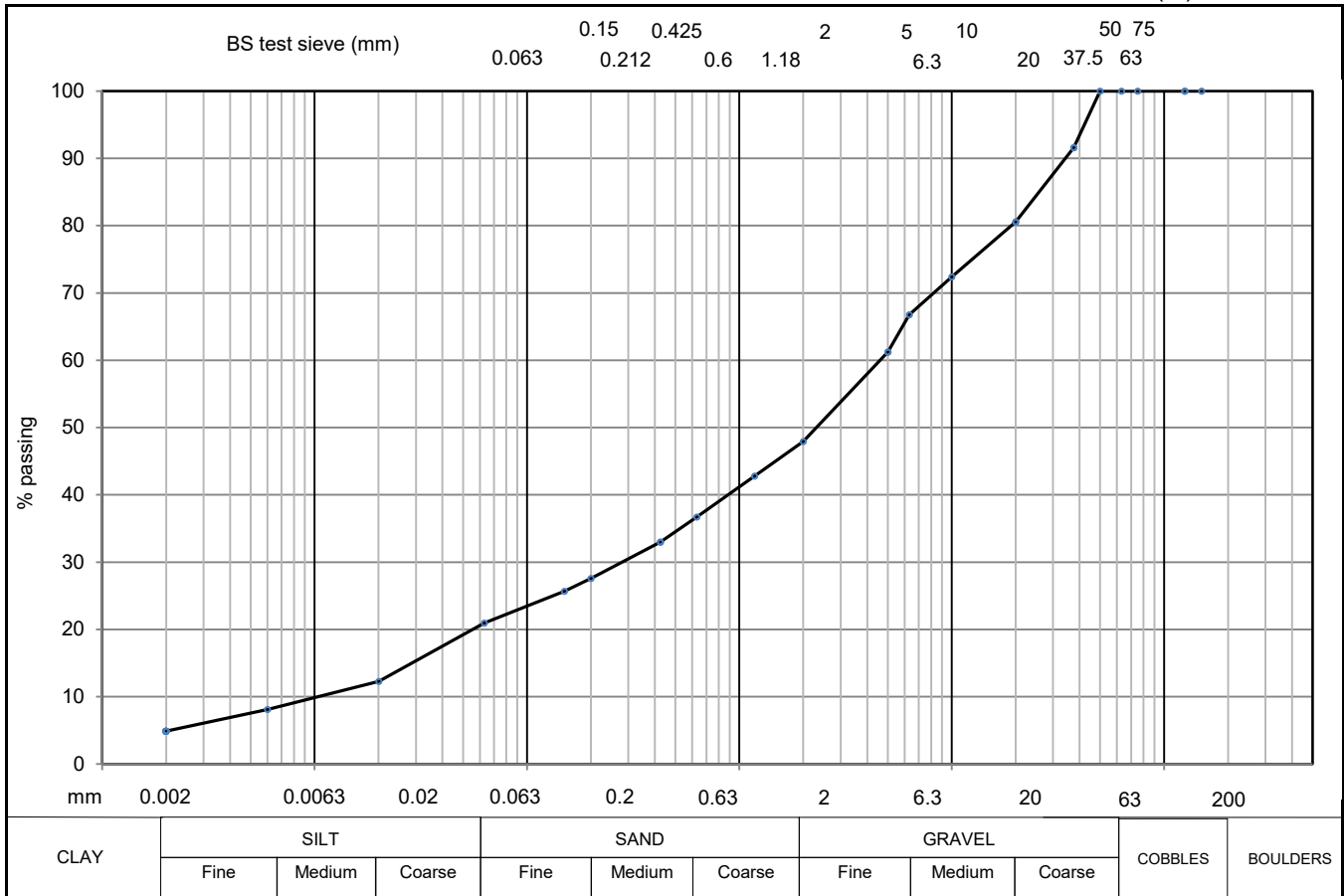
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	12						
SILT	20	150		5	51	20	24
SILT & CLAY	32						
SAND	12	75		2	44	6	18
GRAVEL	56						
COBBLE & BOULDER	0	63	100	1.18	41	2	12
test method(s)	5.2 & 5.4	50	93	0.63	39		
test method		37.5	79	0.425	37		
5.2 - sieving		20	66	0.2	36		
5.3 - sedimentation by hydrometer		10	58	0.15	35		
5.4 - sedimentation by pipette		6.3	53	0.063	32		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35205</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC107
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	8L
DESCRIPTION	Yellowish brown very silty very sandy GRAVEL	SAMPLE DEPTH (m)	1.20
		SPECIMEN TOP (m)	1.20
		SPECIMEN BASE (m)	2.00



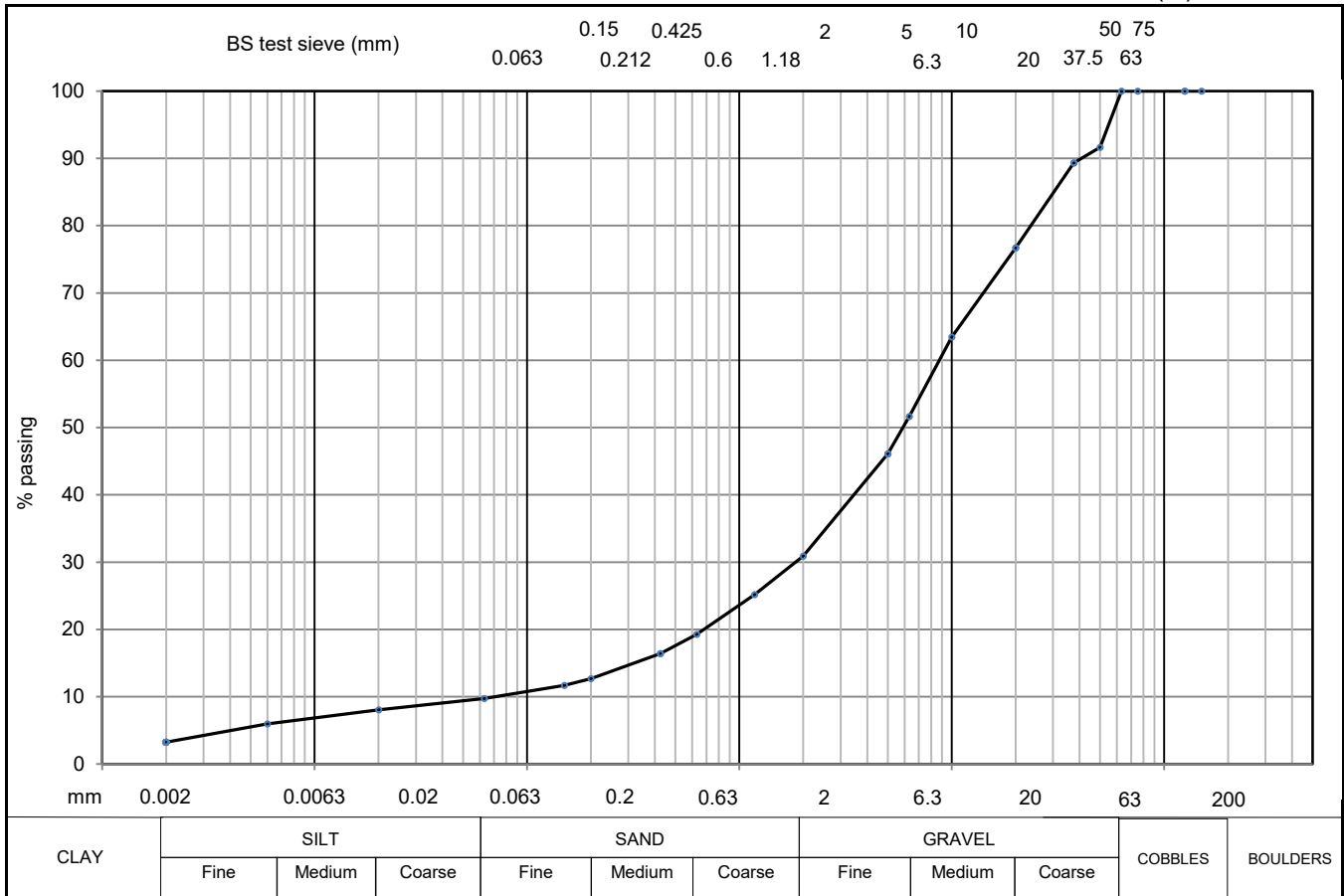
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	5						
SILT	16	150		5	61	20	12
SILT & CLAY	21						
SAND	27	75		2	48	6	8
GRAVEL	52						
COBBLE & BOULDER	0	63		1.18	43	2	5
test method(s)	5.2 & 5.4	50	100	0.63	37		
test method		37.5	92	0.425	33		
5.2 - sieving		20	81	0.2	28		
5.3 - sedimentation by hydrometer		10	72	0.15	26		
5.4 - sedimentation by pipette		6.3	67	0.063	21		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35205</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC107
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	14L
DESCRIPTION	Yellowish brown clayey very sandy GRAVEL	SAMPLE DEPTH (m)	3.20
		SPECIMEN TOP (m)	3.20
		SPECIMEN BASE (m)	4.20



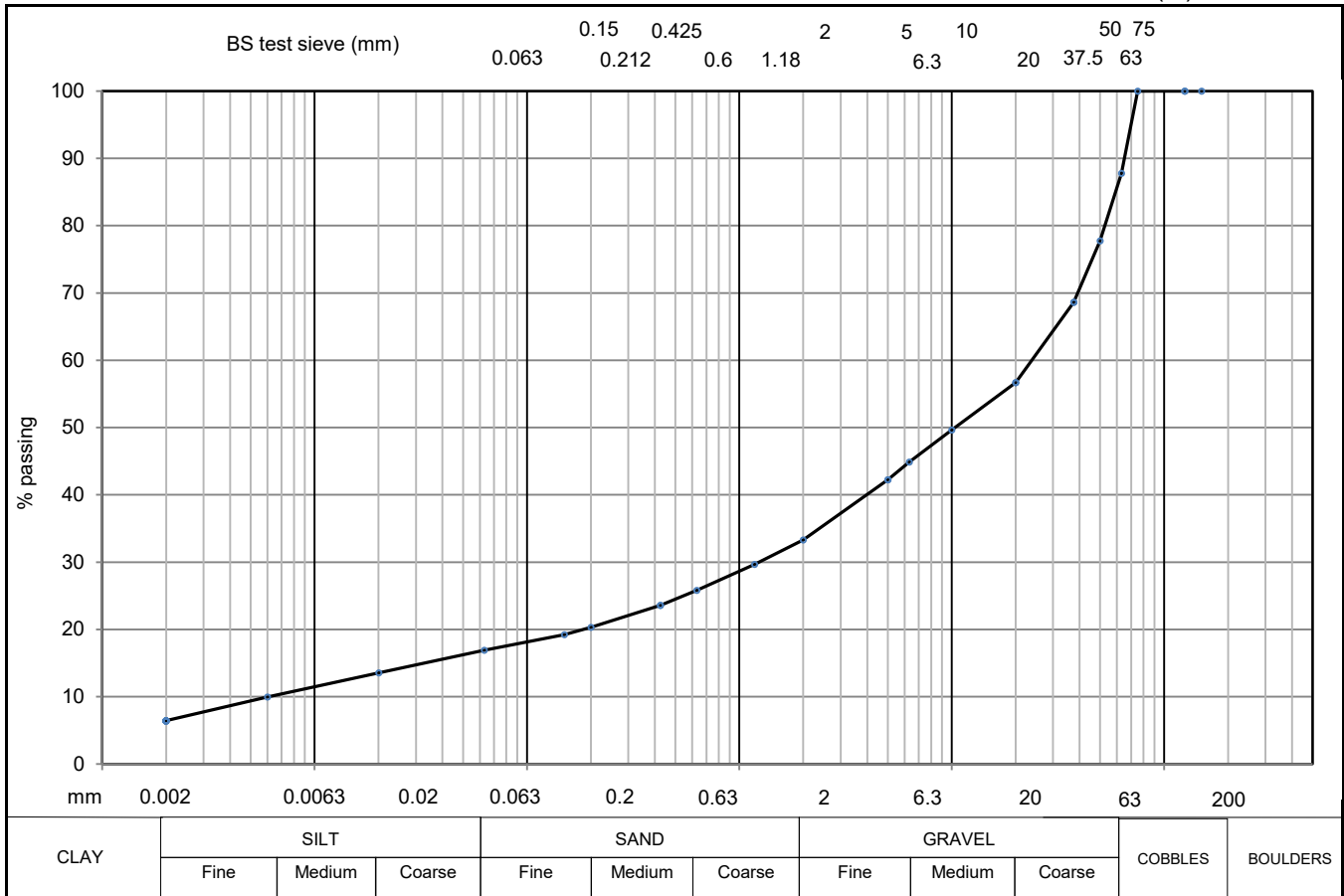
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	3						
SILT	7	150		5	46	20	8
SILT & CLAY	10						
SAND	21	75		2	31	6	6
GRAVEL	69						
COBBLE & BOULDER	0	63	100	1.18	25	2	3
test method(s)	5.2 & 5.4	50	92	0.63	19		
test method		37.5	89	0.425	16		
5.2 - sieving		20	77	0.2	13		
5.3 - sedimentation by hydrometer		10	63	0.15	12		
5.4 - sedimentation by pipette		6.3	52	0.063	10		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>35205</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC108
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	3B
DESCRIPTION	Brown mottled black silty sandy GRAVEL with medium gravel content	SAMPLE DEPTH (m)	1.00
		SPECIMEN TOP (m)	1.00
		SPECIMEN BASE (m)	1.20



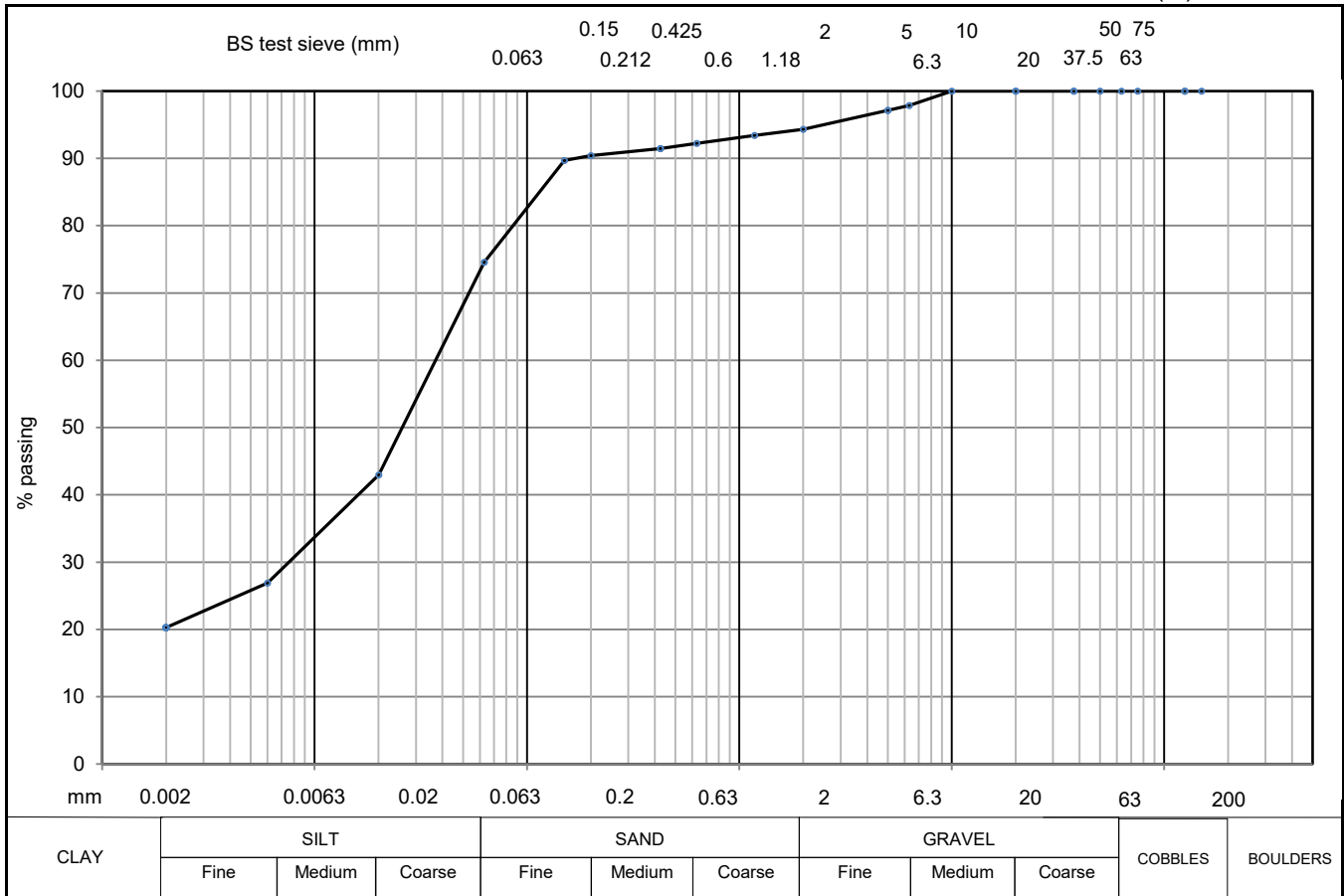
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	6						
SILT	11	150		5	42	20	14
SILT & CLAY	17						
SAND	16	75	100	2	33	6	10
GRAVEL	54						
COBBLE & BOULDER	12	63	88	1.18	30	2	6
test method(s)	5.2# & 5.4	50	78	0.63	26		
test method		37.5	69	0.425	24		
5.2 - sieving		20	57	0.2	20		
5.3 - sedimentation by hydrometer		10	50	0.15	19		
5.4 - sedimentation by pipette		6.3	45	0.063	17		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	CONTRACT <b>35205</b>	CHECKED <b>WJ</b>
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**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC108
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	11L
DESCRIPTION	Light brown slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	3.20
		SPECIMEN TOP (m)	3.90
		SPECIMEN BASE (m)	4.20



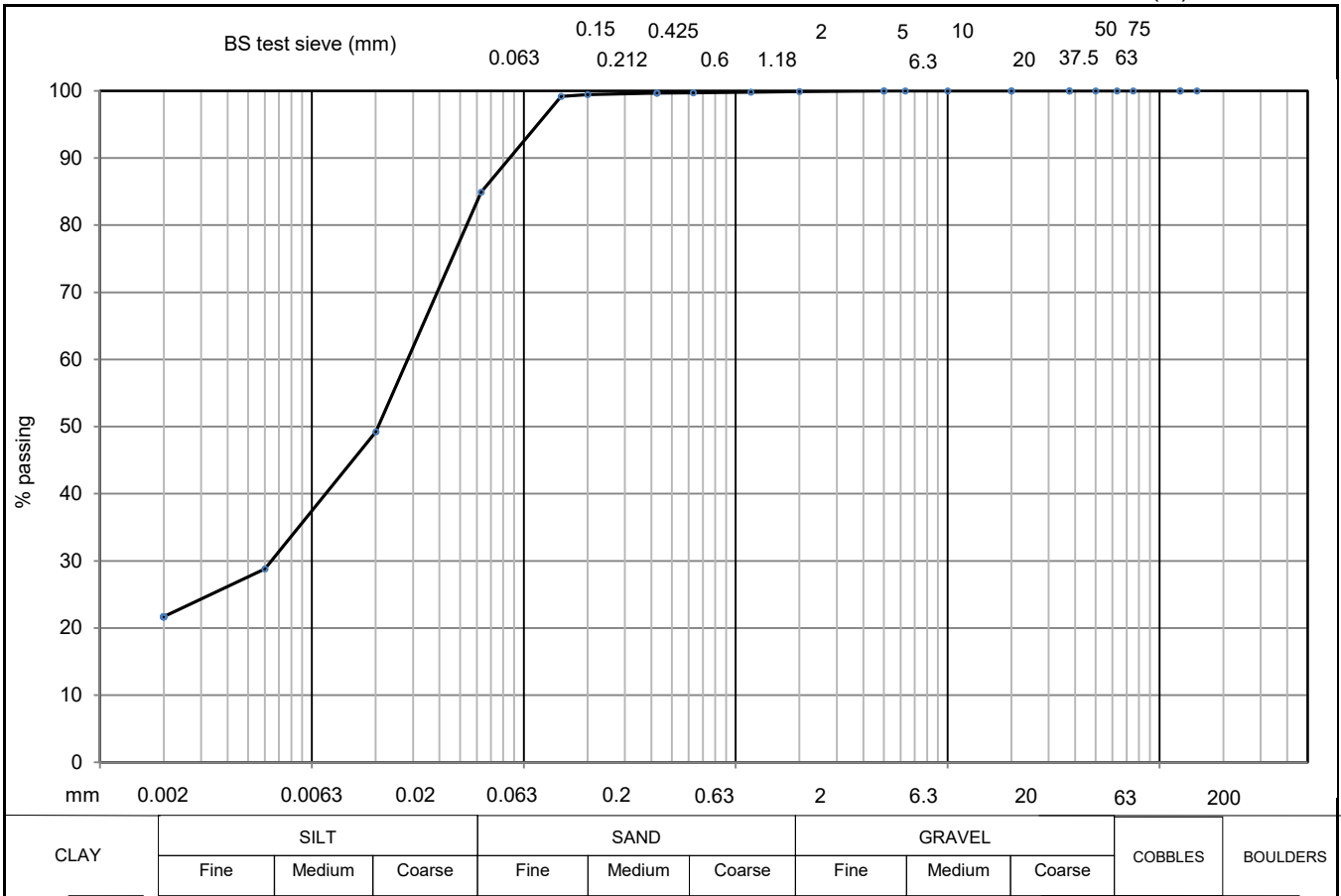
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	20						
SILT	54	150		5	97	20	43
SILT & CLAY	75						
SAND	20	75		2	94	6	27
GRAVEL	6						
COBBLE & BOULDER	0	63		1.18	93	2	20
test method(s)	5.2 & 5.4	50		0.63	92		
test method		37.5		0.425	91		
5.2 - sieving		20		0.2	90		
5.3 - sedimentation by hydrometer		10	100	0.15	90		
5.4 - sedimentation by pipette		6.3	98	0.063	75		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35205</b>	<b>TB</b>

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**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC108
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	14L
DESCRIPTION	Yellowish brown mottled orange slightly sandy clayey SILT	SAMPLE DEPTH (m)	4.20
		SPECIMEN TOP (m)	4.40
		SPECIMEN BASE (m)	4.60



CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		

soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	22						
SILT	63	150		5	100	20	49
SILT & CLAY	85						
SAND	15	75		2	100	6	29
GRAVEL	0						
COBBLE & BOULDER	0	63		1.18	100	2	22
test method(s)	5.2 & 5.4	50		0.63	100		
test method		37.5		0.425	100		
5.2 - sieving		20		0.2	99		
5.3 - sedimentation by hydrometer		10		0.15	99		
5.4 - sedimentation by pipette		6.3		0.063	85		

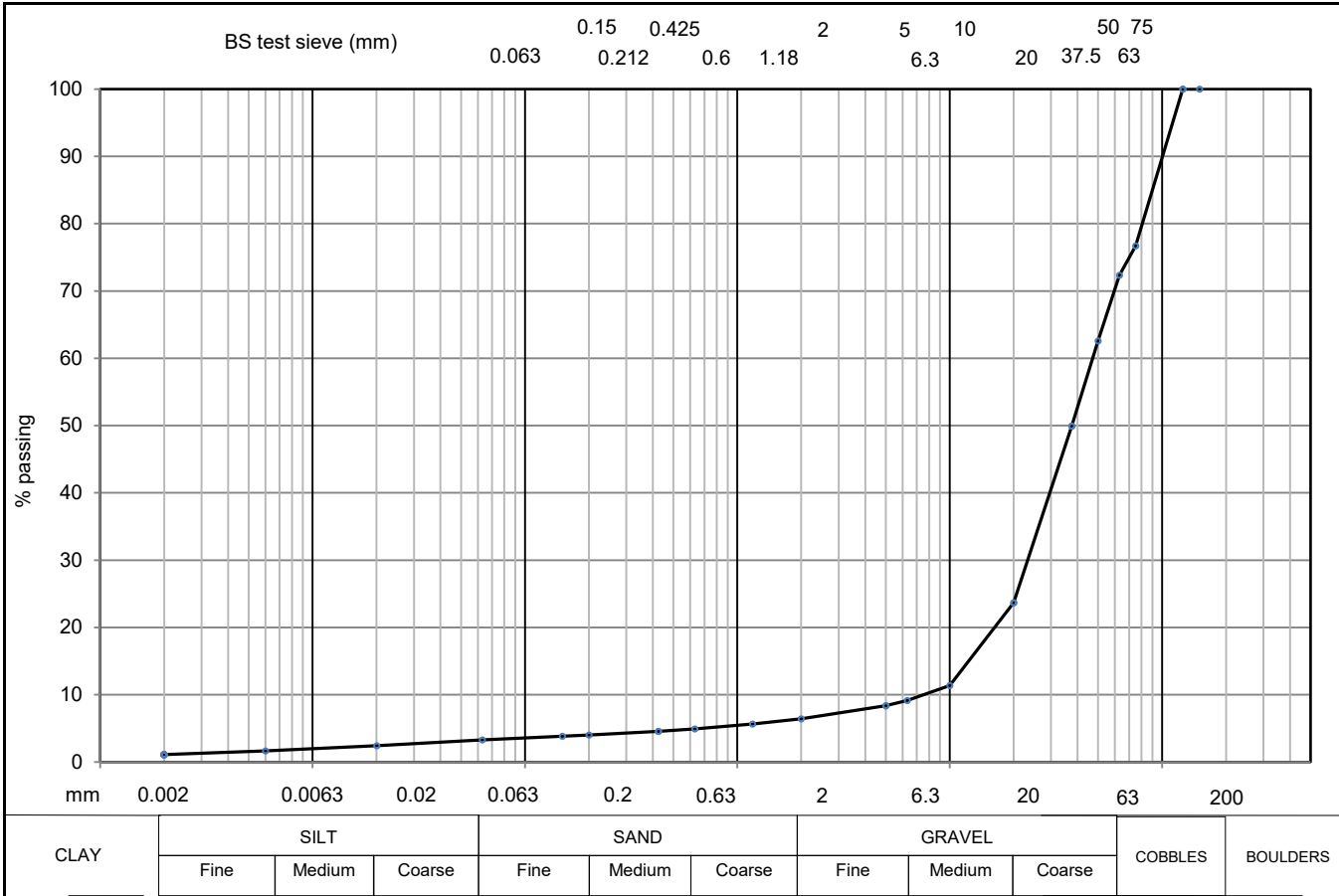
remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35205</b>	<b>TB</b>



Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC207
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	17C
DESCRIPTION	Yellowish brown slightly sandy slightly clayey GRAVEL with high cobble content	SAMPLE DEPTH (m)	5.20
		SPECIMEN TOP (m)	5.20
		SPECIMEN BASE (m)	9.00



CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		

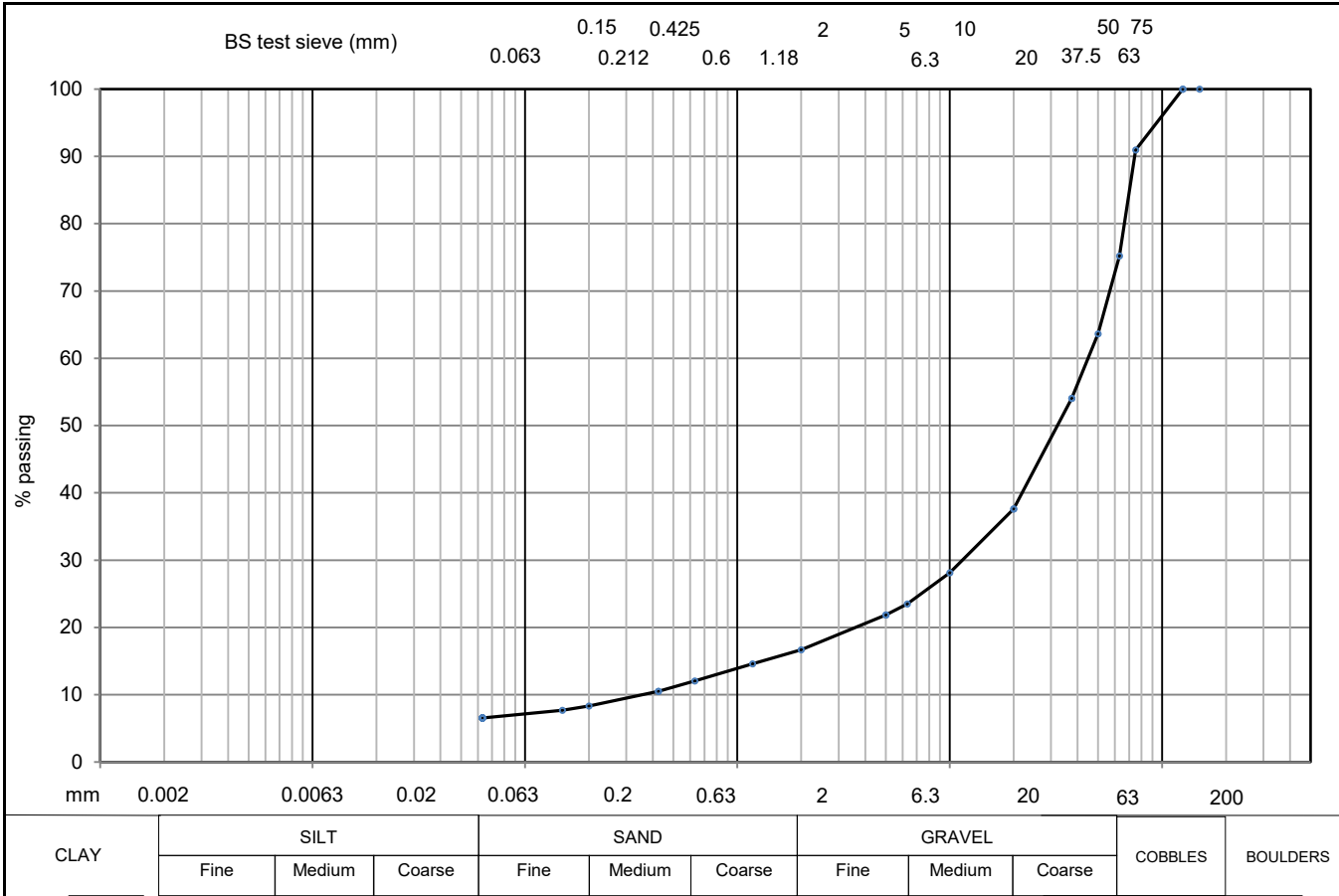
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	1						
SILT	2	150	100	5	8	20	2
SILT & CLAY	3						
SAND	3	75	77	2	6	6	2
GRAVEL	66						
COBBLE & BOULDER	28	63	72	1.18	6	2	1
test method(s)	5.2 & 5.4	50	63	0.63	5		
test method		37.5	50	0.425	5		
5.2 - sieving		20	24	0.2	4		
5.3 - sedimentation by hydrometer		10	11	0.15	4		
5.4 - sedimentation by pipette		6.3	9	0.063	3		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35205</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC224
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	5L
DESCRIPTION	Yellowish brown clayey sandy GRAVEL with high cobble content	SAMPLE DEPTH (m)	1.20
		SPECIMEN TOP (m)	1.20
		SPECIMEN BASE (m)	3.20



CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		

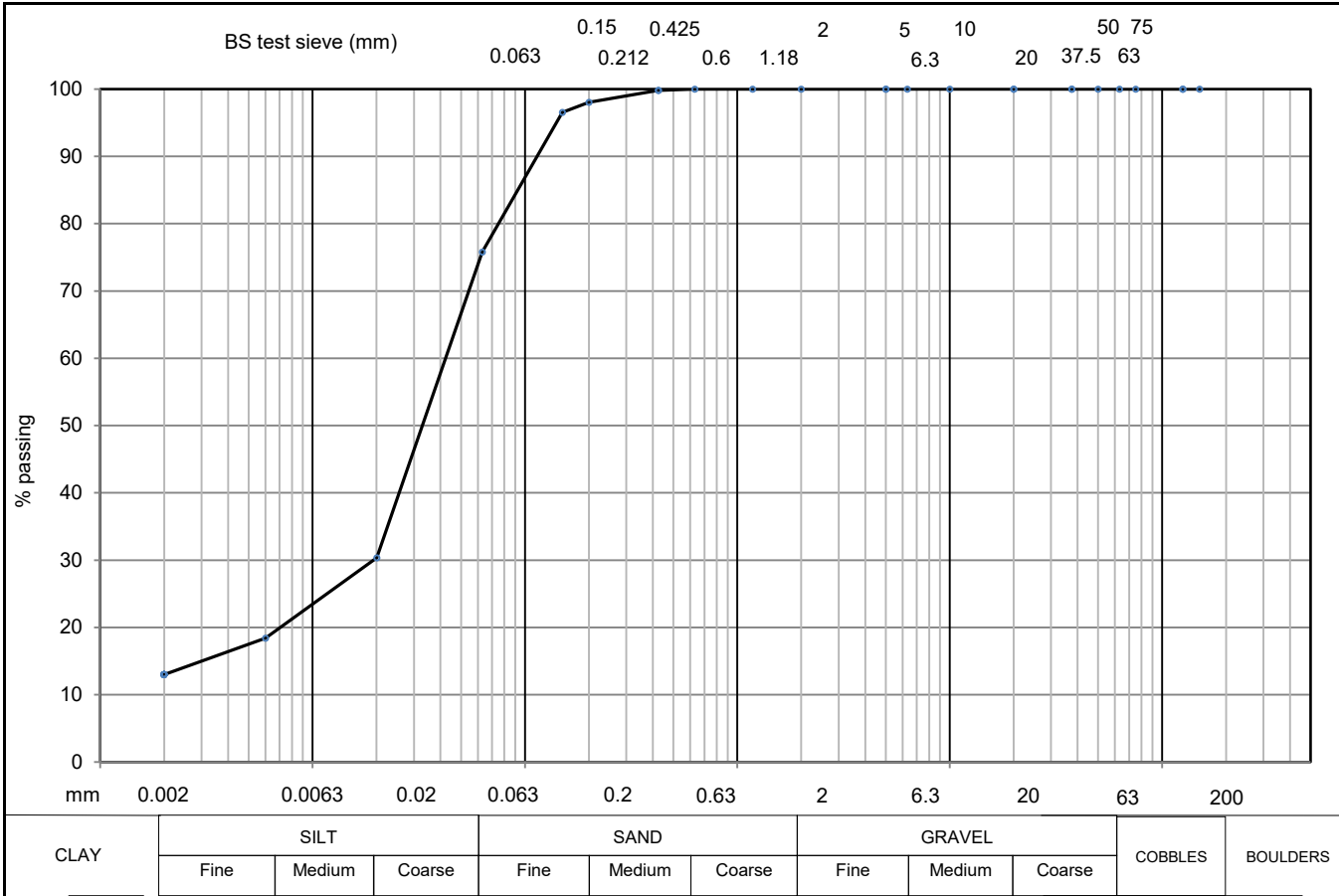
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY							
SILT		150	100	5	22	20	
SILT & CLAY	7						
SAND	10	75	91	2	17	6	
GRAVEL	59						
COBBLE & BOULDER	25	63	75	1.18	15	2	
test method(s)	5.2#	50	64	0.63	12		
test method		37.5	54	0.425	10		
5.2 - sieving		20	38	0.2	8		
5.3 - sedimentation by hydrometer		10	28	0.15	8		
5.4 - sedimentation by pipette		6.3	24	0.063	7		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892	<b>35205</b>	<b>TB</b>
Particle density assigned an assumed value of 2.70 Mg/m3		
COMBINED WITH 8L		

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC224
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	14L
DESCRIPTION	Yellowish brown slightly sandy SILT	SAMPLE DEPTH (m)	4.20
		SPECIMEN TOP (m)	4.60
		SPECIMEN BASE (m)	4.85



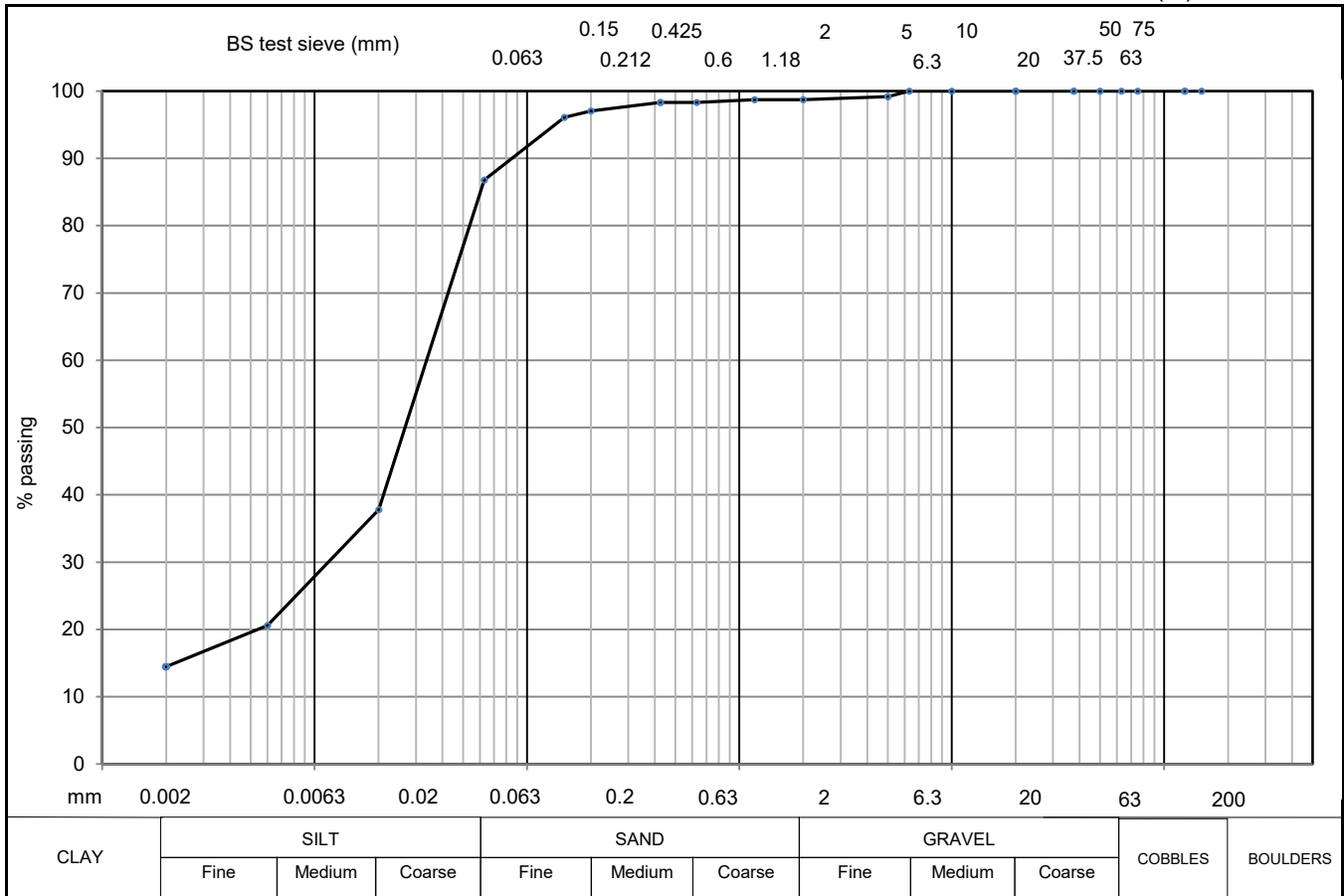
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	13			5		20	30
SILT	63	150		2		6	18
SILT & CLAY	76	75		1.18		2	13
SAND	24						
GRAVEL	0						
COBBLE & BOULDER	0						
test method(s)	5.2 & 5.4	50		0.63	100		
test method		37.5		0.425	100		
5.2 - sieving		20		0.2	98		
5.3 - sedimentation by hydrometer		10		0.15	97		
5.4 - sedimentation by pipette		6.3		0.063	76		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>CONTRACT</b> <b>35205</b>	<b>CHECKED</b> <b>TB</b>
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**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC224
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	34C
DESCRIPTION	Orangish brown slightly gravelly slightly sandy SILT	SAMPLE DEPTH (m)	14.50
		SPECIMEN TOP (m)	15.00
		SPECIMEN BASE (m)	15.30



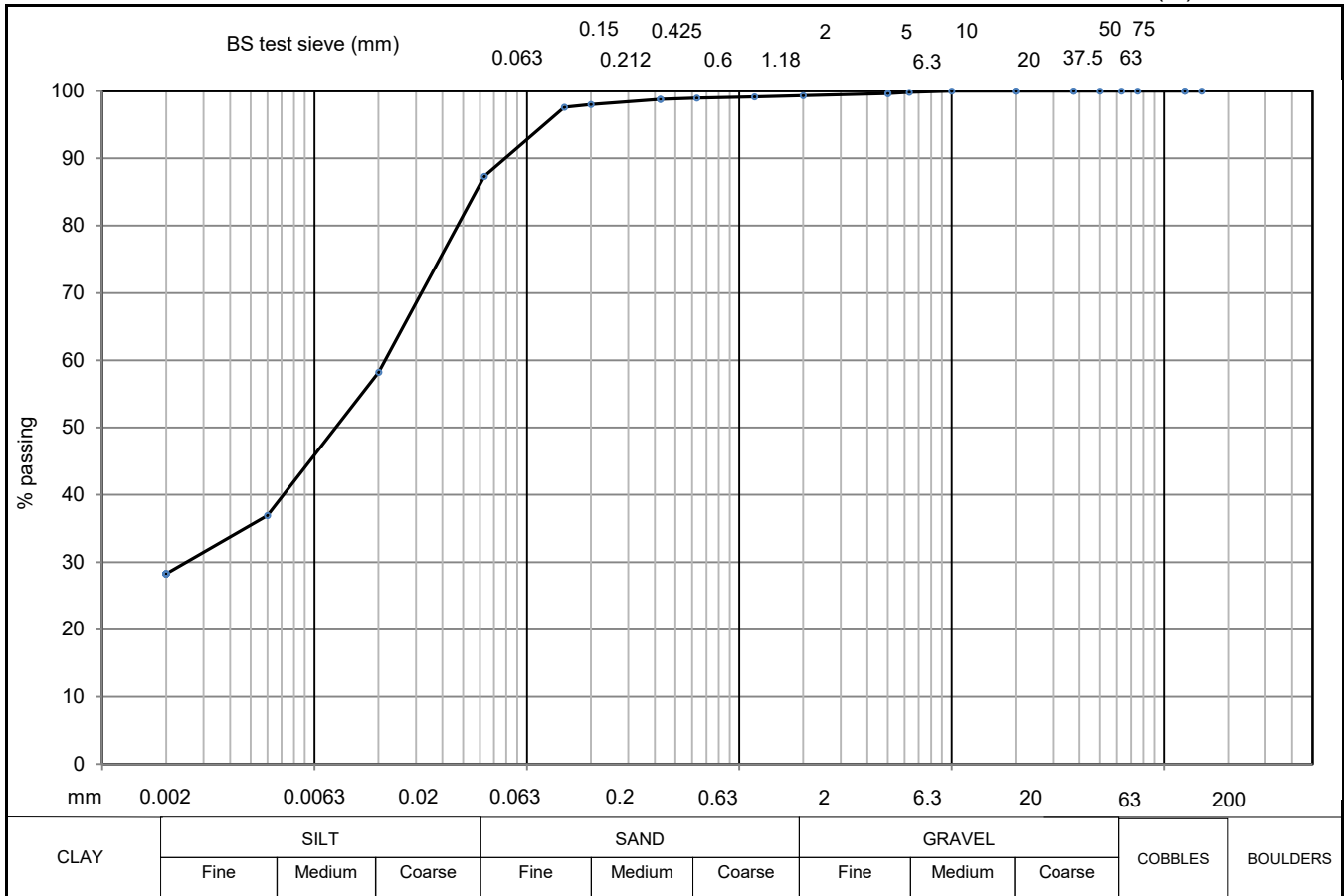
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	15						
SILT	72	150		5	99	20	38
SILT & CLAY	87						
SAND	12	75		2	99	6	21
GRAVEL	1						
COBBLE & BOULDER	0	63		1.18	99	2	14
test method(s)	5.2 & 5.4	50		0.63	98		
test method		37.5		0.425	98		
5.2 - sieving		20		0.2	97		
5.3 - sedimentation by hydrometer		10		0.15	96		
5.4 - sedimentation by pipette		6.3	100	0.063	87		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35205</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP204
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	6B
DESCRIPTION	Orangish btown mottled grey slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	2.00
		SPECIMEN TOP (m)	2.00
		SPECIMEN BASE (m)	2.10



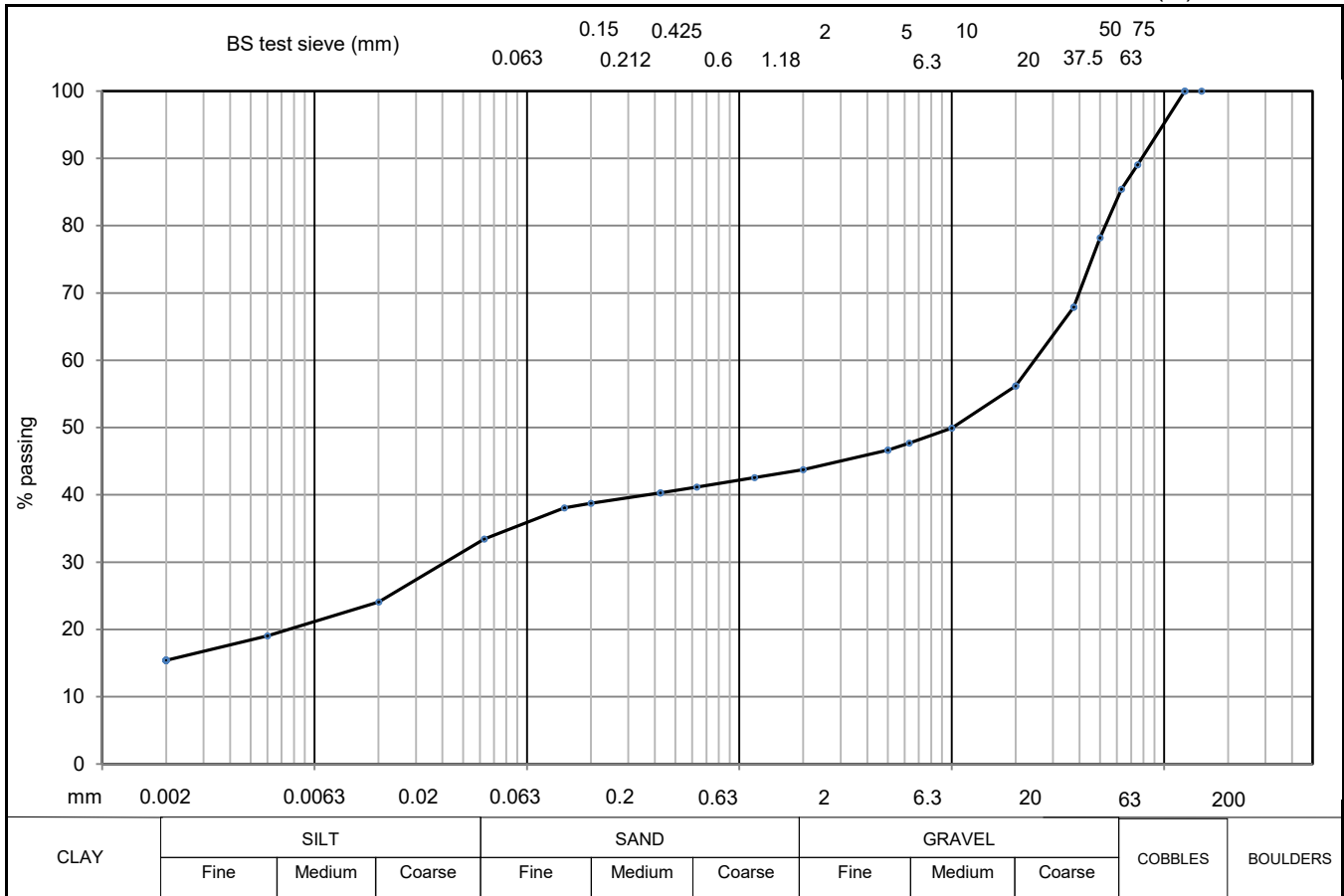
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	28						
SILT	59	150		5	100	20	58
SILT & CLAY	87						
SAND	12	75		2	99	6	37
GRAVEL	1						
COBBLE & BOULDER	0	63		1.18	99	2	28
test method(s)	5.2 & 5.4	50		0.63	99		
test method		37.5		0.425	99		
5.2 - sieving		20		0.2	98		
5.3 - sedimentation by hydrometer		10	100	0.15	98		
5.4 - sedimentation by pipette		6.3	100	0.063	87		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35205</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP205
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	9B
DESCRIPTION	Orangish brown sandy very clayey GRAVEL with medium cobble content	SAMPLE DEPTH (m)	3.30
		SPECIMEN TOP (m)	3.30
		SPECIMEN BASE (m)	3.40



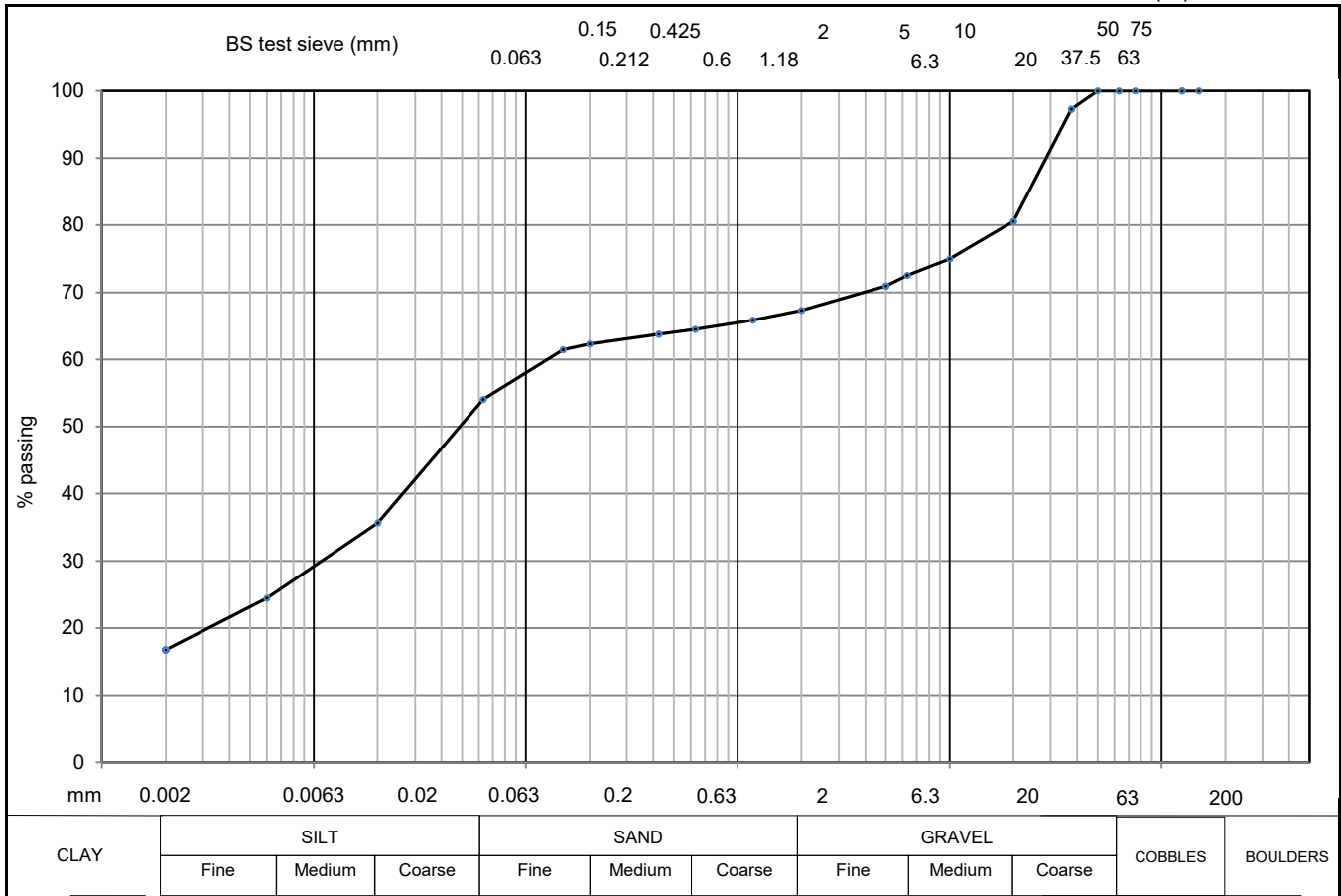
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	15						
SILT	18	150	100	5	47	20	24
SILT & CLAY	33						
SAND	10	75	89	2	44	6	19
GRAVEL	42						
COBBLE & BOULDER	15	63	85	1.18	43	2	15
test method(s)	5.2# & 5.4	50	78	0.63	41		
test method		37.5	68	0.425	40		
5.2 - sieving		20	56	0.2	39		
5.3 - sedimentation by hydrometer		10	50	0.15	38		
5.4 - sedimentation by pipette		6.3	48	0.063	33		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35205</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP207
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	2B
DESCRIPTION	Yellowish brown slightly sandy slightly gravelly silty CLAY	SAMPLE DEPTH (m)	0.50
		SPECIMEN TOP (m)	0.50
		SPECIMEN BASE (m)	0.60



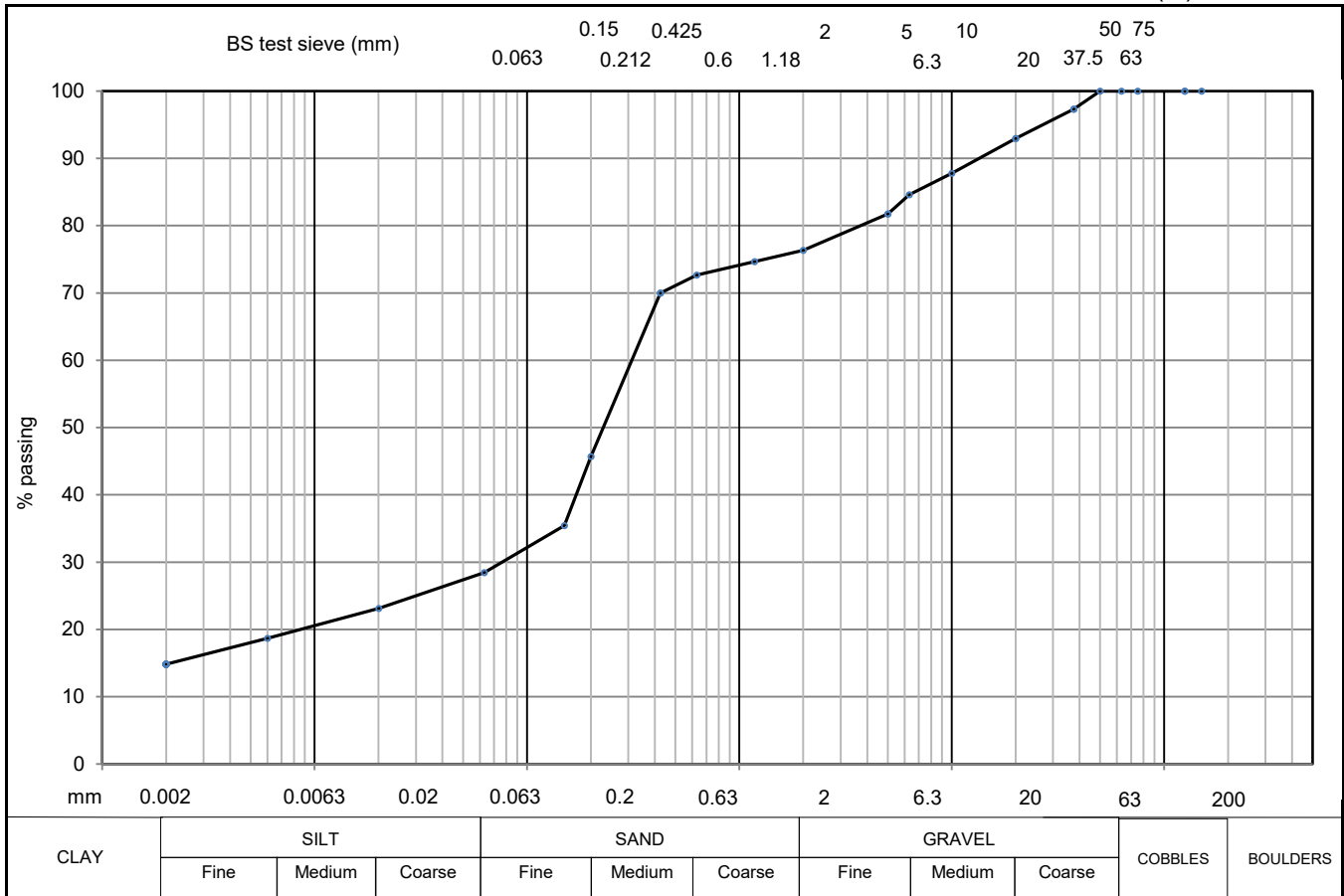
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	17						
SILT	37	150		5	71	20	36
SILT & CLAY	54						
SAND	13	75		2	67	6	24
GRAVEL	33						
COBBLE & BOULDER	0	63		1.18	66	2	17
test method(s)	5.2 & 5.4	50	100	0.63	64		
test method		37.5	97	0.425	64		
5.2 - sieving		20	81	0.2	62		
5.3 - sedimentation by hydrometer		10	75	0.15	61		
5.4 - sedimentation by pipette		6.3	73	0.063	54		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35205</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP601
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	2B
DESCRIPTION	Orangish brown very gravelly very clayey SAND	SAMPLE DEPTH (m)	0.50
		SPECIMEN TOP (m)	0.50
		SPECIMEN BASE (m)	0.60



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	15						
SILT	14	150		5	82	20	23
SILT & CLAY	28						
SAND	48	75		2	76	6	19
GRAVEL	24						
COBBLE & BOULDER	0	63		1.18	75	2	15
test method(s)	5.2 & 5.4	50	100	0.63	73		
test method		37.5	97	0.425	70		
5.2 - sieving		20	93	0.2	46		
5.3 - sedimentation by hydrometer		10	88	0.15	35		
5.4 - sedimentation by pipette		6.3	85	0.063	28		

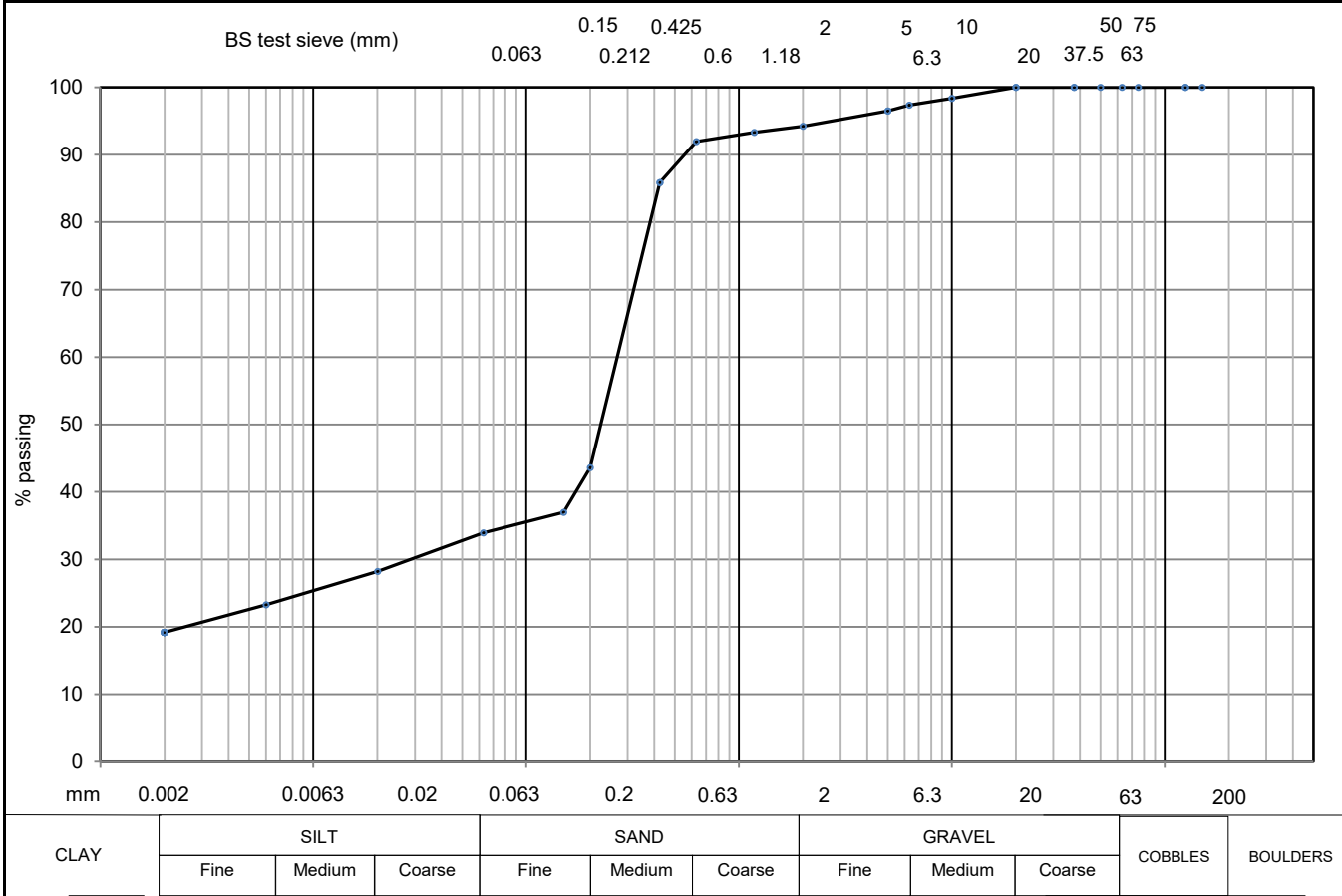
remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>CONTRACT</b> <b>35205</b>	<b>CHECKED</b> <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP601
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	5B
DESCRIPTION	Brown gravelly very clayey SAND	SAMPLE DEPTH (m)	1.50
		SPECIMEN TOP (m)	1.50
		SPECIMEN BASE (m)	1.60



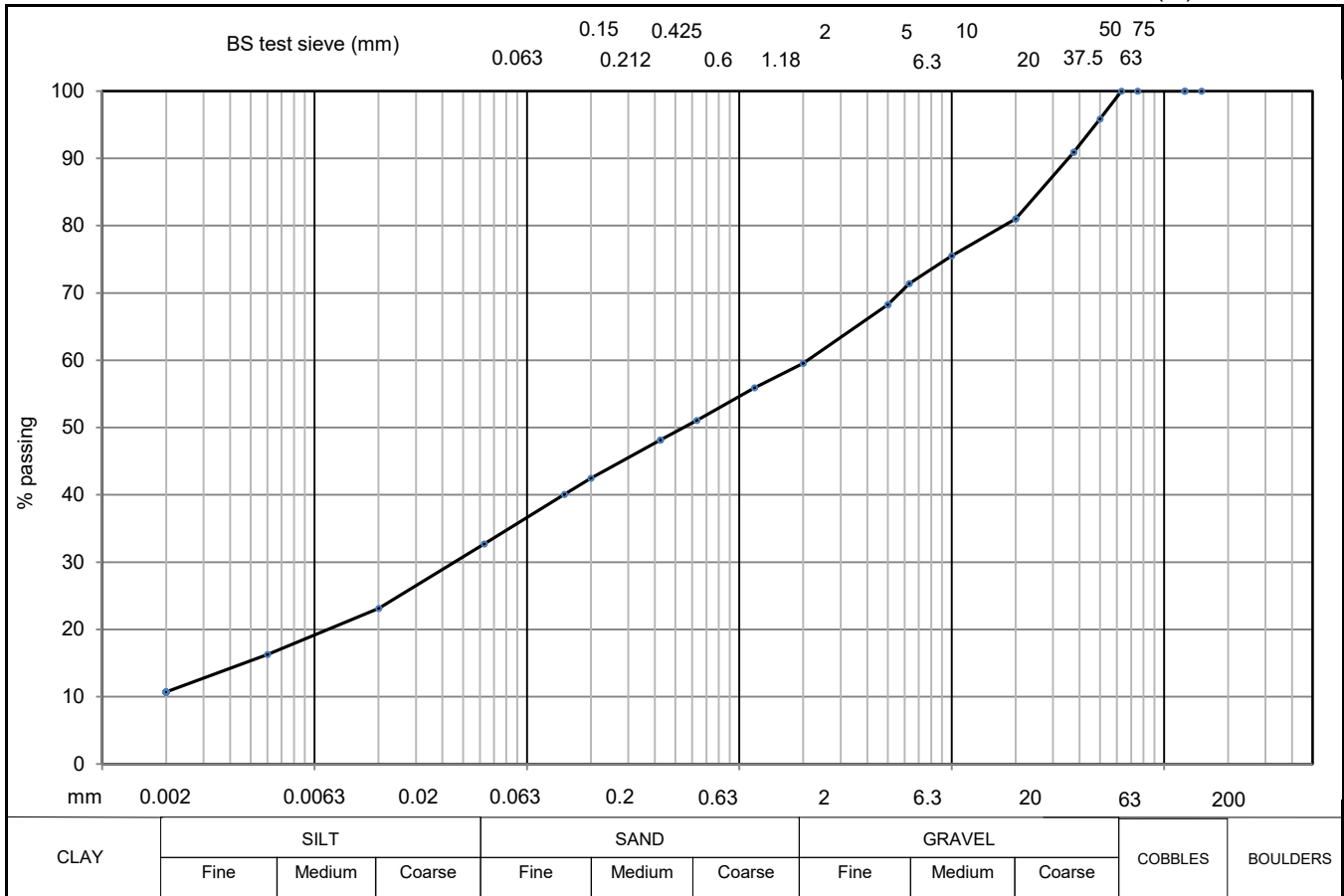
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	19						
SILT	15	150		5	96	20	28
SILT & CLAY	34						
SAND	60	75		2	94	6	23
GRAVEL	6						
COBBLE & BOULDER	0	63		1.18	93	2	19
test method(s)	5.2 & 5.4	50		0.63	92		
test method		37.5		0.425	86		
5.2 - sieving		20	100	0.2	44		
5.3 - sedimentation by hydrometer		10	98	0.15	37		
5.4 - sedimentation by pipette		6.3	97	0.063	34		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>CONTRACT</b> <b>35205</b>	<b>CHECKED</b> <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP601
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	8B
DESCRIPTION	Brown mottled orange very sandy very clayey GRAVEL	SAMPLE DEPTH (m)	2.70
		SPECIMEN TOP (m)	2.70
		SPECIMEN BASE (m)	2.80



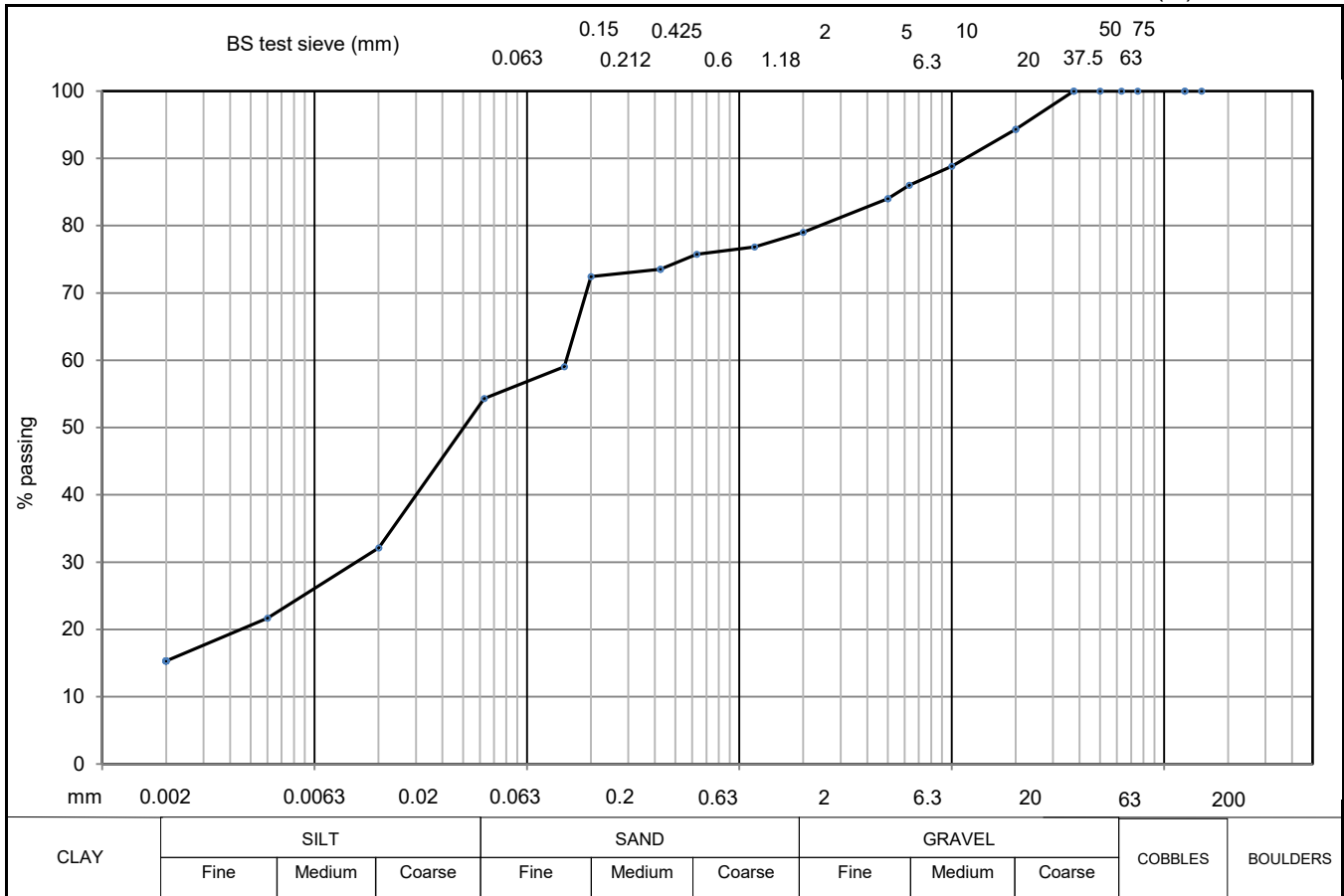
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	11						
SILT	22	150		5	68	20	23
SILT & CLAY	33						
SAND	27	75		2	60	6	16
GRAVEL	40						
COBBLE & BOULDER	0	63	100	1.18	56	2	11
test method(s)	5.2 & 5.4	50	96	0.63	51		
test method		37.5	91	0.425	48		
5.2 - sieving		20	81	0.2	42		
5.3 - sedimentation by hydrometer		10	76	0.15	40		
5.4 - sedimentation by pipette		6.3	71	0.063	33		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35205</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP601
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	11B
DESCRIPTION	Brown mottled orange slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	4.30
		SPECIMEN TOP (m)	4.30
		SPECIMEN BASE (m)	4.40



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	15						
SILT	39	150		5	84	20	32
SILT & CLAY	54						
SAND	25	75		2	79	6	22
GRAVEL	21						
COBBLE & BOULDER	0	63		1.18	77	2	15
test method(s)	5.2 & 5.4	50		0.63	76		
test method		37.5	100	0.425	74		
5.2 - sieving		20	94	0.2	72		
5.3 - sedimentation by hydrometer		10	89	0.15	59		
5.4 - sedimentation by pipette		6.3	86	0.063	54		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>CONTRACT</b> <b>35205</b>	<b>CHECKED</b> <b>TB</b>
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# DRY DENSITY/MOISTURE CONTENT RELATIONSHIP



BS. 1377 : Part 4 : 1990 : 3

CLIENT OSBORNE

BH/TP No.

DSRC108

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION-  
PHASE 2A (1077)

SAMPLE No./TYPE

8L

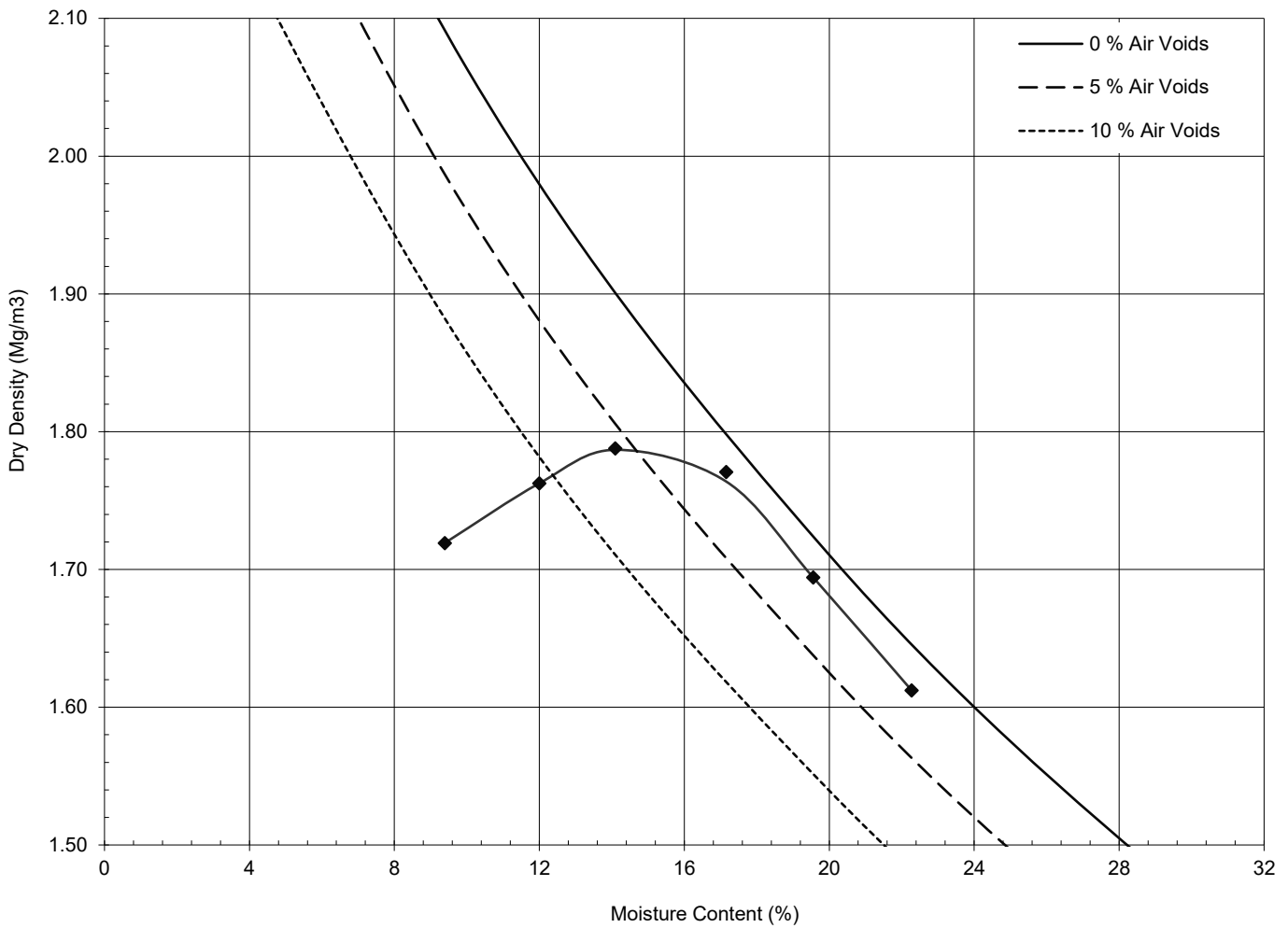
DESCRIPTION Yellowish brown slightly sandy gravelly CLAY

SAMPLE DEPTH (m)

2.20

SPECIMEN DEPTH (m)

3.20

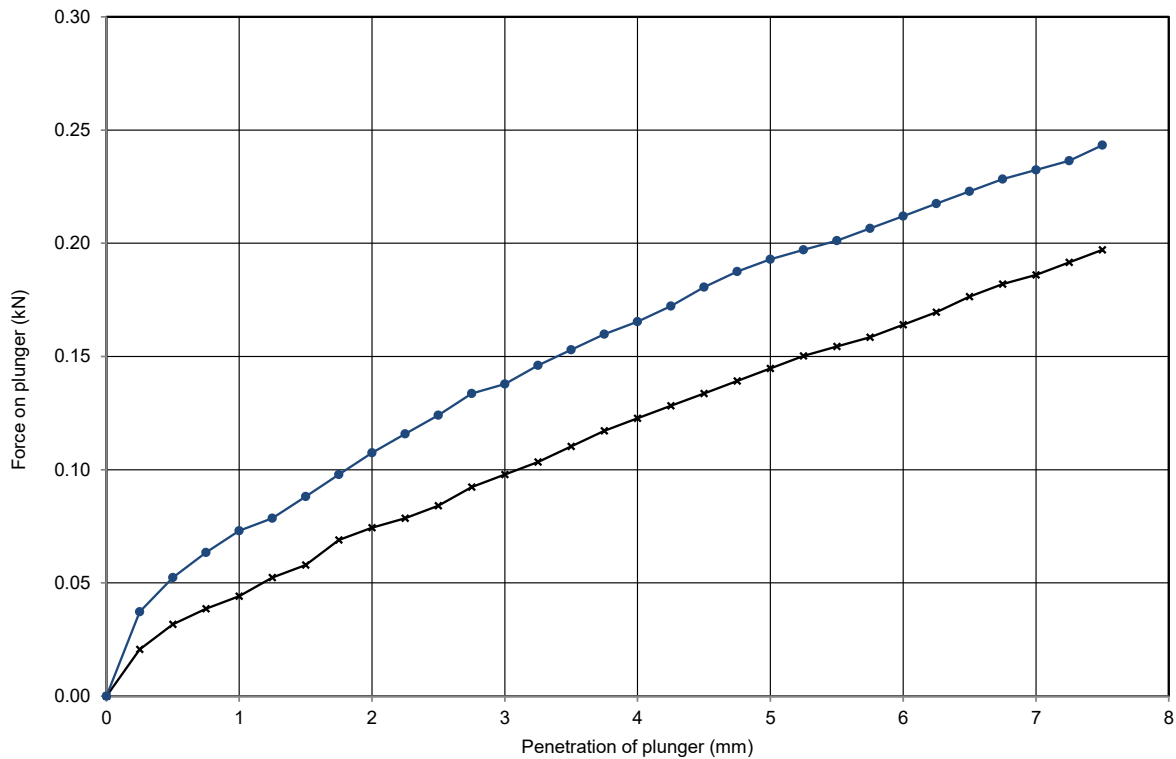


test method	3.4.4.1 2.5kg dynamic compaction - CBR mould				
preparation procedure	3.2.5.2 (grading zone 4)				
sample preparation	C R				
proportion retained on 37.5mm sieve	%	4	initial moisture content	%	20
proportion retained on 20mm sieve	%	7	maximum dry density	(Mg/m <sup>3</sup> )	1.79
particle density	(Mg/m <sup>3</sup> )	#2.60	optimum moisture content	%	15
remarks	# denotes particle density has been assigned an assumed value C denotes sample has been chopped to pass 20mm sieve S denotes sample has been shredded to pass 20mm sieve R denotes sample material has been recycled between/for points				
				CONTRACT	CHECKED
				<b>35205</b>	<b>WJ</b>

Geotechnical Engineering Limited  
**CALIFORNIA BEARING RATIO**  
 BS. 1377 : Part 4 : 1990 : 7



CLIENT	OSBORNE	BH/TP No.	DSRC108
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	8L
DESCRIPTION	Yellowish brown slightly sandy gravelly CLAY	SAMPLE DEPTH (m)	2.20
		SPECIMEN DEPTH (m)	3.20



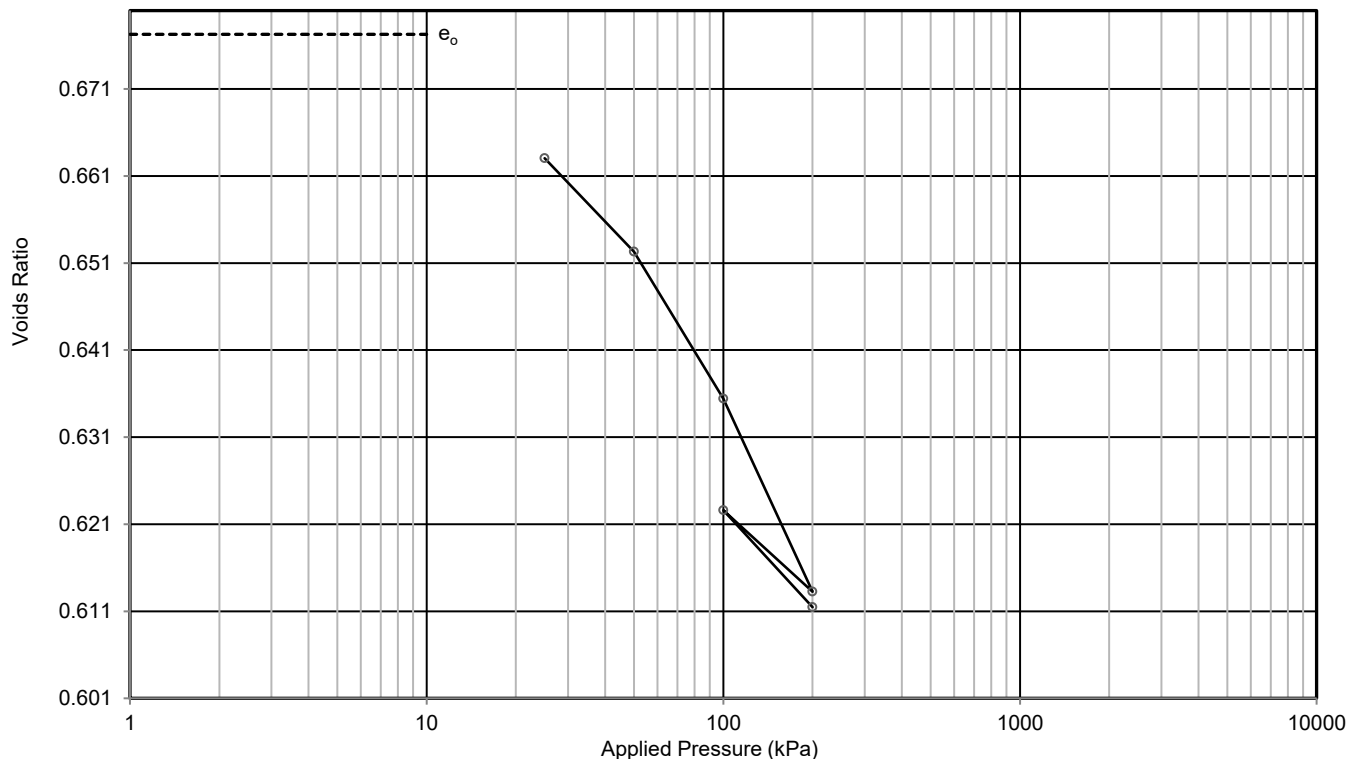
sample preparation:		Dynamic compaction - 2.5kg rammer with specified effort	
proportion > 20mm removed (%)	12.7	sample condition	Soaked
surcharge mass (kg)	10	amount of swell (mm)	0.9
INITIAL CONDITIONS		FINAL CONDITIONS	
moisture content (%)	24	moisture content top (%)	26
bulk density (Mg/m3)	1.98	moisture content base (%)	24
dry density (Mg/m3)	1.60		
remarks		results	
Flooded 17/05/19		CBR value top (%)	0.72
		CBR value base (%)	0.96
		average CBR value (%)	
— x — x — Top — ● — ● — Base		CONTRACT	CHECKED
		<b>35205</b>	<b>WJ</b>

**DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES**

**BS.1377 : Part 5 : 1990 : 3**



CLIENT	OSBORNE	BH/TP No.	CP206
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	55UT
DESCRIPTION	Brown mottled grey sandy silty CLAY	SAMPLE DEPTH (m)	5.00
		SPECIMEN DEPTH (m)	5.05



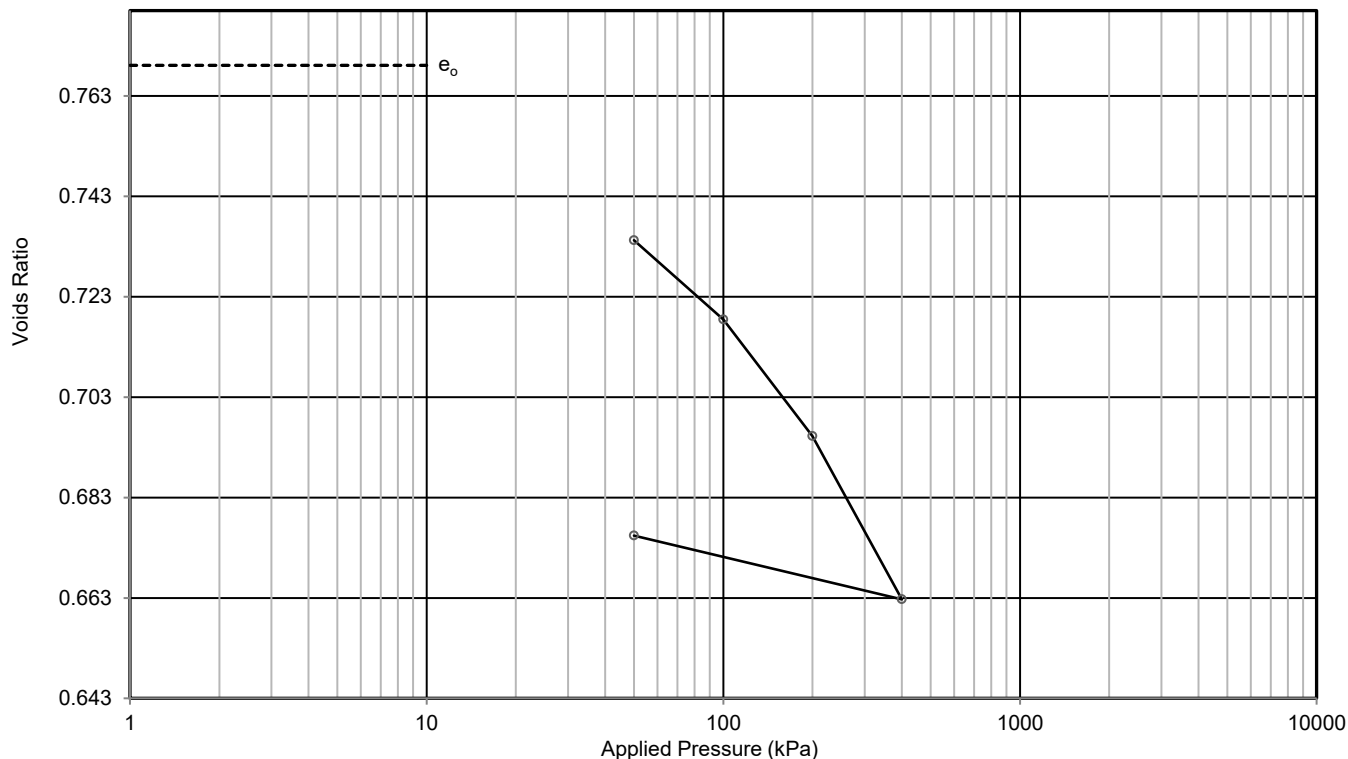
test and sample details			test results			
			pressure stage	voids ratio	laboratory coefficients of	
			(kPa)		compressibility mv (m2/MN)	consolidation Cv (m2/yr)
specimen diameter	mm	63.56				
specimen height	mm	17.79				
initial moisture content	%	23.2				
final moisture content	%	23.4				
initial bulk density	Mg/m3	1.98	25	0.663	0.34	2.4
initial dry density	Mg/m3	1.61	50	0.652	0.26	1
initial voids ratio		0.677	100	0.635	0.2	1.4
initial degree of saturation	%	93	200	0.613	0.14	1.5
particle density	Mg/m3	#2.70	100	0.623	0.058	
swelling pressure	kPa	N/A	200	0.611	0.069	3.6
P'o to P'o +100 kPa		-				
laboratory temperature	oC	20 ± 2				
method of time fitting		root time				
remarks	# denotes particle density has been assigned an assumed value load frame corrections applied				CONTRACT	CHECKED
					<b>35205</b>	<b>TB</b>

**DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES**

**BS.1377 : Part 5 : 1990 : 3**



CLIENT	OSBORNE	BH/TP No.	DSRC108
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-PHASE 2A (1077)	SAMPLE No./TYPE	17UT
DESCRIPTION	Orangish brown mottled grey slightly sandy clayey SILT	SAMPLE DEPTH (m)	5.20
		SPECIMEN DEPTH (m)	5.25



test and sample details			test results			
			pressure stage	voids ratio	laboratory coefficients of	
			(kPa)		compressibility mv (m <sup>2</sup> /MN)	consolidation Cv (m <sup>2</sup> /yr)
specimen diameter	mm	63.20	50	0.734	0.39	4
specimen height	mm	19.04	100	0.718	0.18	5
initial moisture content	%	28.0	200	0.695	0.14	5.2
final moisture content	%	26.0	400	0.663	0.096	5.8
initial bulk density	Mg/m <sup>3</sup>	1.95	50	0.675	0.022	
initial dry density	Mg/m <sup>3</sup>	1.53				
initial voids ratio		0.769				
initial degree of saturation	%	98				
particle density	Mg/m <sup>3</sup>	#2.70				
swelling pressure	kPa	N/A				
P'o to P'o +100 kPa		-				
laboratory temperature	oC	20 ± 2				
method of time fitting		root time				
remarks	# denotes particle density has been assigned an assumed value load frame corrections applied				CONTRACT	CHECKED
					<b>35205</b>	<b>WJ</b>

# SHEAR STRENGTH BY DIRECT SHEAR



**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No.

CP208

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)

SAMPLE No./TYPE

16L

SAMPLE DEPTH (m)

5.00-6.00

SPECIMEN DEPTH (m)

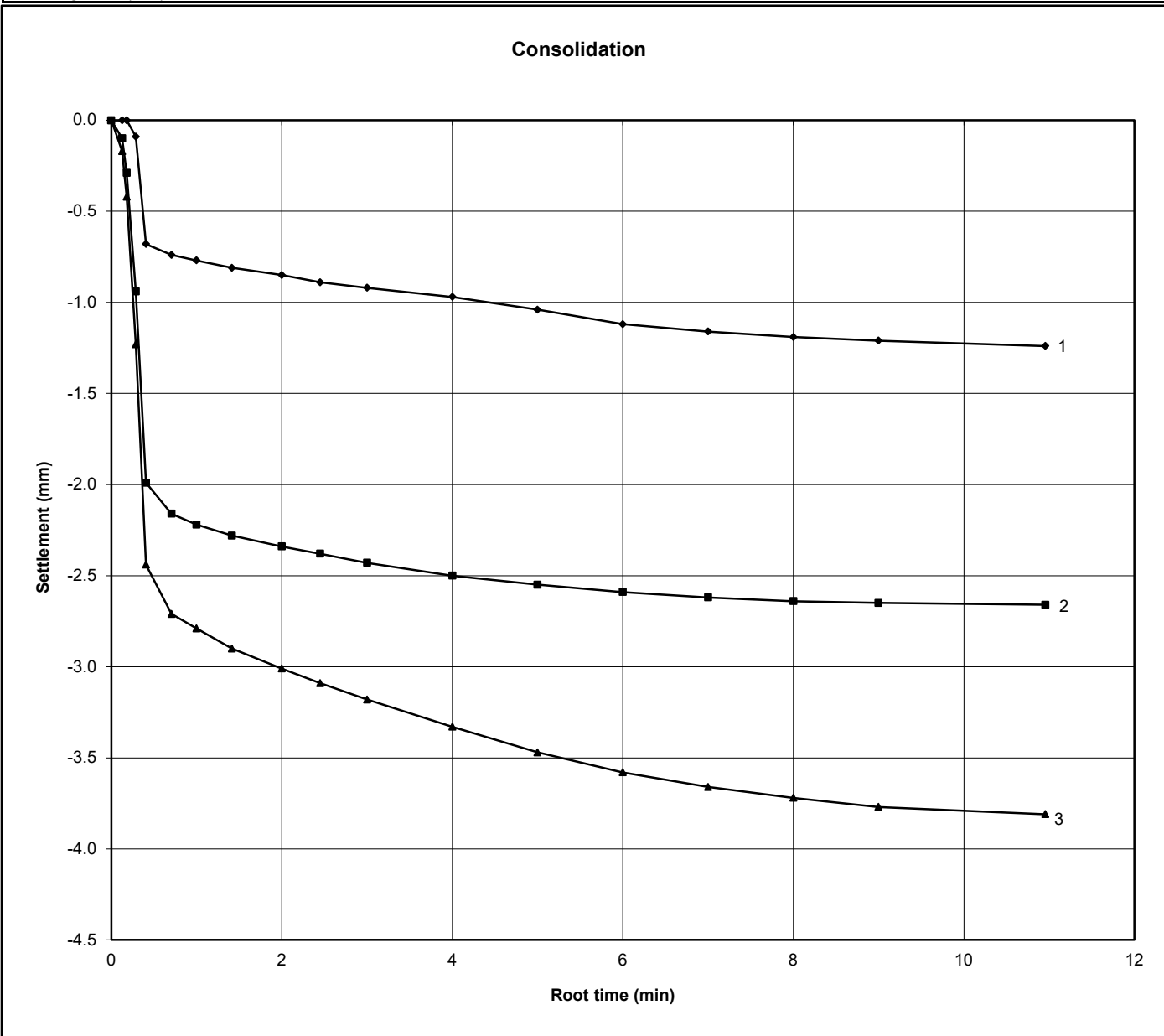
5.60

DESCRIPTION Greenish brown slightly sandy silty CLAY

PREPARATION DETAILS Remoulded using a 2.5kg rammer - 3 layers 27 blows - 0% removed (retained on 2mm sieve).

CONSOLIDATION STAGE RESULTS

Specimen	1	2	3
t100 (min)	9.00	2.50	3.50
t <sub>f</sub> (min)	114.30	31.75	44.45
Machine speed (mm/min)	0.0100	0.0100	0.0100
Normal Stress (kPa)	100	300	600
Initial height (mm)	19.99	19.99	19.99
Final height (mm)	18.75	17.33	16.18



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remarks: Specimens are submerged throughout the test.	CONTRACT <b>35205</b>	CHECKED <b>NP</b>
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# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

CP208

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)

SAMPLE No./TYPE

16L

SAMPLE DEPTH (m)

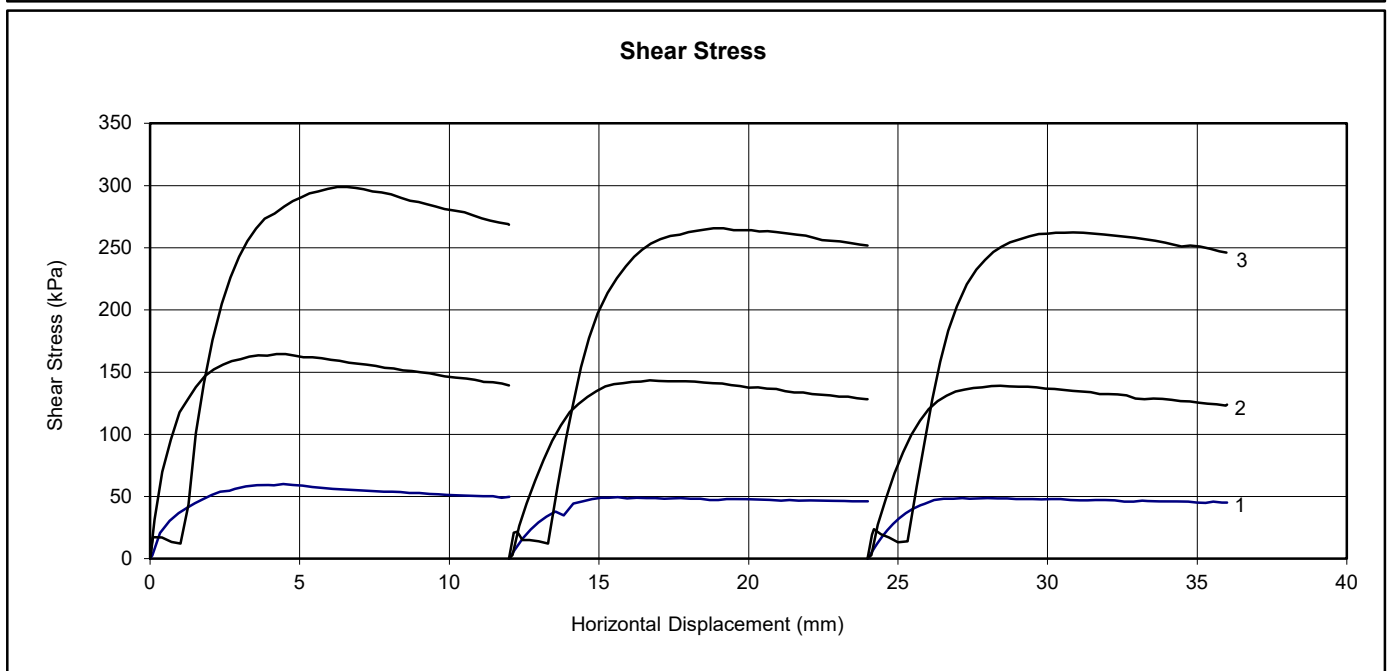
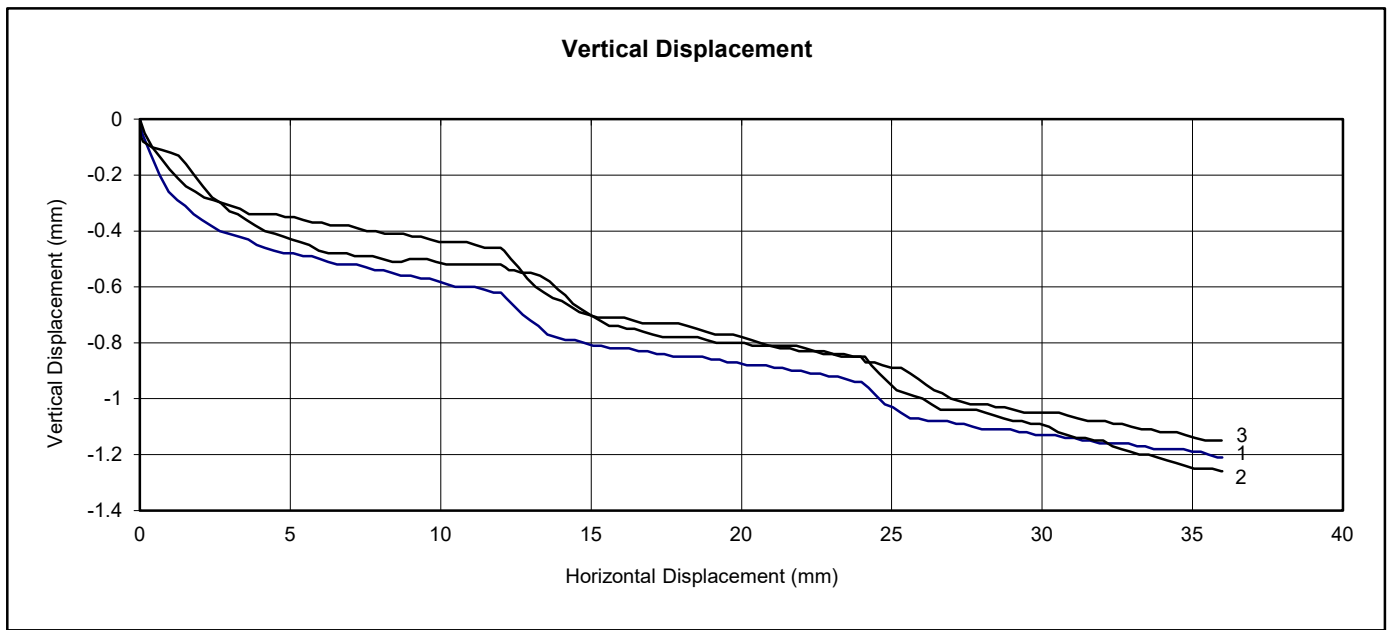
5.00-6.00

SPECIMEN DEPTH (m)

5.60

DESCRIPTION Greenish brown slightly sandy silty CLAY

SHEAR STAGE RESULTS			
Specimen	1	2	3
Peak Shear Strength (kPa)	60.0	164.4	298.9
Residual Shear Strength (kPa)	45.0	123.1	246.1
Cum. Vertical Displ. (mm)	-1.210	-1.260	-1.150
Cum. Forward Displ. (mm)	35.990	35.990	35.970
Normal Stress (kPa)	100	300	600



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remarks:  
slow machine reversal

CONTRACT  
**35205**

CHECKED  
**NP**

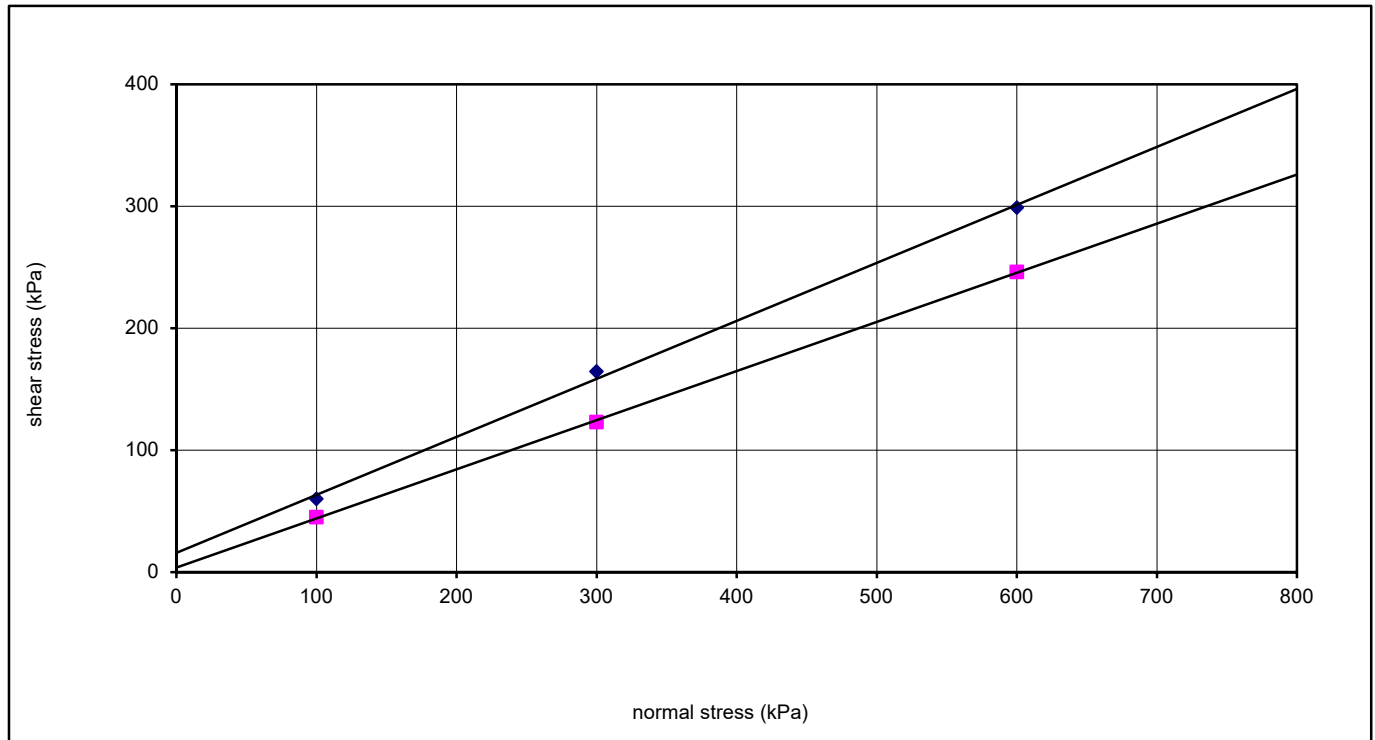


# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE  
 SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)  
 DESCRIPTION Greenish brown slightly sandy silty CLAY

BH/TP No. CP208  
 SAMPLE No./TYPE 16L  
 SAMPLE DEPTH (m) 5.00-6.00  
 SPECIMEN DEPTH (m) 5.60



INITIAL CONDITIONS						
				specimen 1	specimen 2	specimen 3
specimen size (mm)	60	moisture content (%)		22.3	20.3	18.6
	Square	bulk density Mg/m <sup>3</sup>		1.95	1.93	1.91
specimen height (mm)	19.99	dry density Mg/m <sup>3</sup>		1.59	1.61	1.61
		voids ratio		0.694	0.680	0.675
particle density (Mg/m <sup>3</sup> )	2.70 #	degree of saturation (%)		87	81	75
		strain rate (mm/min)		0.01	0.01	0.01

SHEARING STAGES						
specimen	normal stress (kPa)	peak shear stress (kPa)	horizontal displacement (mm)	residual shear stress (kPa)	traverses (No.)	total forward displacement (mm)
1	100	60.0	4.450	45.0	3	35.990
2	300	164.4	4.220	123.1	3	35.990
3	600	298.9	6.260	246.1	3	35.970

SHEAR STRENGTH PARAMETERS			
peak angle of shearing resistance $\phi'$	25	residual angle of shearing resistance $\phi'_r$	22
peak effective cohesion intercept, $c'$ (kPa)	16	residual effective cohesion intercept, $c'_r$ (kPa)	4

remarks: # denotes particle density has been assigned an assumed value.	CONTRACT	CHECKED
	<b>35205</b>	<b>NP</b>

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# SHEAR STRENGTH BY DIRECT SHEAR



**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No.

CP208

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)

SAMPLE No./TYPE

41CS

SAMPLE DEPTH (m)

22.55-22.90

SPECIMEN DEPTH (m)

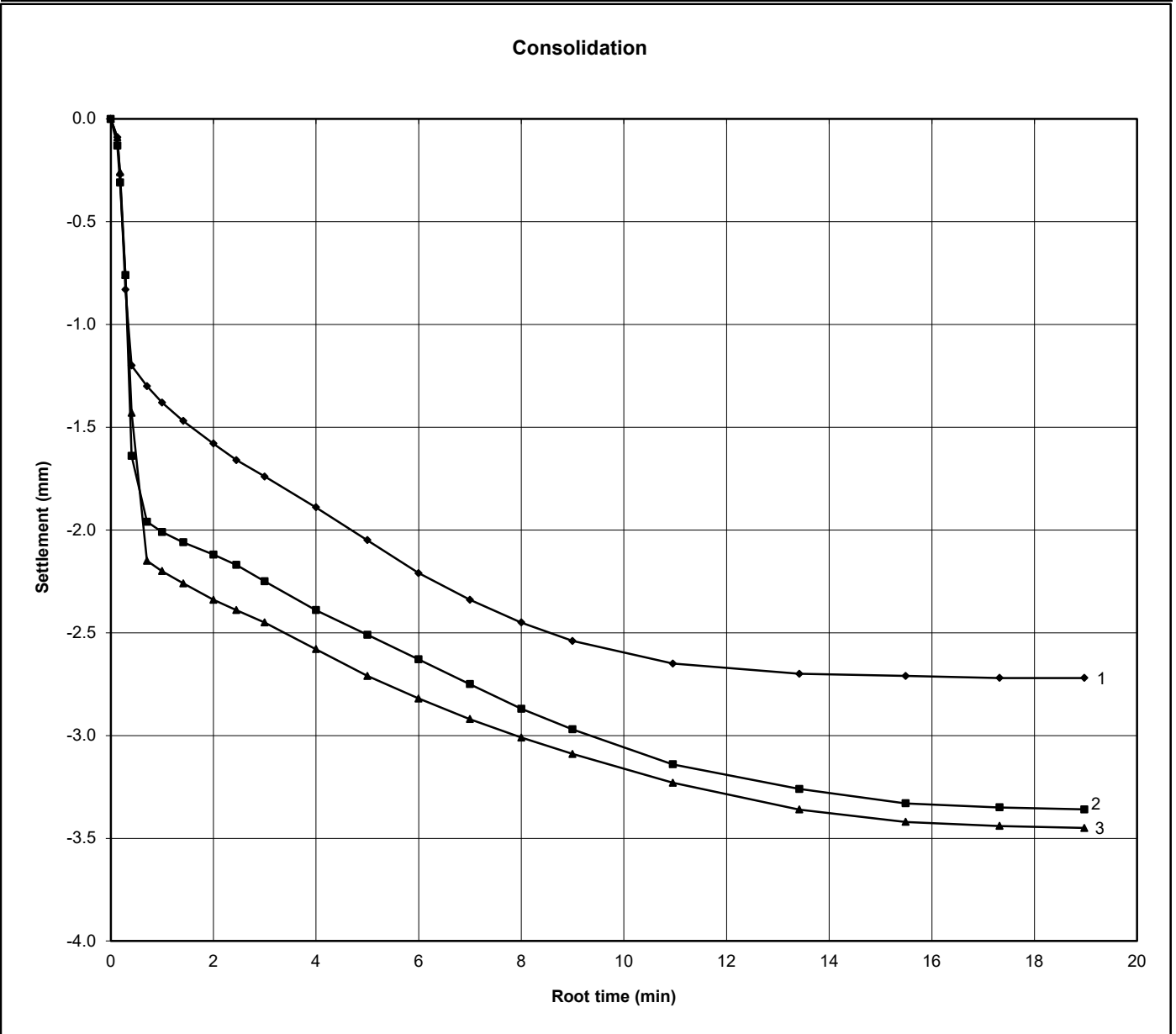
22.60

DESCRIPTION Greyish brown slightly sandy silty CLAY

**PREPARATION DETAILS** Recompacted using a 2.5kg rammer (3 layers 27 blows) - 0% removed (retained on 2mm sieve).

**CONSOLIDATION STAGE RESULTS**

Specimen	1	2	3
t100 (min)	61.70	116.70	93.30
t <sub>f</sub> (min)	783.59	1482.09	1184.91
Machine speed (mm/min)	0.0030	0.0030	0.0030
Normal Stress (kPa)	200	400	600
Initial height (mm)	19.99	19.99	19.99
Final height (mm)	17.27	16.63	16.54



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remarks: Specimens are submerged throughout the test.	CONTRACT <b>35205</b>	CHECKED <b>NP</b>
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# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

CP208

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)

SAMPLE No./TYPE

41CS

SAMPLE DEPTH (m)

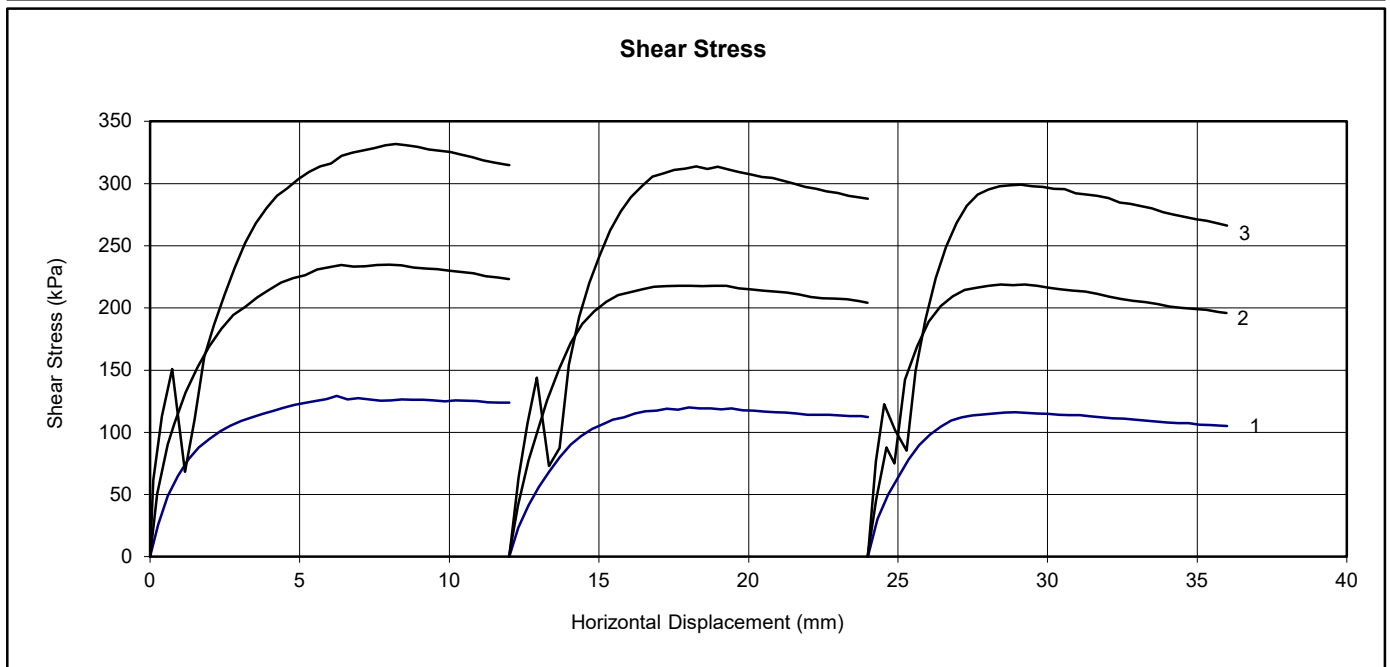
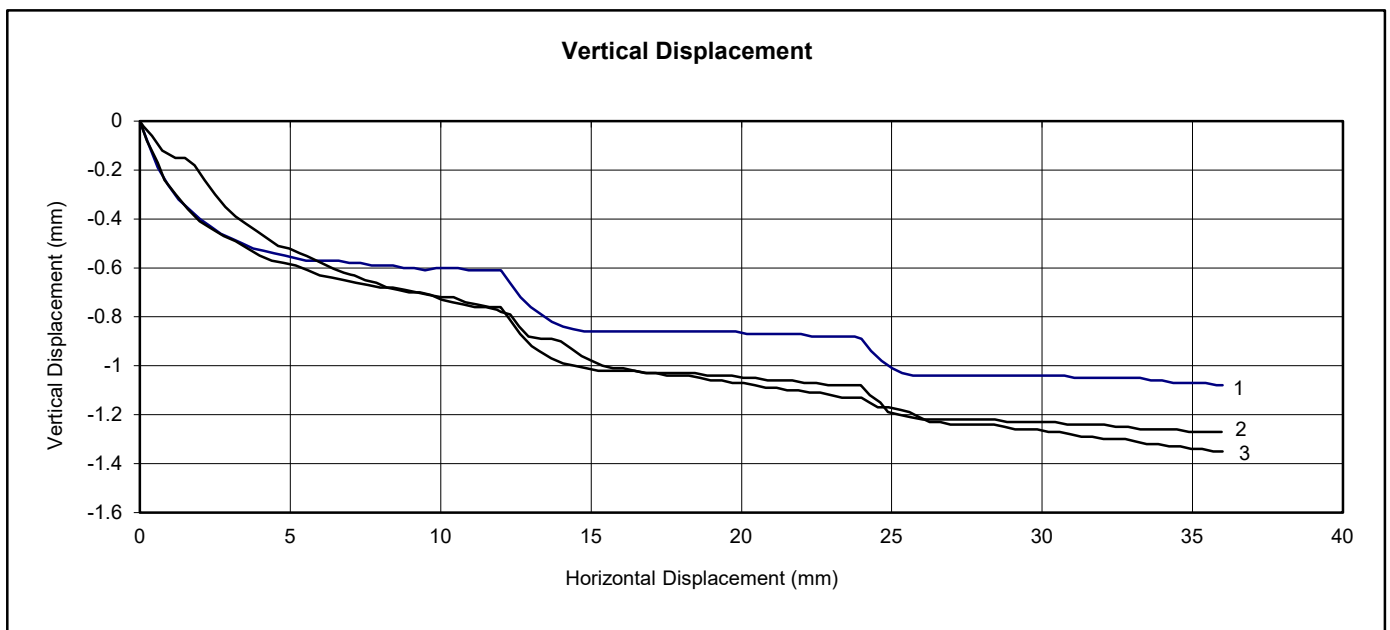
22.55-22.90

SPECIMEN DEPTH (m)

22.60

DESCRIPTION Greyish brown slightly sandy silty CLAY

SHEAR STAGE RESULTS			
Specimen	1	2	3
Peak Shear Strength (kPa)	129.2	234.7	331.7
Residual Shear Strength (kPa)	105.0	195.8	266.1
Cum. Vertical Displ. (mm)	-1.080	-1.270	-1.350
Cum. Forward Displ. (mm)	36.000	35.970	36.000
Normal Stress (kPa)	200	400	600



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remarks:  
slow machine reversal

CONTRACT  
**35205**

CHECKED  
**NP**

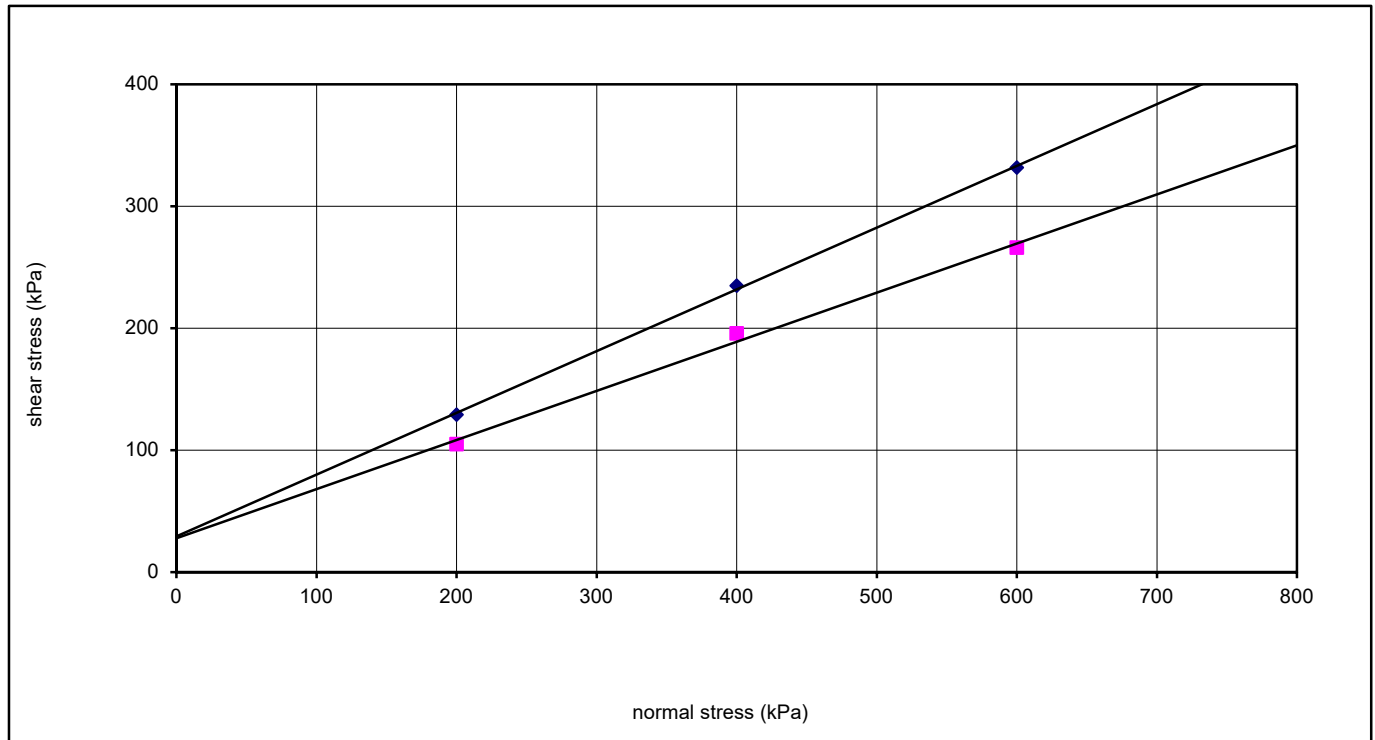
# SHEAR STRENGTH BY DIRECT SHEAR



**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE  
 SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)  
 DESCRIPTION Greyish brown slightly sandy silty CLAY

BH/TP No. CP208  
 SAMPLE No./TYPE 41CS  
 SAMPLE DEPTH (m) 22.55-22.90  
 SPECIMEN DEPTH (m) 22.60



INITIAL CONDITIONS						
				specimen 1	specimen 2	specimen 3
specimen size (mm)	60	moisture content (%)		22.2	20.9	21.1
	Square	bulk density Mg/m <sup>3</sup>		1.71	1.72	1.73
specimen height (mm)	19.99	dry density Mg/m <sup>3</sup>		1.40	1.43	1.43
		voids ratio		0.932	0.895	0.890
particle density (Mg/m <sup>3</sup> )	2.70 #	degree of saturation (%)		64	63	64
		strain rate (mm/min)		0.003	0.003	0.003

SHEARING STAGES						
specimen	normal stress (kPa)	peak shear stress (kPa)	horizontal displacement (mm)	residual shear stress (kPa)	traverses (No.)	total forward displacement (mm)
1	200	129.2	6.240	105.0	3	36.000
2	400	234.7	7.990	195.8	3	35.970
3	600	331.7	8.210	266.1	3	36.000

SHEAR STRENGTH PARAMETERS			
peak angle of shearing resistance $\phi'$	27	residual angle of shearing resistance $\phi'_r$	22
peak effective cohesion intercept, $c'$ (kPa)	29	residual effective cohesion intercept, $c'_r$ (kPa)	28

remarks: # denotes particle density has been assigned an assumed value.	CONTRACT	CHECKED
	<b>35205</b>	<b>NP</b>

◆ peak ■ residual

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# SHEAR STRENGTH BY DIRECT SHEAR



BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

CP212

SAMPLE No./TYPE

24CS

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

SAMPLE DEPTH (m)

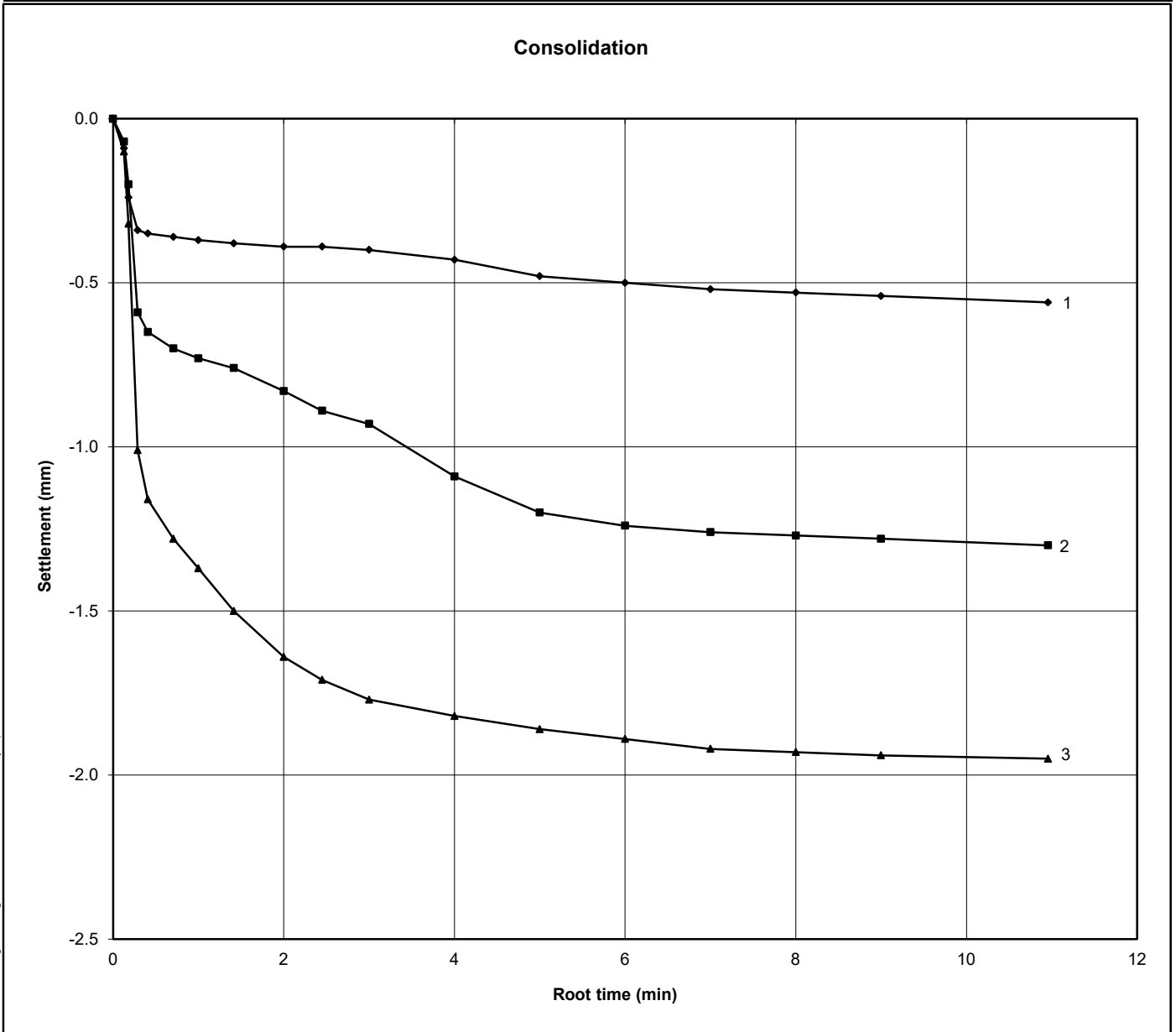
12.00-12.45

SPECIMEN DEPTH (m)

12.00-12.10

DESCRIPTION Brown mottled orange slightly gravelly slightly sandy silty CLAY

PREPARATION DETAILS		Undisturbed		
CONSOLIDATION STAGE RESULTS				
Specimen		1	2	3
t100 (min)		38.00	17.50	8.60
t <sub>f</sub> (min)		482.60	222.25	109.22
Machine speed (mm/min)		0.0100	0.0100	0.0100
Normal Stress (kPa)		100	250	400
Initial height (mm)		19.99	19.99	19.99
Final height (mm)		19.43	18.69	18.04



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remarks: Residual shear stress for specimen 3 not reported.

CONTRACT

CHECKED

**35205**

**NP**



# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

CP212

SAMPLE No./TYPE

24CS

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

SAMPLE DEPTH (m)

12.00-12.45

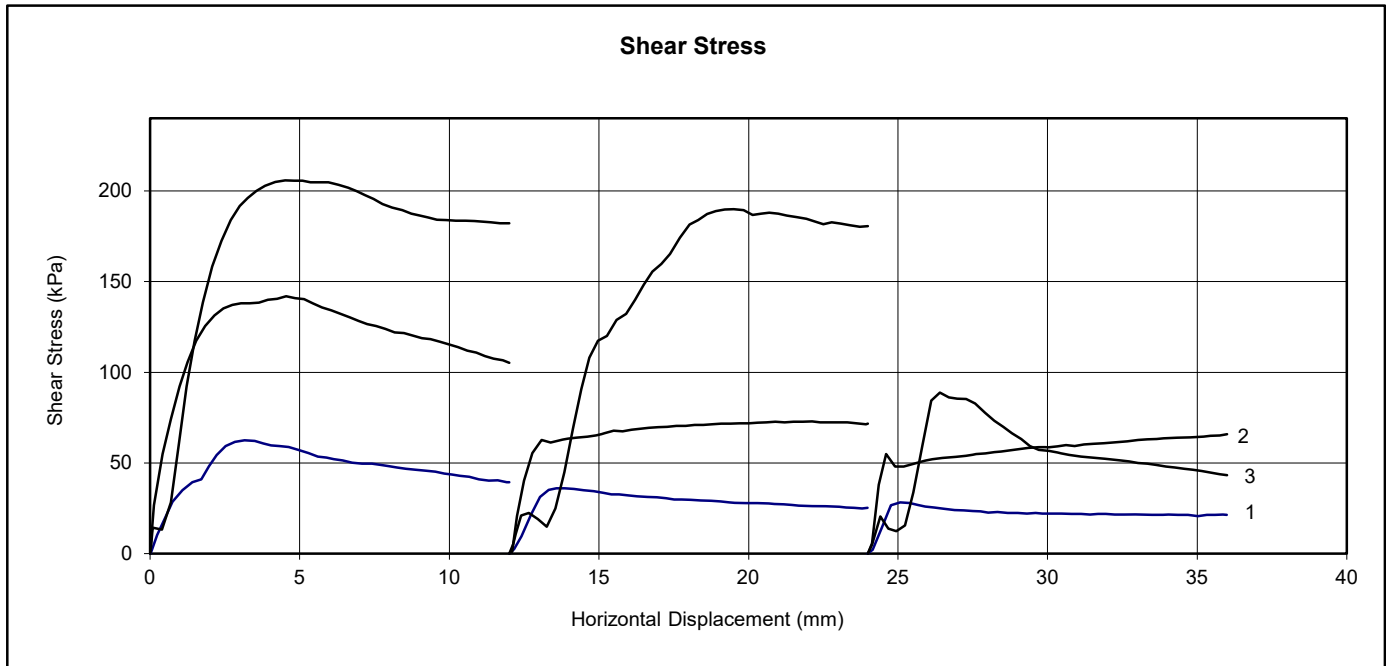
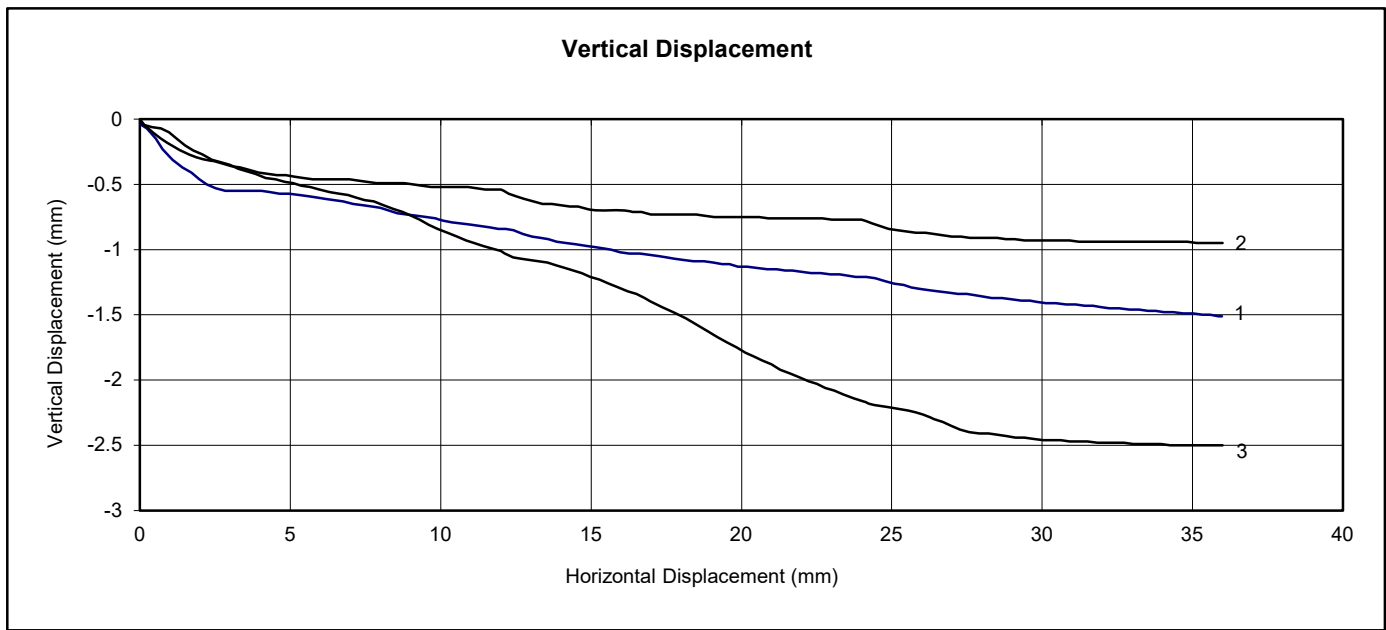
SPECIMEN DEPTH (m)

12.00-12.10

DESCRIPTION Brown mottled orange slightly gravelly slightly sandy silty CLAY

**SHEAR STAGE RESULTS**

Specimen	1	2	3
Peak Shear Strength (kPa)	62.5	141.9	205.8
Residual Shear Strength (kPa)	20.8	58.6	43.3
Cum. Vertical Displ. (mm)	-1.510	-0.950	-2.500
Cum. Forward Displ. (mm)	35.980	36.000	36.000
Normal Stress (kPa)	100	250	400



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remarks: slow machine reversal  
 Specimen 3 reached the hanger bar travel limit during shear stage 2  
 and therefore has no residual shear value.

CONTRACT	CHECKED
<b>35205</b>	<b>NP</b>

# SHEAR STRENGTH BY DIRECT SHEAR



**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No. CP212

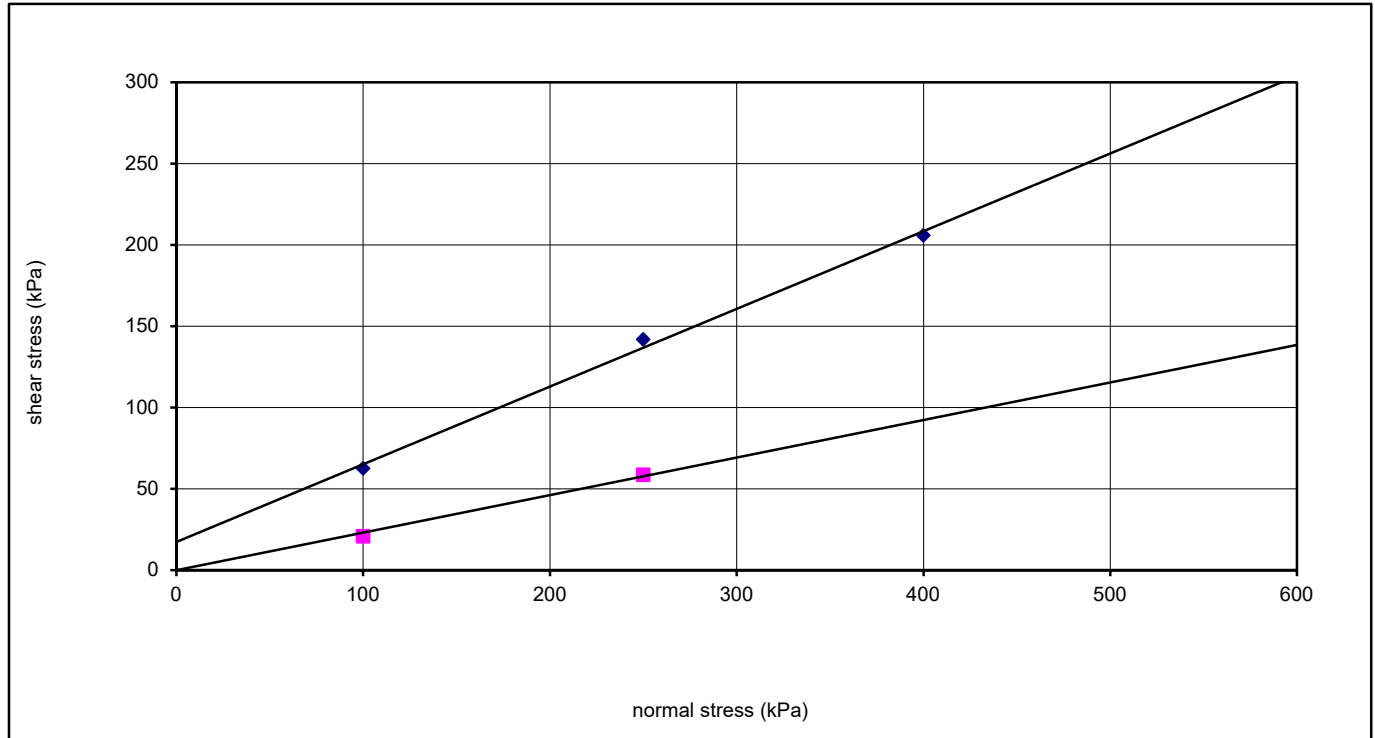
SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION-PHASE 2A (1077)

SAMPLE No./TYPE 24CS

SAMPLE DEPTH (m) 12.00-12.45

SPECIMEN DEPTH (m) 12.00-12.10

DESCRIPTION Brown mottled orange slightly gravelly slightly sandy silty CLAY



INITIAL CONDITIONS						
				specimen 1	specimen 2	specimen 3
specimen size (mm)	60	moisture content (%)		26.2	24.5	26.2
	Square	bulk density Mg/m <sup>3</sup>		1.98	1.98	1.98
specimen height (mm)	19.99	dry density Mg/m <sup>3</sup>		1.57	1.59	1.57
		voids ratio		0.718	0.702	0.720
particle density (Mg/m <sup>3</sup> )	2.70 #	degree of saturation (%)		99	94	98
		strain rate (mm/min)		0.01	0.01	0.01

SHEARING STAGES						
specimen	normal stress (kPa)	peak shear stress (kPa)	horizontal displacement (mm)	residual shear stress (kPa)	traverses (No.)	total forward displacement (mm)
1	100	62.5	3.160	20.8	3	35.980
2	250	141.9	4.550	58.6	3	36.000
3	400	205.8	4.510	43.3	3	36.000

SHEAR STRENGTH PARAMETERS			
peak angle of shearing resistance $\phi'$	26	residual angle of shearing resistance $\phi'_r$	13
peak effective cohesion intercept, $c'$ (kPa)	17	residual effective cohesion intercept, $c'_r$ (kPa)	0

remarks: # denotes particle density has been assigned an assumed value.	CONTRACT	CHECKED
Specimen 3 reached the hanger bar travel limit during shear stage 2 and therefore has no residual shear value. ◆ peak ■ residual		
	<b>35205</b>	<b>NP</b>

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# SHEAR STRENGTH BY DIRECT SHEAR



BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

CP223

SAMPLE No./TYPE

6UT

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

SAMPLE DEPTH (m)

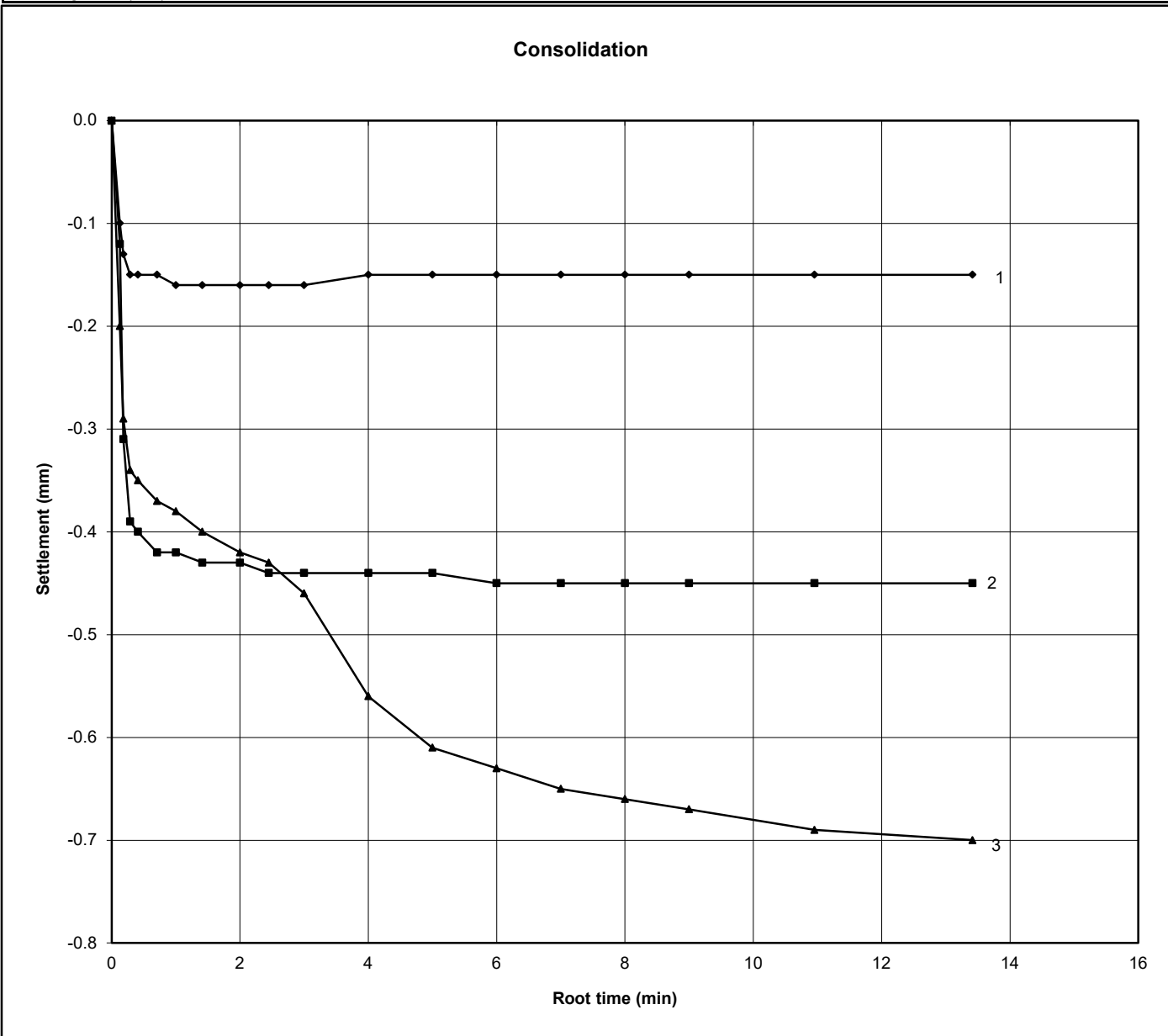
2.00-2.45

SPECIMEN DEPTH (m)

2.05-2.15

DESCRIPTION Greyish brown mottled grey and orange slightly sandy silty CLAY

PREPARATION DETAILS		Undisturbed		
CONSOLIDATION STAGE RESULTS				
Specimen		<b>1</b>	<b>2</b>	<b>3</b>
t100 (min)		1.40	1.20	27.00
tf (min)		17.78	15.24	342.90
Machine speed (mm/min)		0.0100	0.0100	0.0100
Normal Stress (kPa)		25	50	100
Initial height (mm)		19.99	19.99	19.99
Final height (mm)		19.83	19.54	19.29



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remarks:

CONTRACT	CHECKED
<b>35205</b>	<b>NP</b>



# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

CP223

SAMPLE No./TYPE

6UT

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

SAMPLE DEPTH (m)

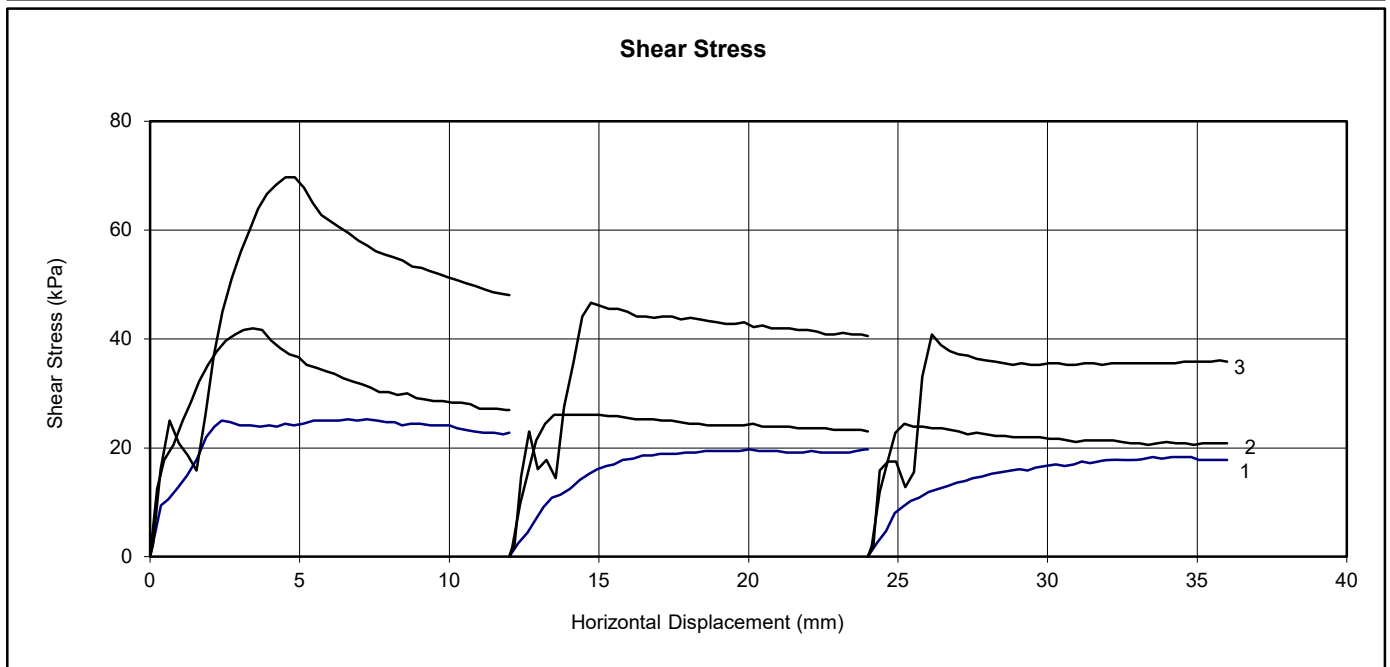
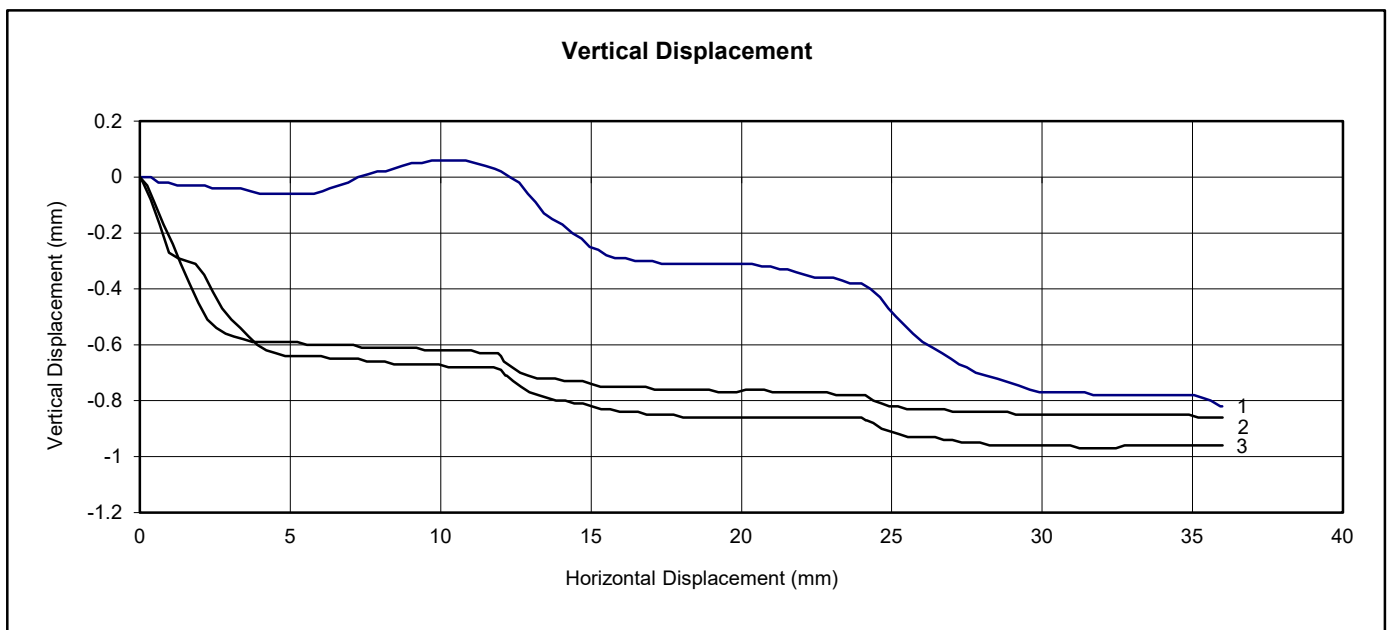
2.00-2.45

SPECIMEN DEPTH (m)

2.05-2.15

DESCRIPTION Greyish brown mottled grey and orange slightly sandy silty CLAY

SHEAR STAGE RESULTS			
Specimen	1	2	3
Peak Shear Strength (kPa)	25.3	41.9	69.7
Residual Shear Strength (kPa)	16.7	20.6	35.3
Cum. Vertical Displ. (mm)	-0.820	-0.860	-0.960
Cum. Forward Displ. (mm)	35.990	36.000	36.000
Normal Stress (kPa)	25	50	100



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remarks:  
slow machine reversal

CONTRACT  
**35205**

CHECKED  
**NP**



# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

CP223

SAMPLE No./TYPE

6UT

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION-PHASE 2A (1077)

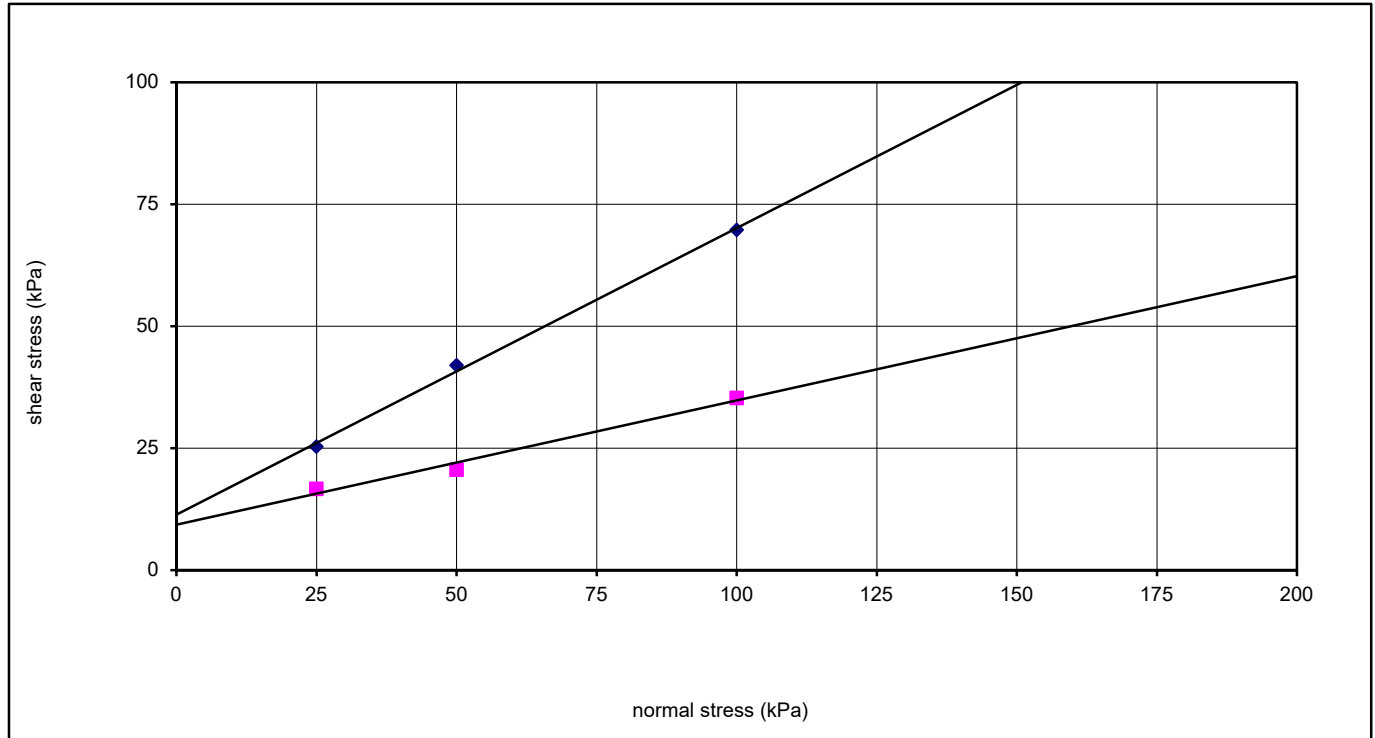
SAMPLE DEPTH (m)

2.00-2.45

DESCRIPTION Greyish brown mottled grey and orange slightly sandy silty CLAY

SPECIMEN DEPTH (m)

2.05-2.15



## INITIAL CONDITIONS

			specimen 1	specimen 2	specimen 3
specimen size (mm)	60	moisture content (%)	30.9	27.9	27.4
	Square	bulk density Mg/m <sup>3</sup>	1.97	1.94	1.93
specimen height (mm)	19.99	dry density Mg/m <sup>3</sup>	1.50	1.52	1.52
		voids ratio	0.797	0.775	0.778
particle density (Mg/m <sup>3</sup> )	2.70 #	degree of saturation (%)	105	97	95
		strain rate (mm/min)	0.01	0.01	0.01

## SHEARING STAGES

specimen	normal stress (kPa)	peak shear stress (kPa)	horizontal displacement (mm)	residual shear stress (kPa)	traverses (No.)	total forward displacement (mm)
1	25	25.3	6.610	16.7	3	35.990
2	50	41.9	3.430	20.6	3	36.000
3	100	69.7	4.520	35.3	3	36.000

## SHEAR STRENGTH PARAMETERS

peak angle of shearing resistance $\phi'$	30	residual angle of shearing resistance $\phi'_r$	14
peak effective cohesion intercept, $c'$ (kPa)	11	residual effective cohesion intercept, $c'_r$ (kPa)	9

remarks: # denotes particle density has been assigned an assumed value.

CONTRACT

CHECKED

**35205**

**NP**

◆ peak ■ residual

# SHEAR STRENGTH BY DIRECT SHEAR



**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No.

DSRC108

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION-  
PHASE 2A (1077)

SAMPLE No./TYPE

36CS

SAMPLE DEPTH (m)

14.20-14.60

SPECIMEN DEPTH (m)

14.20-14.30

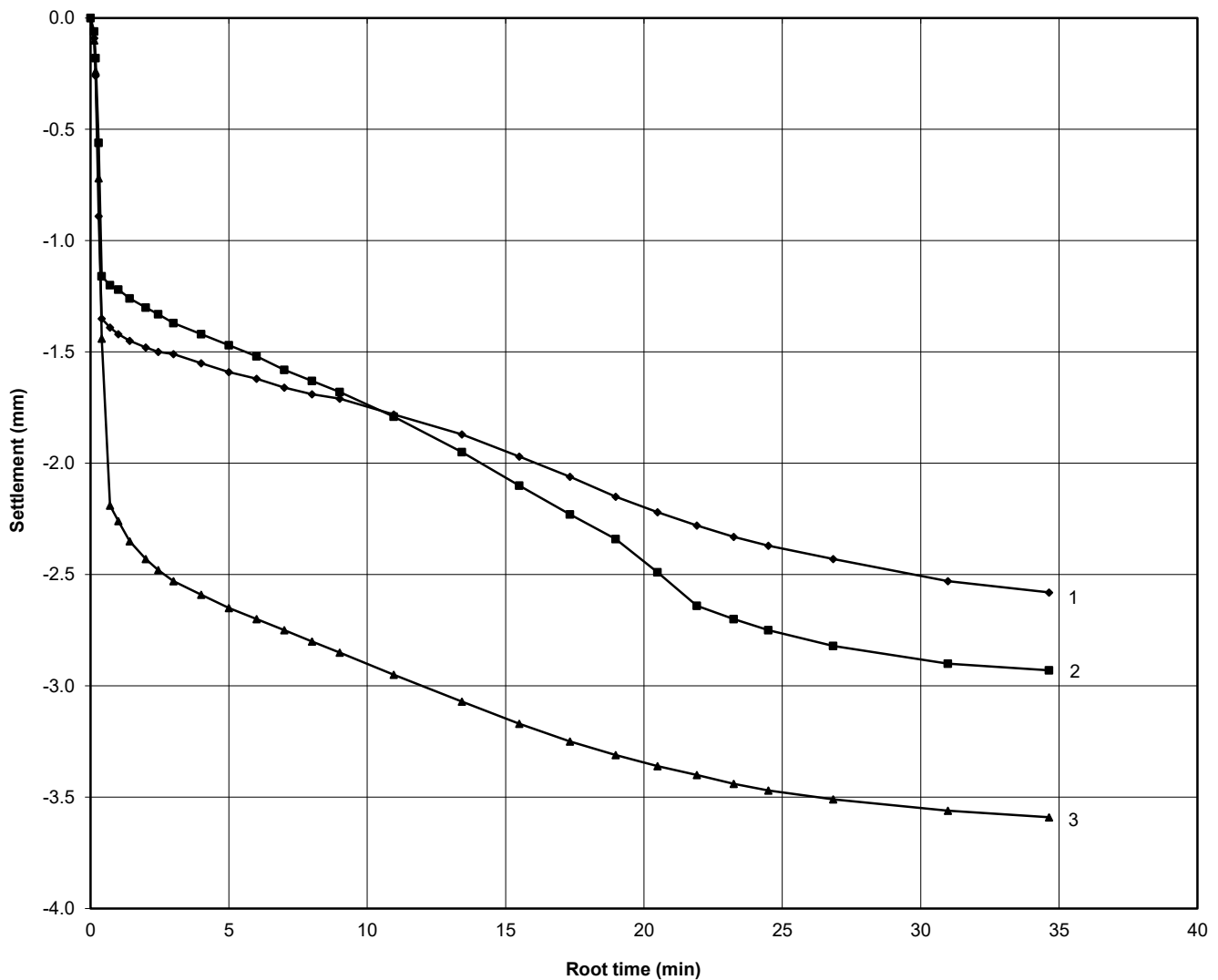
DESCRIPTION Greyish brown slightly sandy silty CLAY with rare shell  
fragments

PREPARATION DETAILS Remoulded using a tamping rod - 0% removed (retained on 2mm sieve).

**CONSOLIDATION STAGE RESULTS**

Specimen	1	2	3
t100 (min)	148.00	245.10	70.30
tf (min)	1879.60	3112.77	892.81
Machine speed (mm/min)	0.0020	0.0020	0.0020
Normal Stress (kPa)	150	300	600
Initial height (mm)	19.90	19.90	19.90
Final height (mm)	17.32	16.97	16.31

**Consolidation**



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remarks: Test was scheduled as undisturbed, however the material was too brittle.  
remoulded test was undertaken with permission of the client.

CONTRACT  
**35205**

CHECKED  
**NP**



# SHEAR STRENGTH BY DIRECT SHEAR

**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No.

DSRC108

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION-PHASE 2A (1077)

SAMPLE No./TYPE

36CS

SAMPLE DEPTH (m)

14.20-14.60

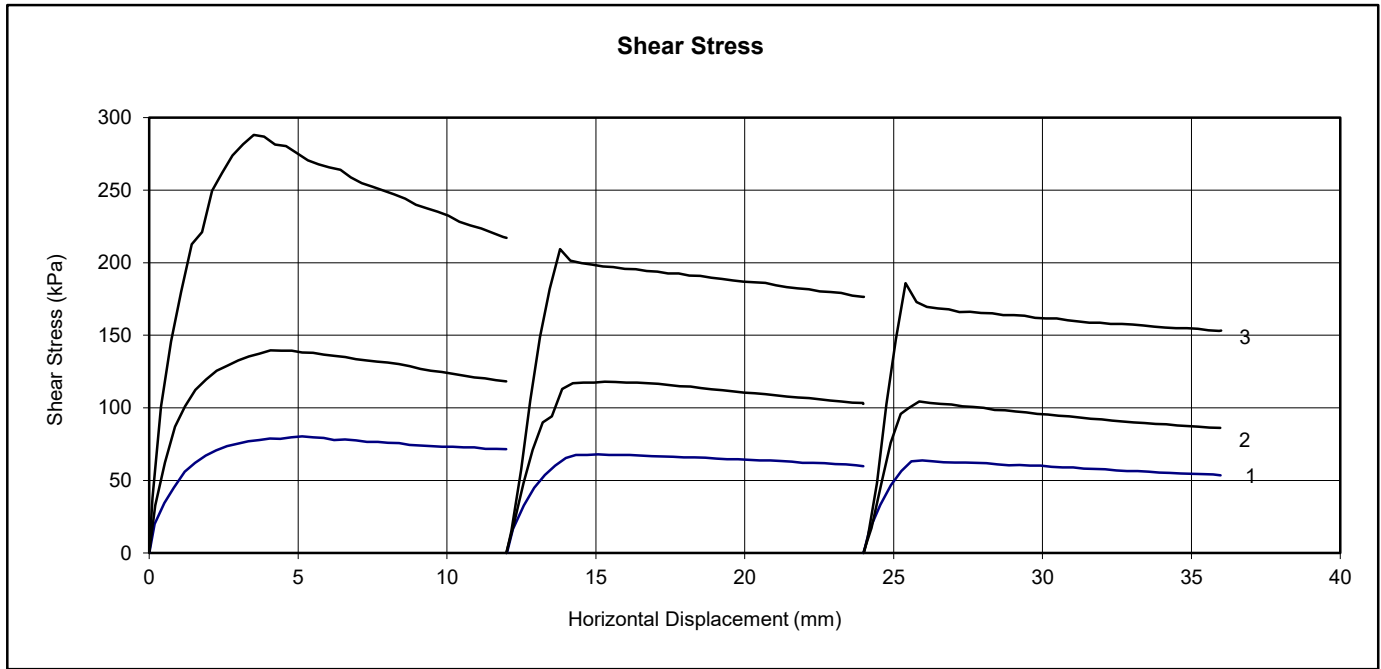
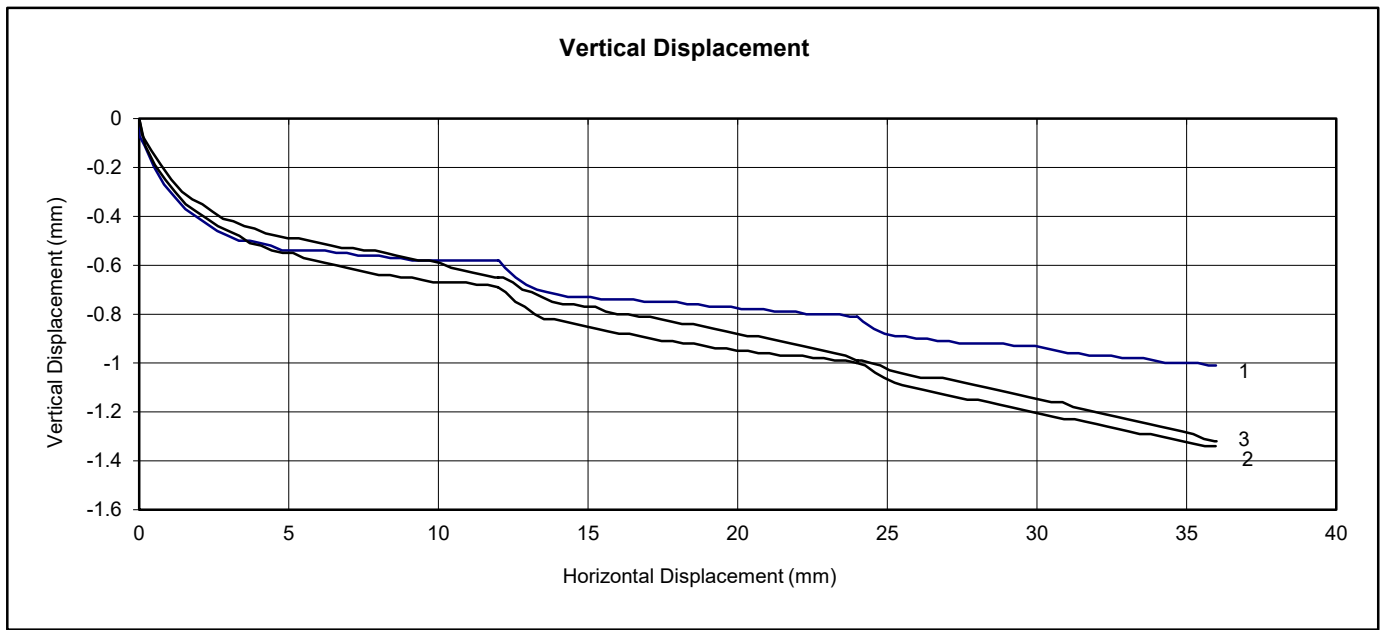
DESCRIPTION Greyish brown slightly sandy silty CLAY with rare shell fragments

SPECIMEN DEPTH (m)

14.20-14.30

**SHEAR STAGE RESULTS**

Specimen	1	2	3
Peak Shear Strength (kPa)	80.3	139.6	288.1
Residual Shear Strength (kPa)	53.5	86.1	152.9
Cum. Vertical Displ. (mm)	-1.010	-1.340	-1.320
Cum. Forward Displ. (mm)	35.980	35.970	36.000
Normal Stress (kPa)	150	300	600



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remarks:  
slow machine reversal

CONTRACT  
**35205**

CHECKED  
**NP**



# SHEAR STRENGTH BY DIRECT SHEAR

**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No.

DSRC108

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION-PHASE 2A (1077)

SAMPLE No./TYPE

36CS

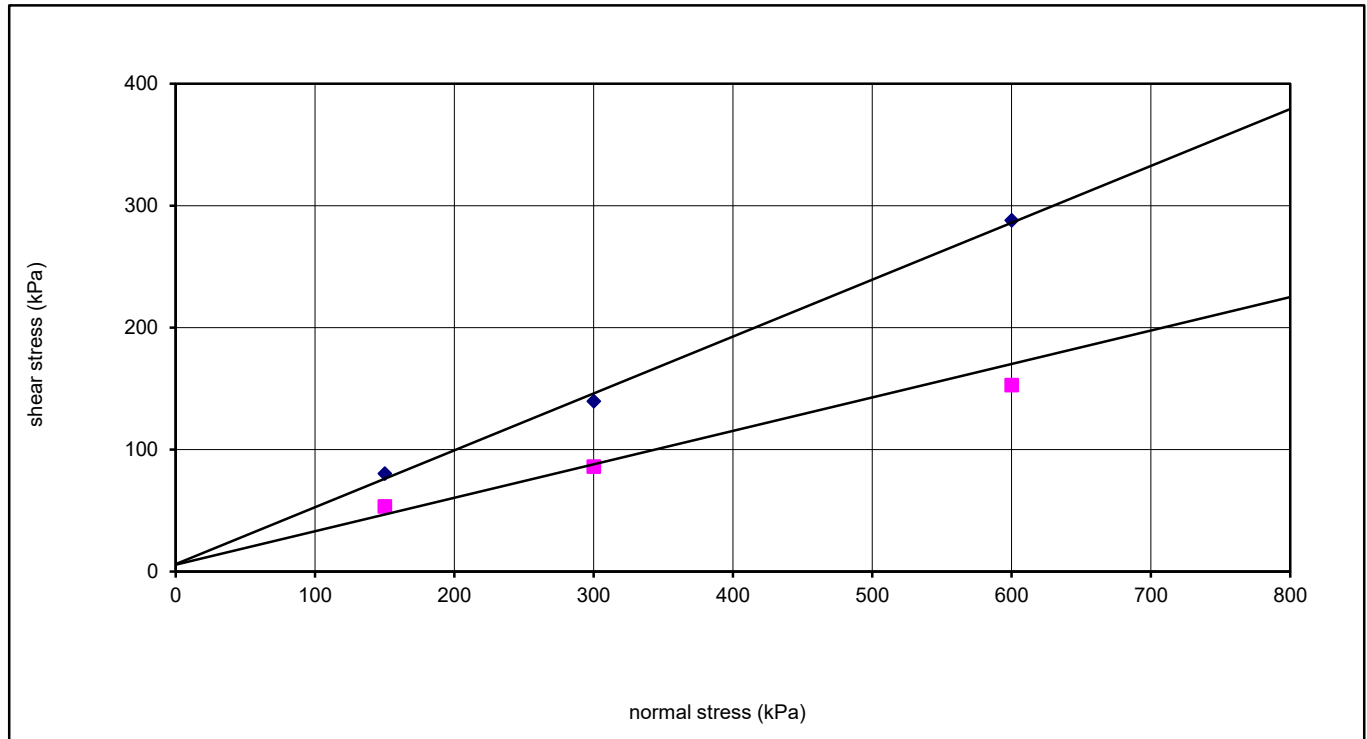
SAMPLE DEPTH (m)

14.20-14.60

SPECIMEN DEPTH (m)

14.20-14.30

DESCRIPTION Greyish brown slightly sandy silty CLAY with rare shell fragments



INITIAL CONDITIONS						
				specimen 1	specimen 2	specimen 3
specimen size (mm)	60	moisture content (%)		22.4	20.9	19.3
	Square	bulk density Mg/m <sup>3</sup>		1.82	1.82	1.81
specimen height (mm)	19.90	dry density Mg/m <sup>3</sup>		1.49	1.51	1.52
		voids ratio		0.817	0.792	0.779
particle density (Mg/m <sup>3</sup> )	2.70 #	degree of saturation (%)		74	71	67
		strain rate (mm/min)		0.002	0.002	0.002

SHEARING STAGES						
specimen	normal stress (kPa)	peak shear stress (kPa)	horizontal displacement (mm)	residual shear stress (kPa)	traverses (No.)	total forward displacement (mm)
1	150	80.3	5.140	53.5	3	35.980
2	300	139.6	4.070	86.1	3	35.970
3	600	288.1	3.510	152.9	3	36.000

SHEAR STRENGTH PARAMETERS			
peak angle of shearing resistance $\phi'$	25	residual angle of shearing resistance $\phi'_r$	15
peak effective cohesion intercept, $c'$ (kPa)	6	residual effective cohesion intercept, $c'_r$ (kPa)	6

remarks: # denotes particle density has been assigned an assumed value.	CONTRACT	CHECKED
	<b>35205</b>	<b>NP</b>

◆ peak ■ residual

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# SHEAR STRENGTH BY DIRECT SHEAR



BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

DSRC207

SAMPLE No./TYPE

34CS

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

SAMPLE DEPTH (m)

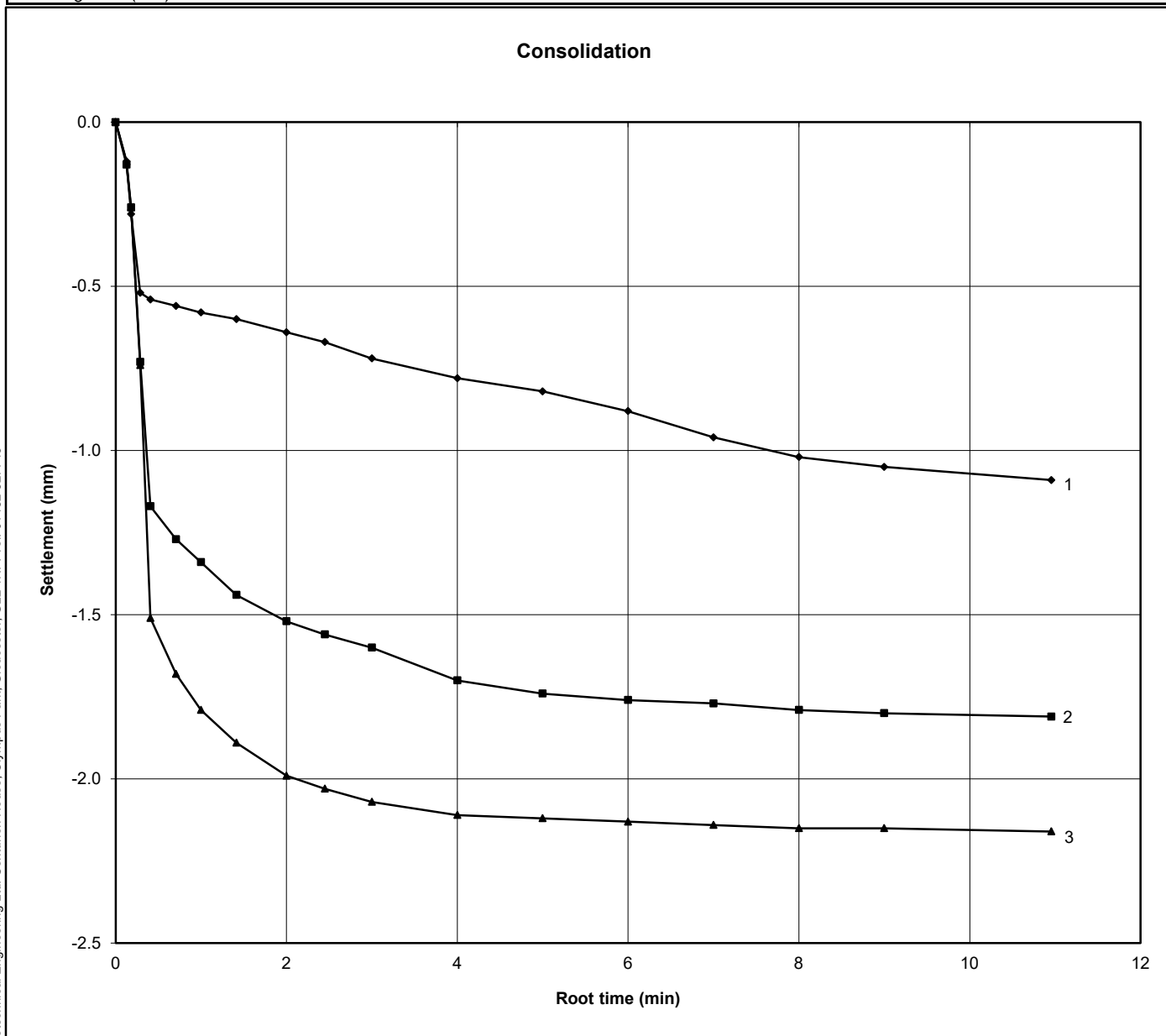
17.60-18.00

SPECIMEN DEPTH (m)

17.70-17.80

DESCRIPTION Grey and brown slightly gravelly slightly sandy silty CLAY

PREPARATION DETAILS	Undisturbed		
CONSOLIDATION STAGE RESULTS			
Specimen	1	2	3
t100 (min)	37.21	6.80	2.30
t <sub>f</sub> (min)	472.57	86.36	29.21
Machine speed (mm/min)	0.0100	0.0100	0.0100
Normal Stress (kPa)	180	360	720
Initial height (mm)	19.99	19.99	19.99
Final height (mm)	18.90	18.18	17.83



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remarks:	CONTRACT	CHECKED
	<b>35205</b>	<b>NP</b>



# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

DSRC207

SAMPLE No./TYPE

34CS

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

SAMPLE DEPTH (m)

17.60-18.00

SPECIMEN DEPTH (m)

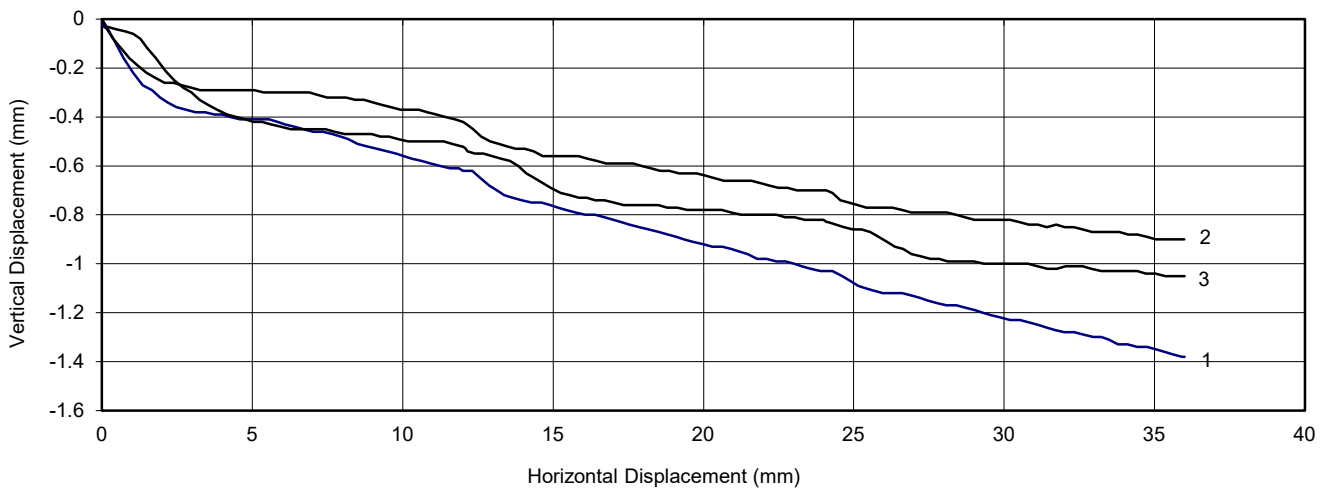
17.70-17.80

DESCRIPTION Grey and brown slightly gravelly slightly sandy silty CLAY

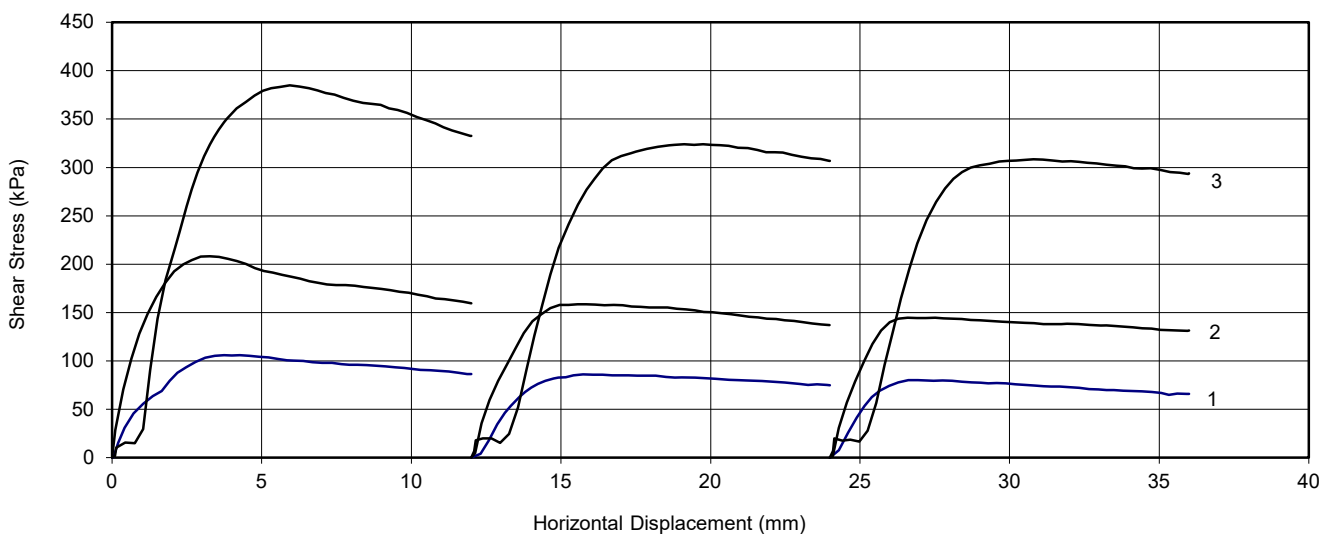
## SHEAR STAGE RESULTS

Specimen	1	2	3
Peak Shear Strength (kPa)	106.1	208.1	384.7
Residual Shear Strength (kPa)	65.0	131.1	293.3
Cum. Vertical Displ. (mm)	-1.380	-0.900	-1.050
Cum. Forward Displ. (mm)	36.000	35.990	36.000
Normal Stress (kPa)	180	360	720

Vertical Displacement



Shear Stress



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remarks:

slow machine reversal

CONTRACT

**35205**

CHECKED

**NP**



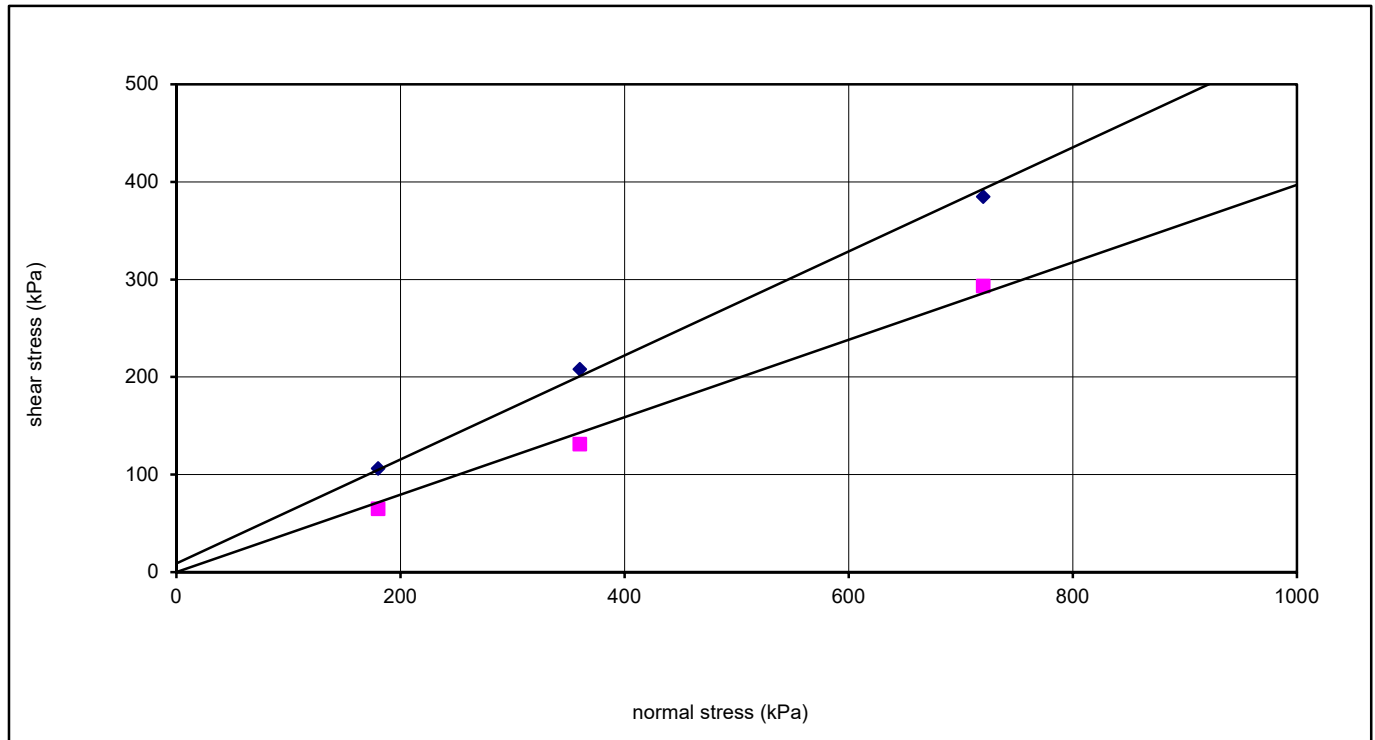
# SHEAR STRENGTH BY DIRECT SHEAR



**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE  
 SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION-PHASE 2A (1077)  
 DESCRIPTION Grey and brown slightly gravelly slightly sandy silty CLAY

BH/TP No. DSRC207  
 SAMPLE No./TYPE 34CS  
 SAMPLE DEPTH (m) 17.60-18.00  
 SPECIMEN DEPTH (m) 17.70-17.80



INITIAL CONDITIONS						
				specimen 1	specimen 2	specimen 3
specimen size (mm)	60	moisture content (%)		22.3	20.3	18.8
	Square	bulk density Mg/m <sup>3</sup>		2.05	2.05	2.05
specimen height (mm)	19.99	dry density Mg/m <sup>3</sup>		1.68	1.70	1.73
		voids ratio		0.610	0.584	0.563
particle density (Mg/m <sup>3</sup> )	2.70 #	degree of saturation (%)		99	94	90
		strain rate (mm/min)		0.01	0.01	0.01

SHEARING STAGES						
specimen	normal stress (kPa)	peak shear stress (kPa)	horizontal displacement (mm)	residual shear stress (kPa)	traverses (No.)	total forward displacement (mm)
1	180	106.1	3.740	65.0	3	36.000
2	360	208.1	3.260	131.1	3	35.990
3	720	384.7	5.940	293.3	3	36.000

SHEAR STRENGTH PARAMETERS			
peak angle of shearing resistance $\phi'$	28	residual angle of shearing resistance $\phi'_r$	22
peak effective cohesion intercept, $c'$ (kPa)	9	residual effective cohesion intercept, $c'_r$ (kPa)	0

remarks: # denotes particle density has been assigned an assumed value.	CONTRACT	CHECKED
	<b>35205</b>	<b>NP</b>

◆ peak ■ residual

Geotechnical Engineering Ltd, Centurion House, Olympus Park, Gloucester, GL2 4NF, Tel. 01452 527743

# SHEAR STRENGTH BY DIRECT SHEAR



**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No.

DSRC224

SAMPLE No./TYPE

18L

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

SAMPLE DEPTH (m)

6.20-7.20

SPECIMEN DEPTH (m)

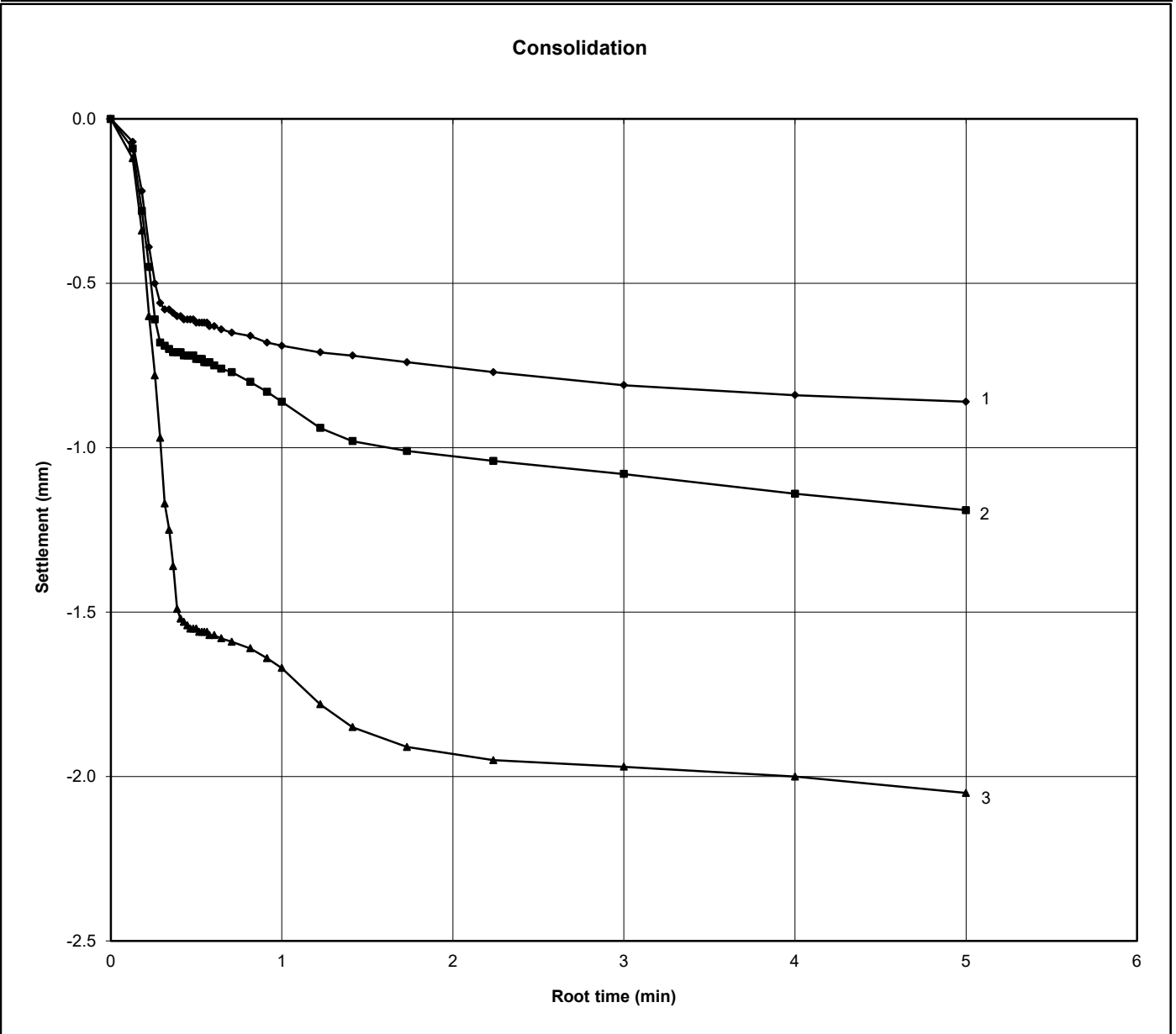
6.90

DESCRIPTION Yellowish brown sandy clayey SILT

**PREPARATION DETAILS** Remoulded using a 2.5kg rammer - 3 layers 27 blows - 0% removed (retained on 2mm sieve).

**CONSOLIDATION STAGE RESULTS**

Specimen	1	2	3
t100 (min)	1.10	2.73	1.96
t <sub>f</sub> (min)	13.97	34.67	24.89
Machine speed (mm/min)	0.0100	0.0100	0.0100
Normal Stress (kPa)	100	200	400
Initial height (mm)	19.96	19.96	19.96
Final height (mm)	19.10	18.77	17.91



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remarks: Specimens are submerged throughout the test.	CONTRACT <b>35205</b>	CHECKED
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# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

DSRC224

SAMPLE No./TYPE

18L

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

SAMPLE DEPTH (m)

6.20-7.20

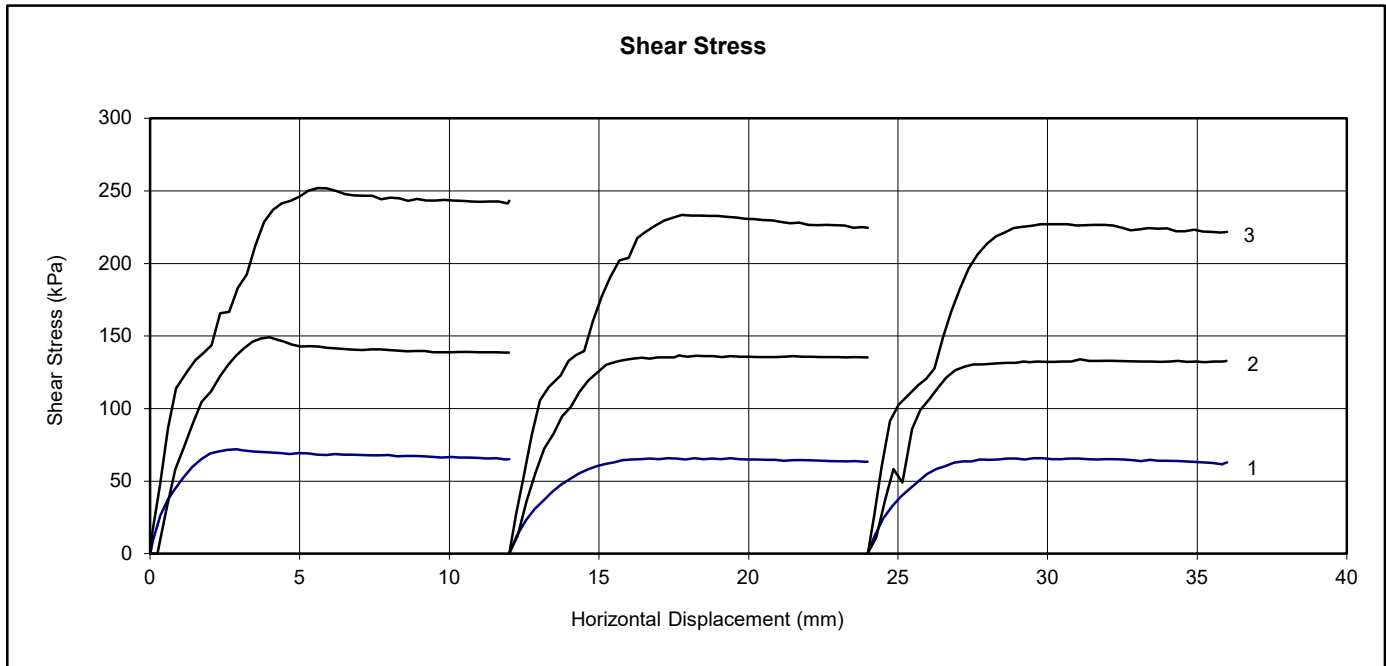
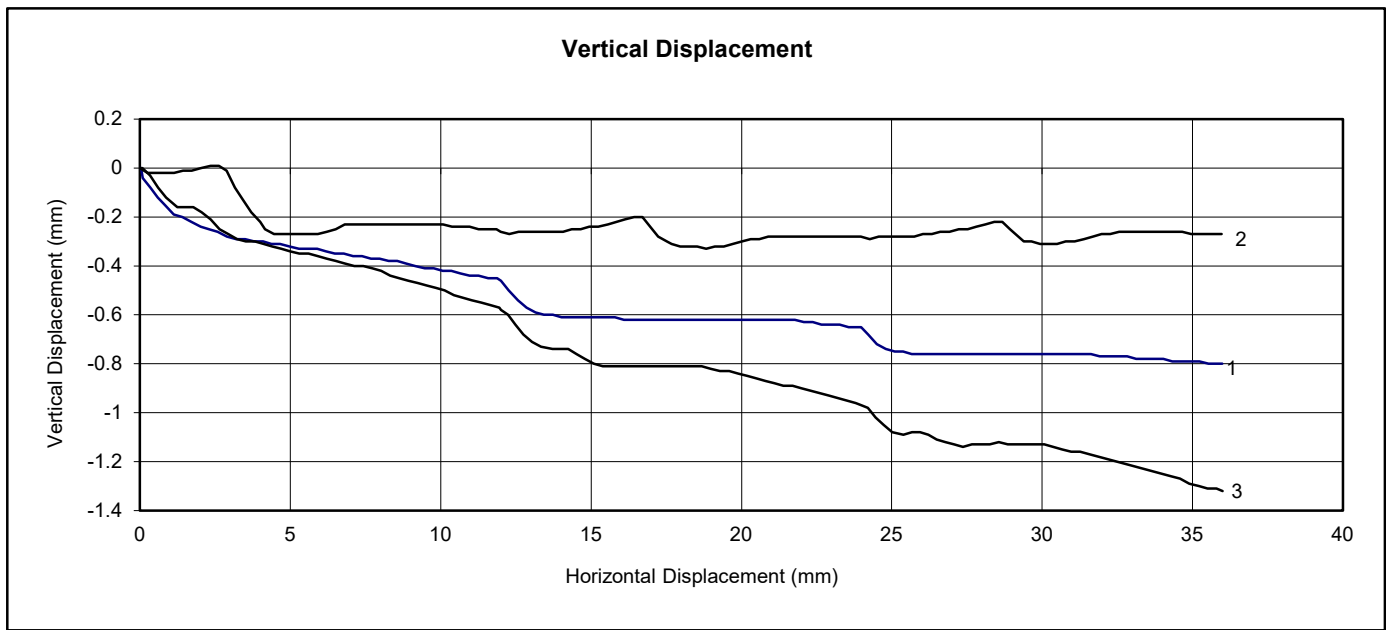
SPECIMEN DEPTH (m)

6.90

DESCRIPTION Yellowish brown sandy clayey SILT

**SHEAR STAGE RESULTS**

Specimen	1	2	3
Peak Shear Strength (kPa)	71.9	149.2	251.9
Residual Shear Strength (kPa)	61.7	131.9	221.4
Cum. Vertical Displ. (mm)	-0.800	-0.270	-1.320
Cum. Forward Displ. (mm)	35.990	35.970	36.000
Normal Stress (kPa)	100	200	400



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remarks:  
slow machine reversal

CONTRACT

CHECKED

**35205**

# SHEAR STRENGTH BY DIRECT SHEAR



BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

DSRC224

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION-PHASE 2A (1077)

SAMPLE No./TYPE

18L

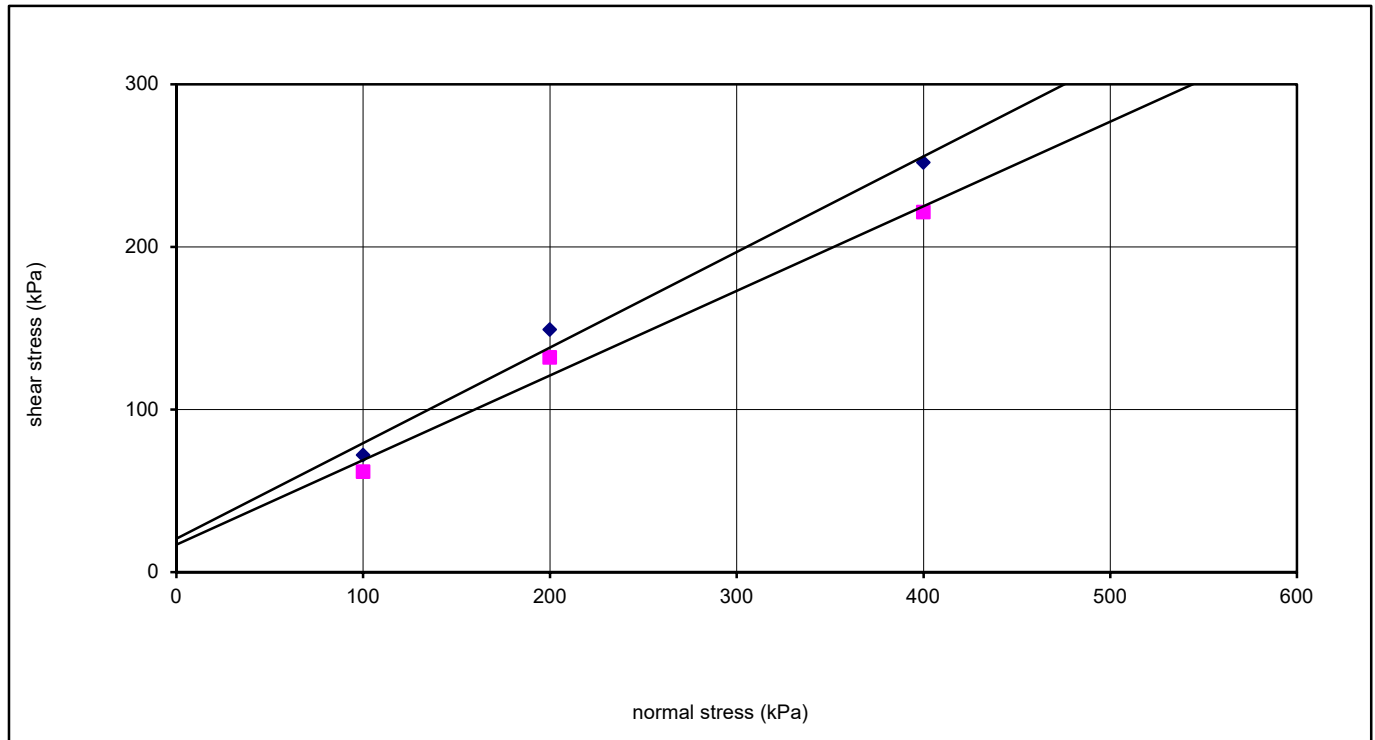
SAMPLE DEPTH (m)

6.20-7.20

SPECIMEN DEPTH (m)

6.90

DESCRIPTION Yellowish brown sandy clayey SILT



### INITIAL CONDITIONS

			specimen 1	specimen 2	specimen 3
specimen size (mm)	60	moisture content (%)	20.4	18.8	17.9
	Square	bulk density Mg/m <sup>3</sup>	1.92	1.95	1.98
specimen height (mm)	19.96	dry density Mg/m <sup>3</sup>	1.59	1.64	1.68
		voids ratio	0.695	0.647	0.611
particle density (Mg/m <sup>3</sup> )	2.70 #	degree of saturation (%)	79	78	79
		strain rate (mm/min)	0.01	0.01	0.01

### SHEARING STAGES

specimen	normal stress (kPa)	peak shear stress (kPa)	horizontal displacement (mm)	residual shear stress (kPa)	traverses (No.)	total forward displacement (mm)
1	100	71.9	2.890	61.7	3	35.990
2	200	149.2	3.990	131.9	3	35.970
3	400	251.9	5.600	221.4	3	36.000

### SHEAR STRENGTH PARAMETERS

peak angle of shearing resistance $\phi'$	30	residual angle of shearing resistance $\phi'_r$	27
peak effective cohesion intercept, $c'$ (kPa)	21	residual effective cohesion intercept, $c'_r$ (kPa)	17

remarks: # denotes particle density has been assigned an assumed value.

CONTRACT

CHECKED

**35205**

◆ peak ■ residual

# SHEAR STRENGTH BY DIRECT SHEAR



**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No.

DSRC224

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)

SAMPLE No./TYPE

40CS

SAMPLE DEPTH (m)

18.50-19.00

DESCRIPTION Greyish brown slightly sandy silty CLAY

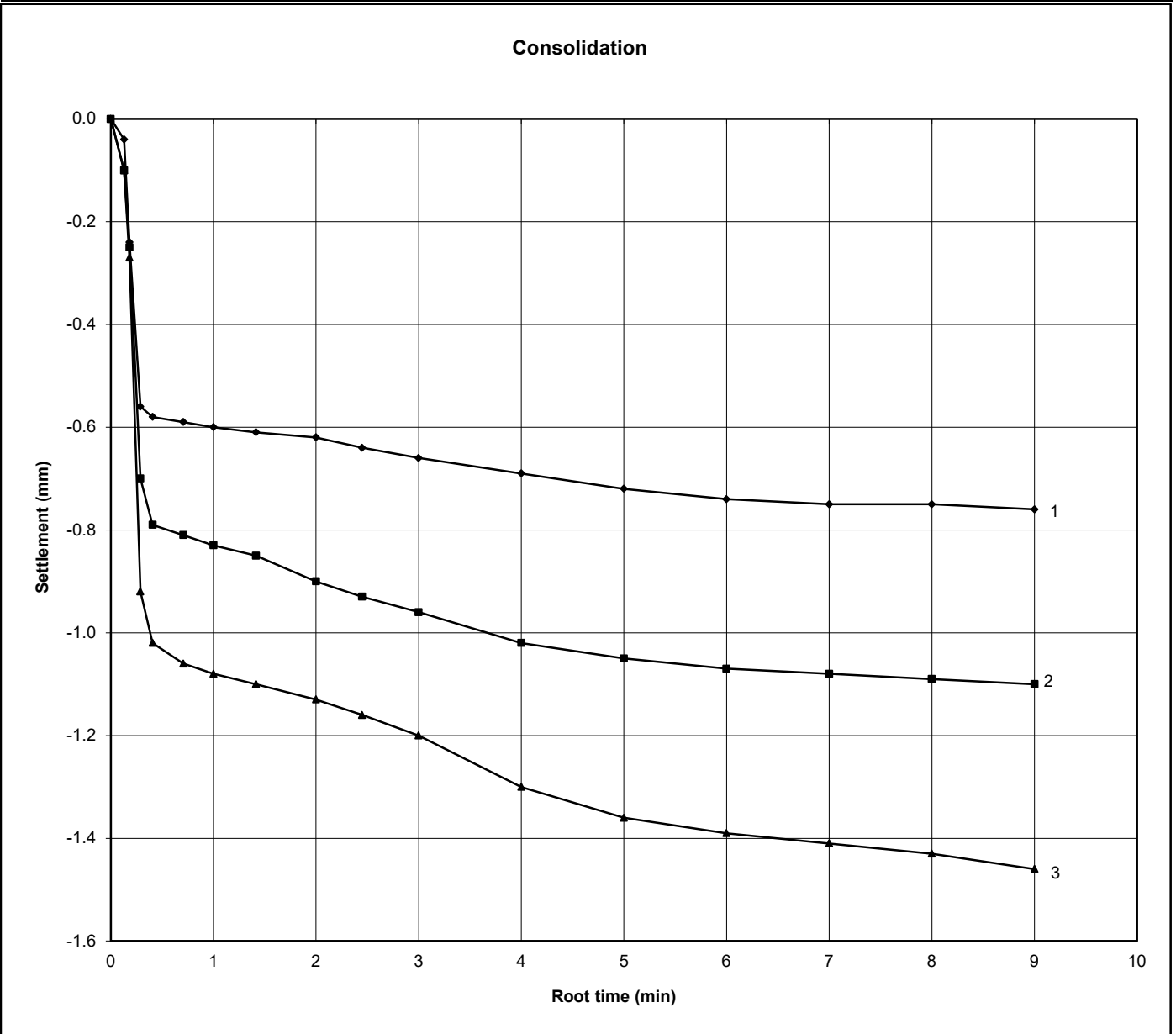
SPECIMEN DEPTH (m)

18.60-18.70

**PREPARATION DETAILS** Recompacted using a 2.5kg rammer (3 layers 27 blows) - 0% removed (retained on 2mm sieve).

**CONSOLIDATION STAGE RESULTS**

Specimen	1	2	3
t100 (min)	2.25	0.64	0.81
t <sub>f</sub> (min)	28.58	8.13	10.29
Machine speed (mm/min)	0.0100	0.0100	0.0100
Normal Stress (kPa)	150	300	600
Initial height (mm)	19.99	19.99	19.99
Final height (mm)	19.23	18.89	18.53



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remarks: Specimens are submerged throughout the test.

CONTRACT  
**35205**

CHECKED  
**NP**



# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

DSRC224

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)

SAMPLE No./TYPE

40CS

SAMPLE DEPTH (m)

18.50-19.00

SPECIMEN DEPTH (m)

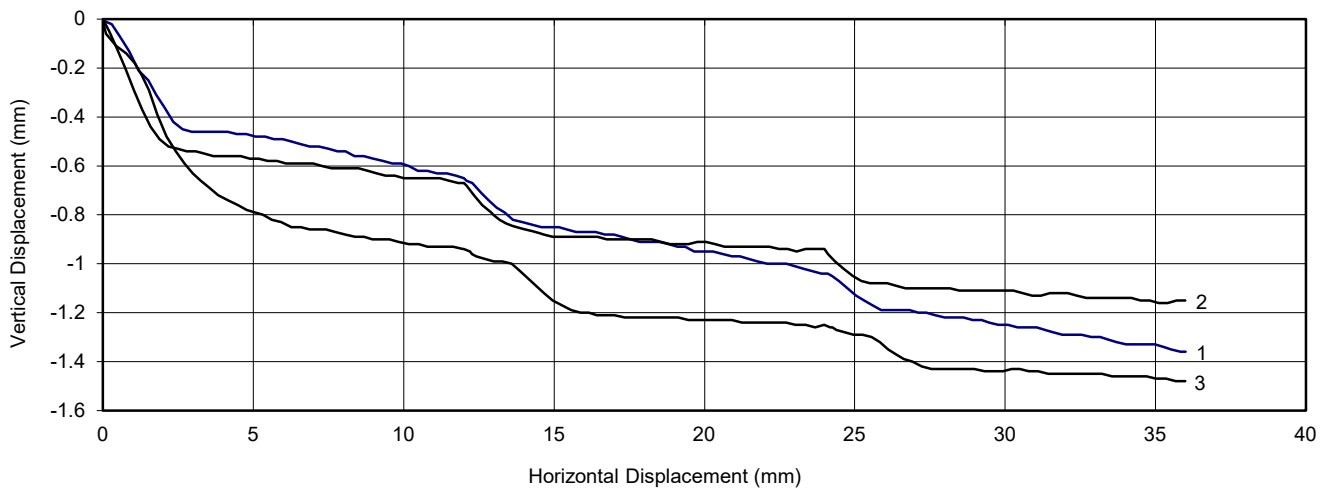
18.60-18.70

DESCRIPTION Greyish brown slightly sandy silty CLAY

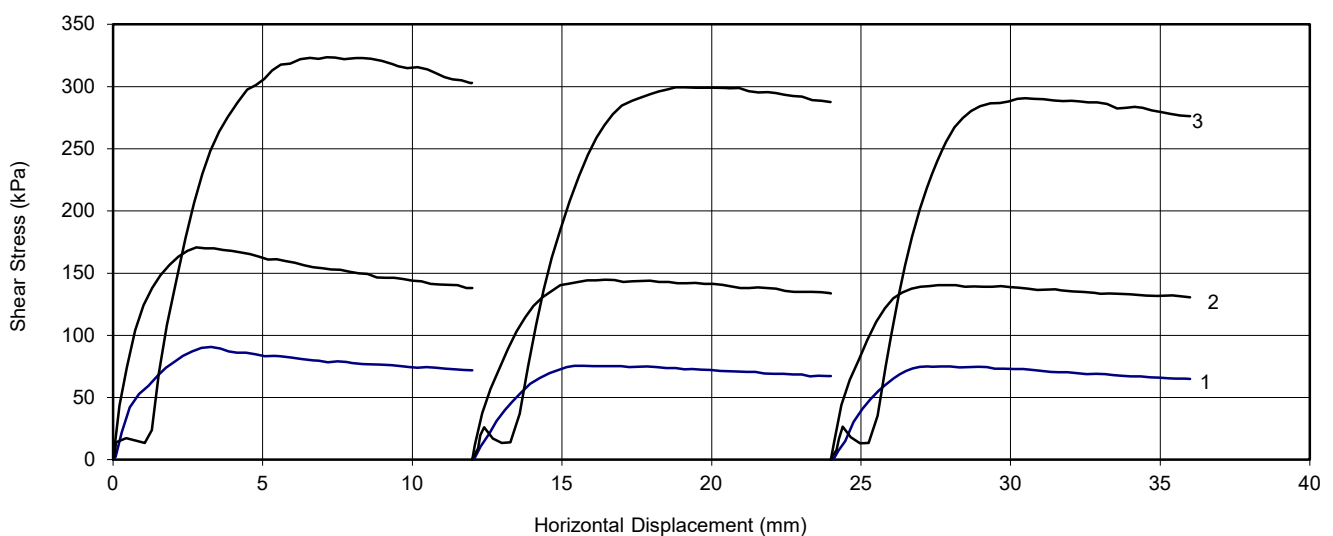
## SHEAR STAGE RESULTS

Specimen	1	2	3
Peak Shear Strength (kPa)	90.6	170.6	323.6
Residual Shear Strength (kPa)	65.0	130.6	276.1
Cum. Vertical Displ. (mm)	-1.360	-1.150	-1.480
Cum. Forward Displ. (mm)	36.000	35.990	35.990
Normal Stress (kPa)	150	300	600

Vertical Displacement



Shear Stress



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remarks:

slow machine reversal

CONTRACT

**35205**

CHECKED

**NP**

# SHEAR STRENGTH BY DIRECT SHEAR



**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No.

DSRC224

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)

SAMPLE No./TYPE

40CS

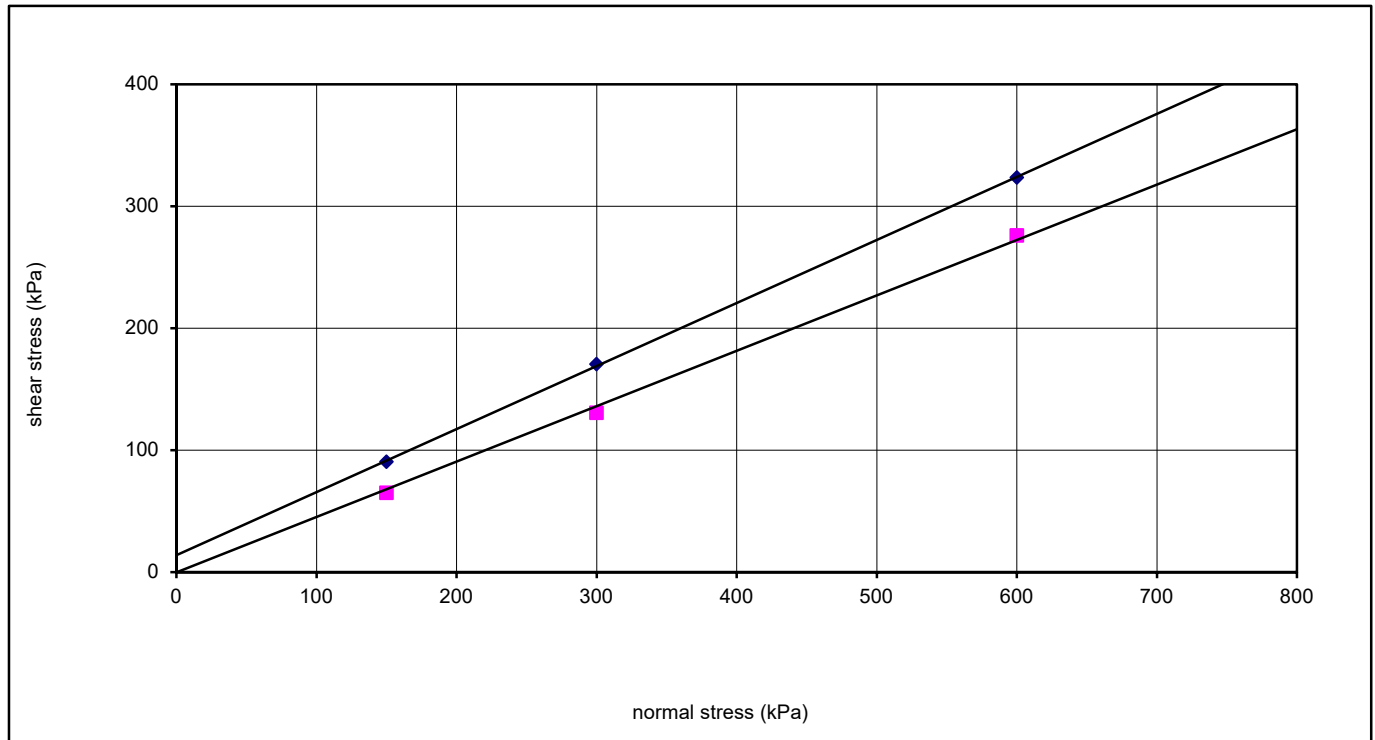
SAMPLE DEPTH (m)

18.50-19.00

SPECIMEN DEPTH (m)

18.60-18.70

DESCRIPTION Greyish brown slightly sandy silty CLAY



INITIAL CONDITIONS						
				specimen 1	specimen 2	specimen 3
specimen size (mm)	60	moisture content (%)		20.8	19.9	18.8
	Square	bulk density Mg/m <sup>3</sup>		1.99	1.95	1.91
specimen height (mm)	19.99	dry density Mg/m <sup>3</sup>		1.64	1.63	1.61
		voids ratio		0.642	0.660	0.678
particle density (Mg/m <sup>3</sup> )	2.70 #	degree of saturation (%)		88	81	75
		strain rate (mm/min)		0.01	0.01	0.01

SHEARING STAGES						
specimen	normal stress (kPa)	peak shear stress (kPa)	horizontal displacement (mm)	residual shear stress (kPa)	traverses (No.)	total forward displacement (mm)
1	150	90.6	3.270	65.0	3	36.000
2	300	170.6	2.780	130.6	3	35.990
3	600	323.6	7.140	276.1	3	35.990

SHEAR STRENGTH PARAMETERS			
peak angle of shearing resistance $\phi'$	27	residual angle of shearing resistance $\phi'_r$	25
peak effective cohesion intercept, $c'$ (kPa)	14	residual effective cohesion intercept, $c'_r$ (kPa)	0

remarks: # denotes particle density has been assigned an assumed value.	CONTRACT	CHECKED
	<b>35205</b>	<b>NP</b>

◆ peak ■ residual

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# SHEAR STRENGTH BY DIRECT SHEAR



**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No.

DSRC224

SAMPLE No./TYPE

55C

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

SAMPLE DEPTH (m)

34.00-35.50

SPECIMEN DEPTH (m)

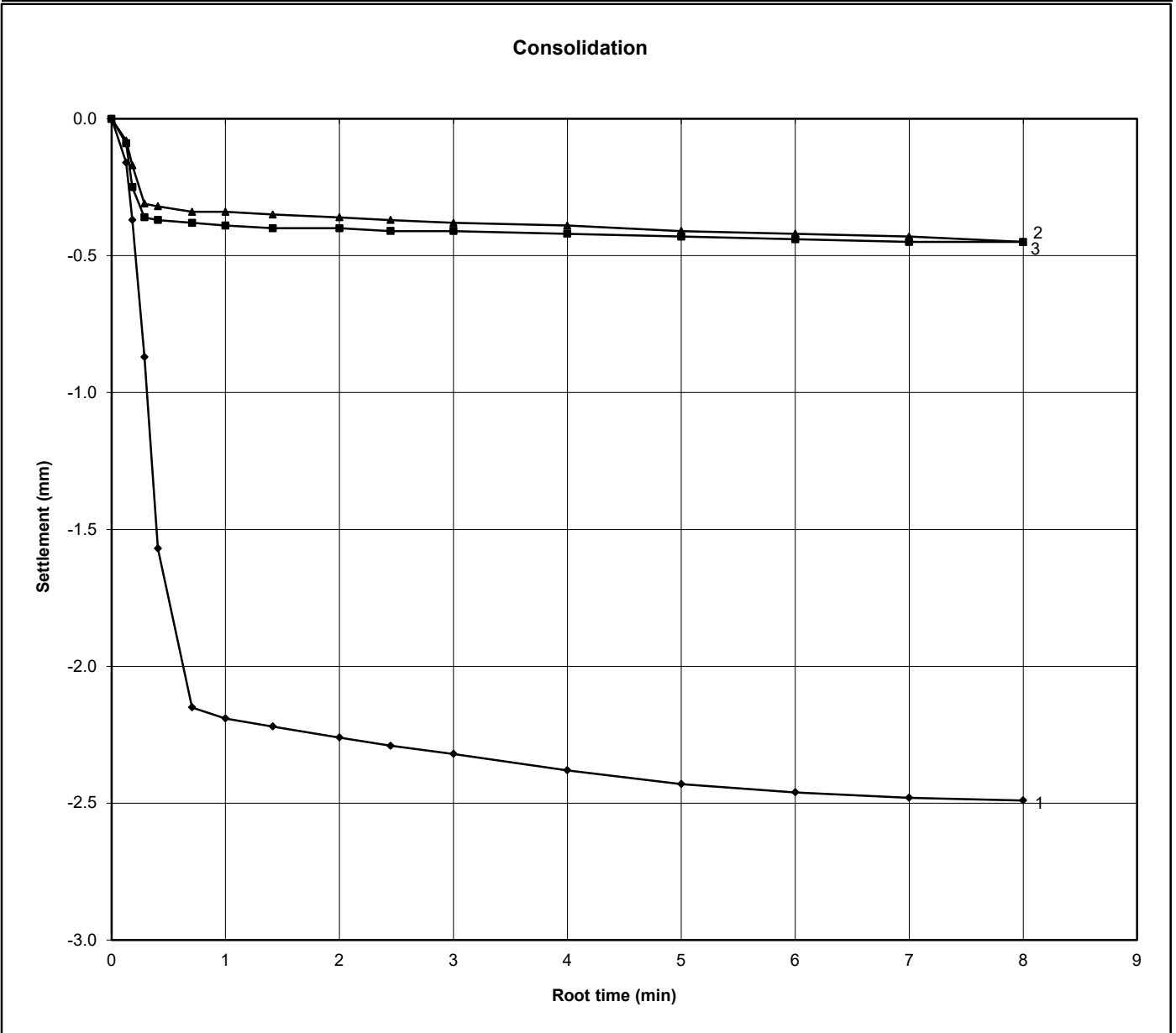
35.40

DESCRIPTION Grey silty CLAY

PREPARATION DETAILS Remoulded using a 2.5kg rammer, 3 layers 27 blows - 0% removed (retained on 2mm sieve).

**CONSOLIDATION STAGE RESULTS**

Specimen	1	2	3
t100 (min)	0.64	0.16	0.16
tf (min)	8.13	2.03	2.03
Machine speed (mm/min)	0.0100	0.0100	0.0100
Normal Stress (kPa)	200	400	800
Initial height (mm)	19.90	19.90	19.90
Final height (mm)	17.41	19.45	19.45



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remarks: Specimens are submerged throughout the test.	CONTRACT <b>35205</b>	CHECKED
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# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

DSRC224

SAMPLE No./TYPE

55C

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

SAMPLE DEPTH (m)

34.00-35.50

SPECIMEN DEPTH (m)

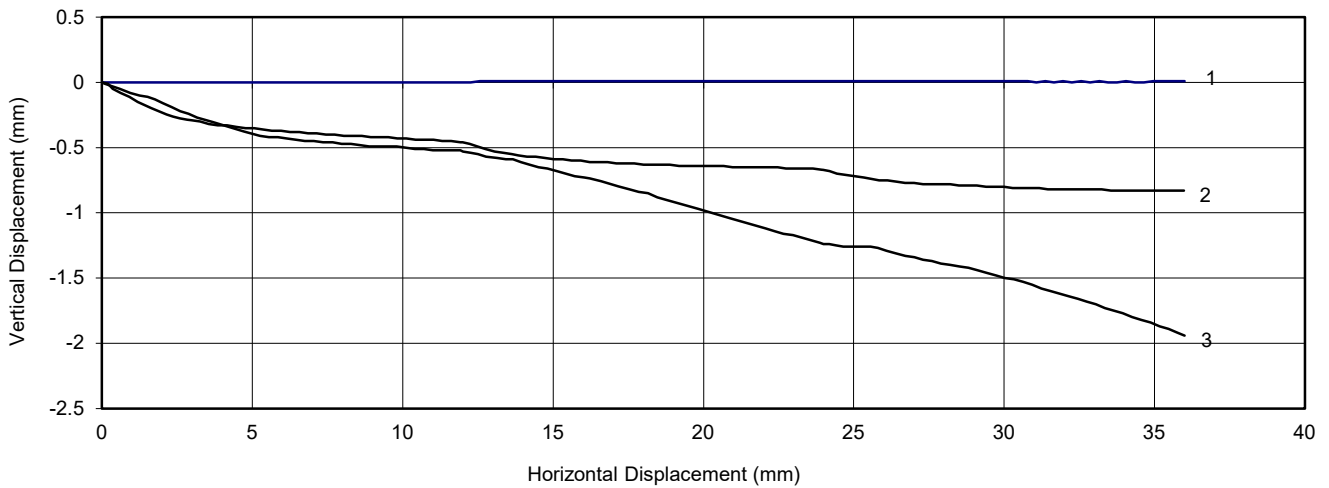
35.40

DESCRIPTION Grey silty CLAY

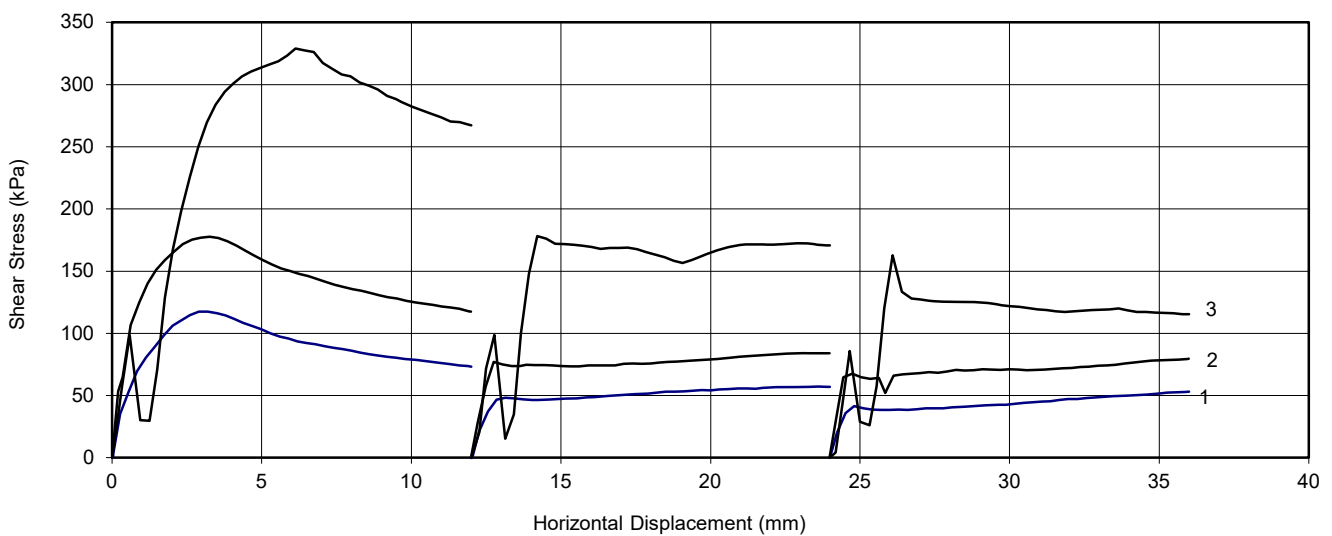
**SHEAR STAGE RESULTS**

Specimen	1	2	3
Peak Shear Strength (kPa)	117.5	177.6	328.8
Residual Shear Strength (kPa)	43.5	70.4	115.5
Cum. Vertical Displ. (mm)	0.010	-0.830	-1.940
Cum. Forward Displ. (mm)	36.000	35.980	36.000
Normal Stress (kPa)	200	400	800

**Vertical Displacement**



**Shear Stress**



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remarks:

slow machine reversal

CONTRACT

**35205**

CHECKED

# SHEAR STRENGTH BY DIRECT SHEAR



BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

DSRC224

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION-PHASE 2A (1077)

SAMPLE No./TYPE

55C

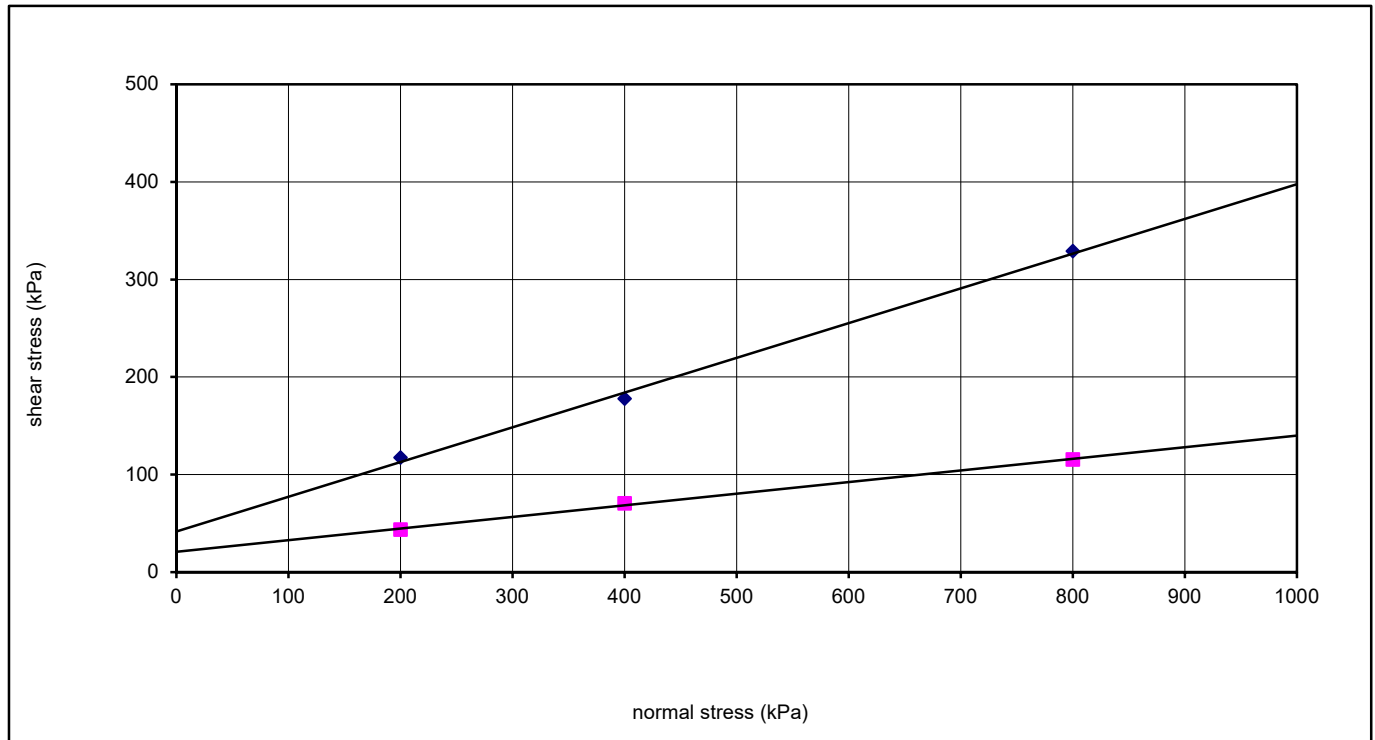
DESCRIPTION Grey silty CLAY

SAMPLE DEPTH (m)

34.00-35.50

SPECIMEN DEPTH (m)

35.40



INITIAL CONDITIONS						
				specimen 1	specimen 2	specimen 3
specimen size (mm)	60	moisture content (%)		23.2	22.5	21.7
	Square	bulk density Mg/m <sup>3</sup>		1.99	1.96	2.00
specimen height (mm)	19.90	dry density Mg/m <sup>3</sup>		1.62	1.60	1.64
		voids ratio		0.671	0.685	0.648
particle density (Mg/m <sup>3</sup> )	2.70 #	degree of saturation (%)		94	89	91
		strain rate (mm/min)		0.01	0.01	0.01

SHEARING STAGES						
specimen	normal stress (kPa)	peak shear stress (kPa)	horizontal displacement (mm)	residual shear stress (kPa)	traverses (No.)	total forward displacement (mm)
1	200	117.5	2.900	43.5	3	36.000
2	400	177.6	3.260	70.4	3	35.980
3	800	328.8	6.130	115.5	3	36.000

SHEAR STRENGTH PARAMETERS			
peak angle of shearing resistance $\phi'$	20	residual angle of shearing resistance $\phi'_r$	7
peak effective cohesion intercept, $c'$ (kPa)	42	residual effective cohesion intercept, $c'_r$ (kPa)	21

remarks: # denotes particle density has been assigned an assumed value.	CONTRACT	CHECKED
	<b>35205</b>	
◆ peak ■ residual		

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# SHEAR STRENGTH BY DIRECT SHEAR



**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No.

TP204

SAMPLE No./TYPE

13BLK

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

SAMPLE DEPTH (m)

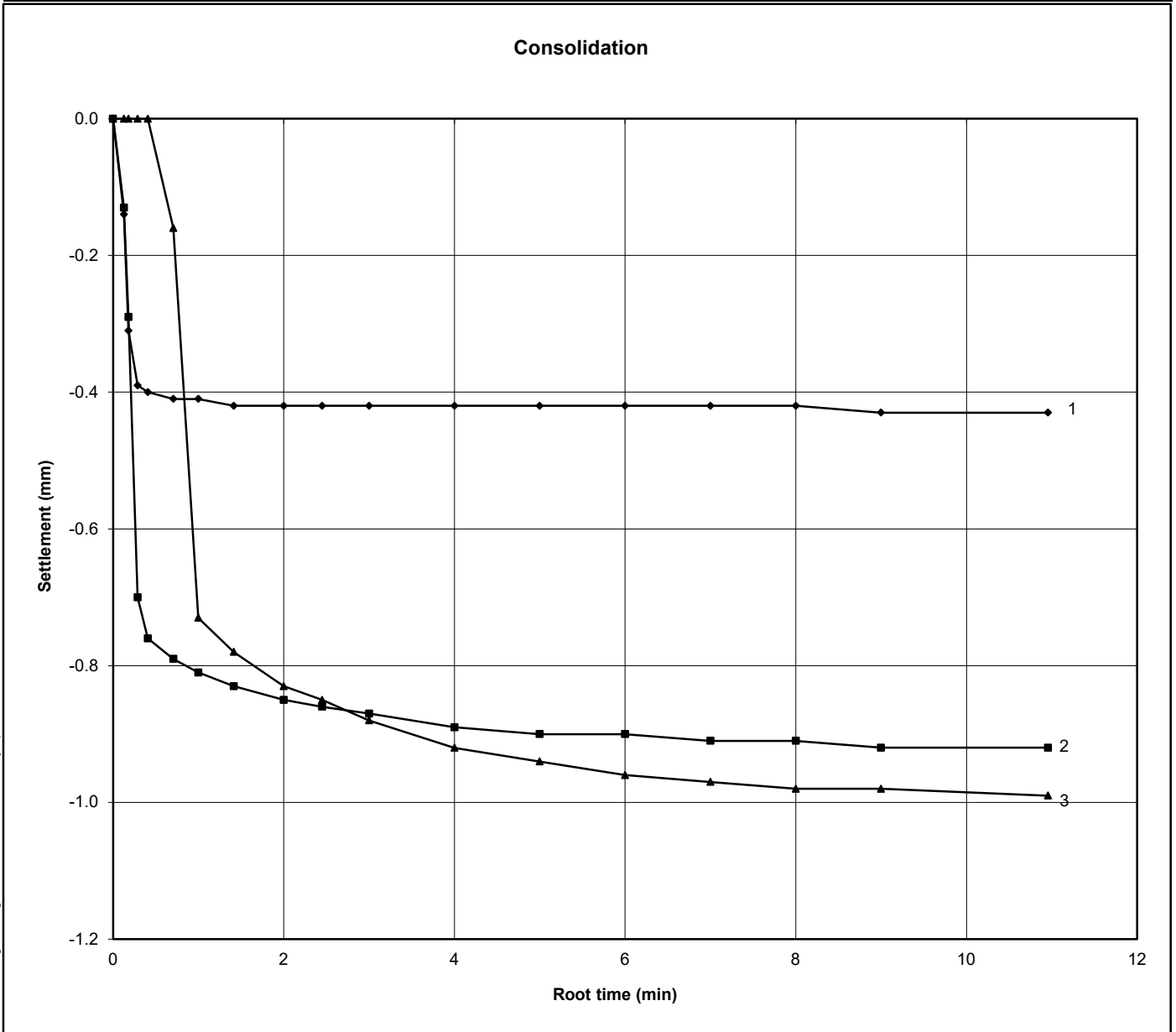
4.80-5.00

SPECIMEN DEPTH (m)

4.80

DESCRIPTION Brown mottled orange and grey slightly gravelly slightly sandy silty CLAY

PREPARATION DETAILS	Undisturbed		
CONSOLIDATION STAGE RESULTS			
Specimen	1	2	3
t100 (min)	0.70	6.76	12.96
t <sub>f</sub> (min)	8.89	85.85	164.59
Machine speed (mm/min)	0.0100	0.0100	0.0100
Normal Stress (kPa)	40	80	160
Initial height (mm)	19.90	19.99	19.96
Final height (mm)	19.47	19.07	18.97



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remarks:

CONTRACT	CHECKED
<b>35205</b>	<b>NP</b>



# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

TP204

SAMPLE No./TYPE

13BLK

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

SAMPLE DEPTH (m)

4.80-5.00

SPECIMEN DEPTH (m)

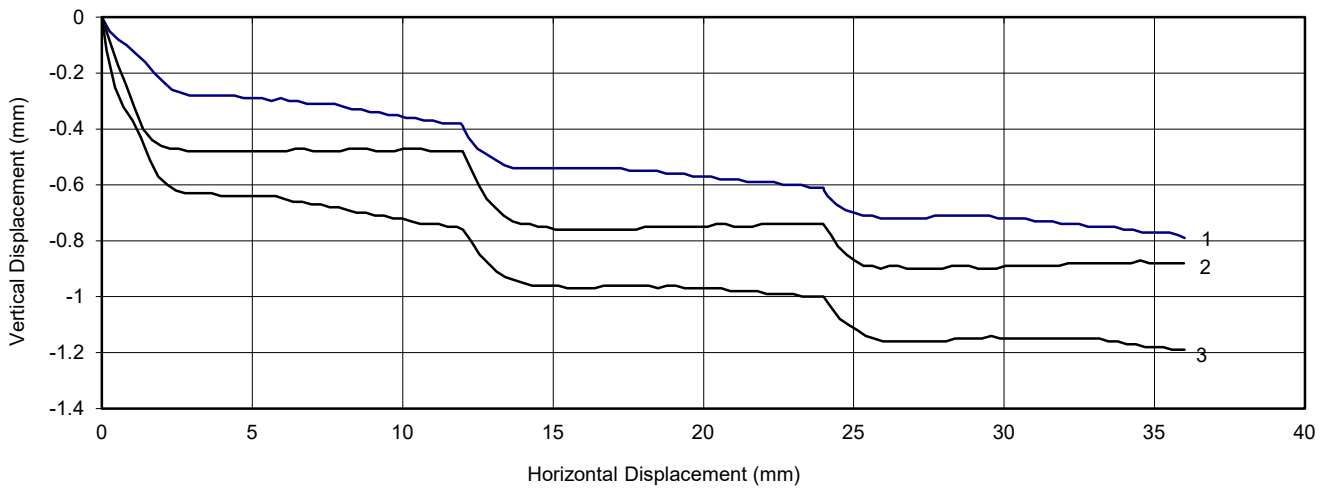
4.80

DESCRIPTION Brown mottled orange and grey slightly gravelly slightly sandy silty CLAY

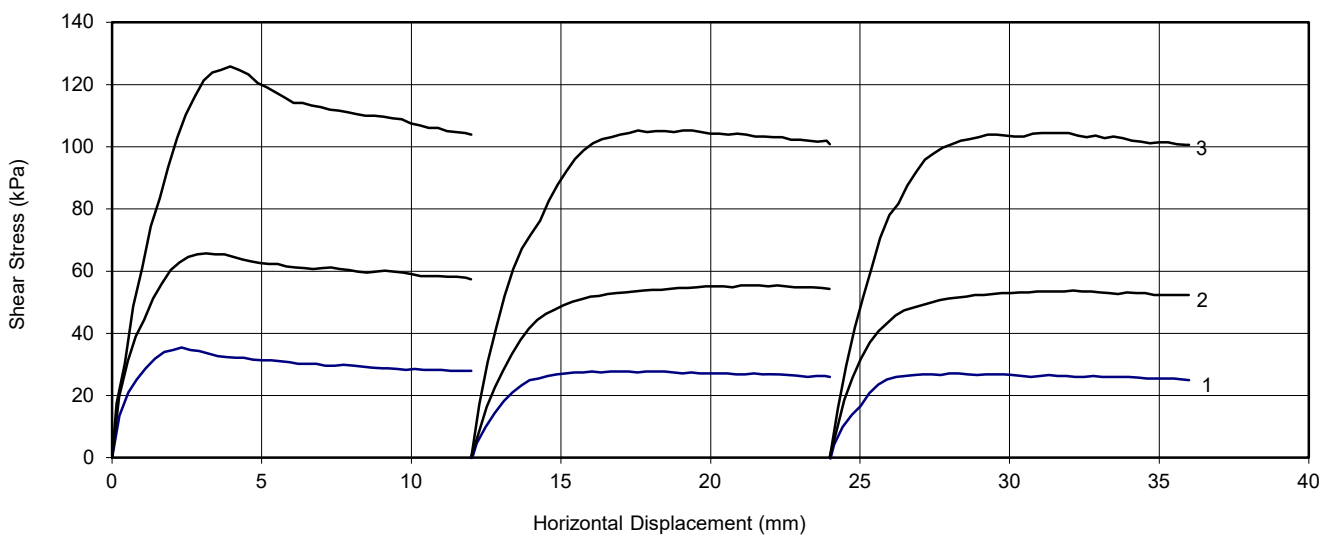
**SHEAR STAGE RESULTS**

Specimen	1	2	3
Peak Shear Strength (kPa)	35.5	65.7	125.8
Residual Shear Strength (kPa)	24.9	52.4	100.6
Cum. Vertical Displ. (mm)	-0.790	-0.880	-1.190
Cum. Forward Displ. (mm)	36.000	35.980	36.000
Normal Stress (kPa)	40	80	160

**Vertical Displacement**



**Shear Stress**



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remarks:

slow machine reversal

CONTRACT

**35205**

CHECKED

**NP**



# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

TP204

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION-PHASE 2A (1077)

SAMPLE No./TYPE

13BLK

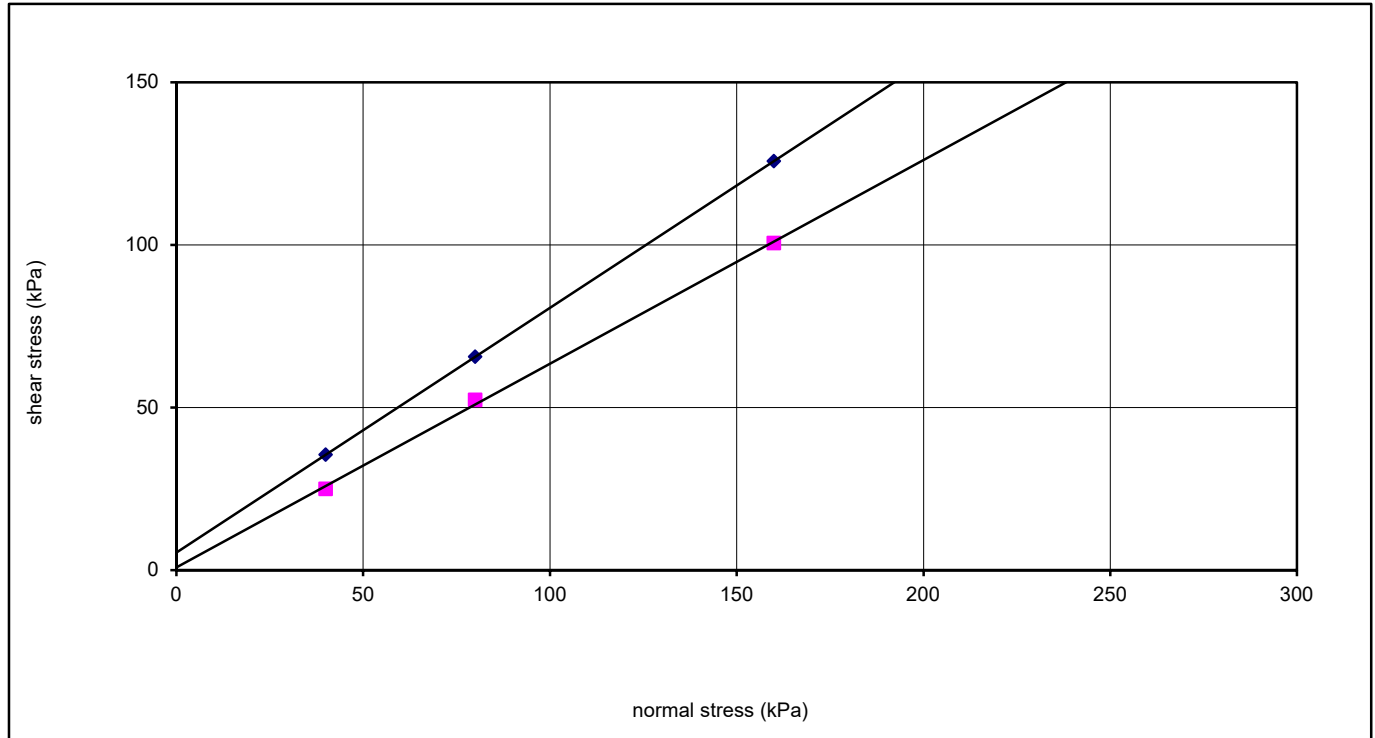
DESCRIPTION Brown mottled orange and grey slightly gravelly slightly sandy silty CLAY

SAMPLE DEPTH (m)

4.80-5.00

SPECIMEN DEPTH (m)

4.80



## INITIAL CONDITIONS

			specimen 1	specimen 2	specimen 3
specimen size (mm)	60	moisture content (%)	23.6	23.0	22.5
	Square	bulk density Mg/m <sup>3</sup>	2.03	1.96	1.98
specimen height (mm)	19.90	dry density Mg/m <sup>3</sup>	1.64	1.59	1.62
		voids ratio	0.645	0.693	0.667
particle density (Mg/m <sup>3</sup> )	2.70 #	degree of saturation (%)	99	90	91
		strain rate (mm/min)	0.01	0.01	0.01

## SHEARING STAGES

specimen	normal stress (kPa)	peak shear stress (kPa)	horizontal displacement (mm)	residual shear stress (kPa)	traverses (No.)	total forward displacement (mm)
1	40	35.5	2.320	24.9	3	36.000
2	80	65.7	3.140	52.4	3	35.980
3	160	125.8	3.950	100.6	3	36.000

## SHEAR STRENGTH PARAMETERS

peak angle of shearing resistance $\phi'$	37	residual angle of shearing resistance $\phi'_r$	32
peak effective cohesion intercept, $c'$ (kPa)	5	residual effective cohesion intercept, $c'_r$ (kPa)	1

remarks: # denotes particle density has been assigned an assumed value.

CONTRACT

CHECKED

**35205**

**NP**

◆ peak ■ residual

# SHEAR STRENGTH BY DIRECT SHEAR



**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No.

TP207

SAMPLE No./TYPE

12BLK

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

SAMPLE DEPTH (m)

3.90-4.10

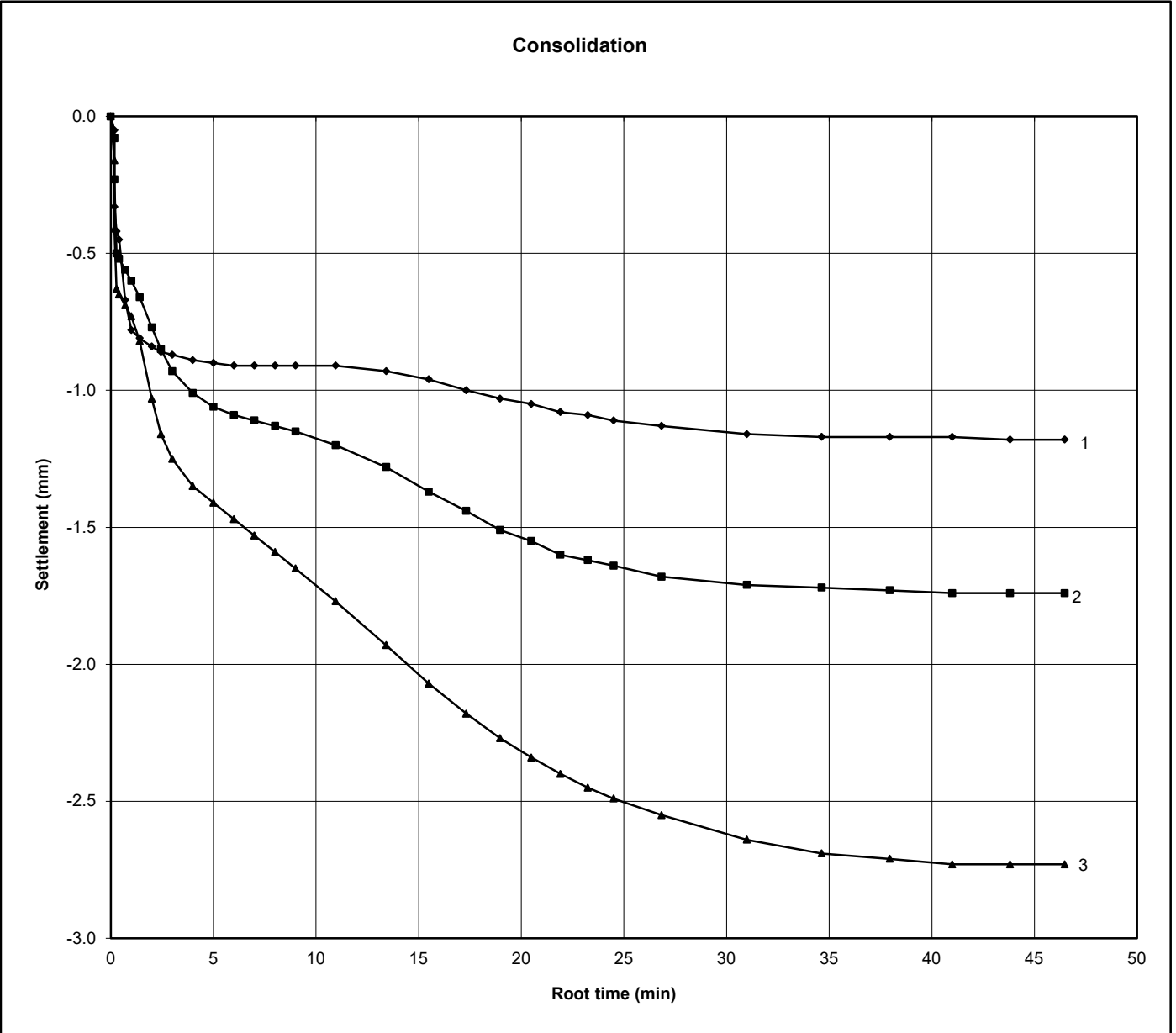
SPECIMEN DEPTH (m)

3.95

DESCRIPTION Dark grey slightly gravelly slightly sandy CLAY

PREPARATION DETAILS Remoulded using a tamping rod - <1% removed (retained on 2mm sieve).

CONSOLIDATION STAGE RESULTS			
Specimen	1	2	3
t100 (min)	68.80	60.90	57.40
t <sub>f</sub> (min)	873.76	773.43	728.98
Machine speed (mm/min)	0.0060	0.0060	0.0060
Normal Stress (kPa)	50	100	200
Initial height (mm)	19.99	19.99	19.99
Final height (mm)	18.81	18.25	17.26



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remarks:	CONTRACT	CHECKED
	<b>35205</b>	<b>NP</b>



# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

TP207

SAMPLE No./TYPE

12BLK

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

SAMPLE DEPTH (m)

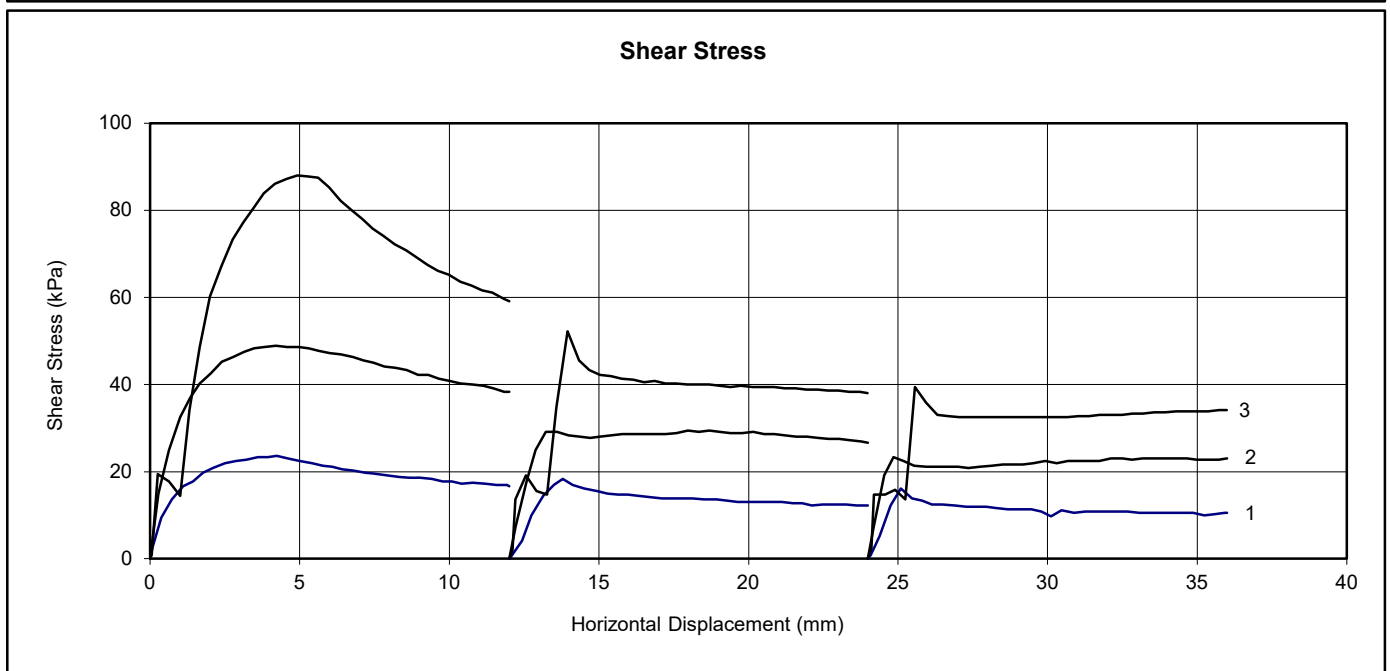
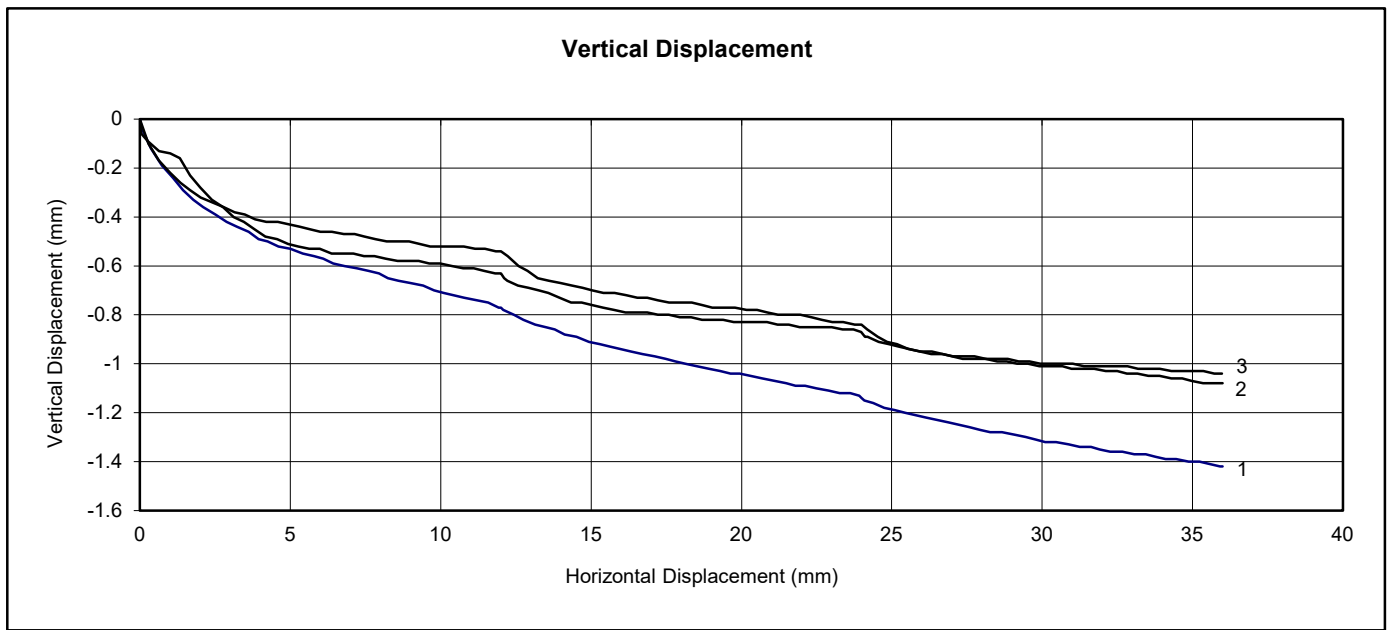
3.90-4.10

SPECIMEN DEPTH (m)

3.95

DESCRIPTION Dark grey slightly gravelly slightly sandy CLAY

SHEAR STAGE RESULTS			
Specimen	1	2	3
Peak Shear Strength (kPa)	23.6	48.9	88.1
Residual Shear Strength (kPa)	10.0	22.5	34.2
Cum. Vertical Displ. (mm)	-1.420	-1.080	-1.040
Cum. Forward Displ. (mm)	36.000	36.000	35.980
Normal Stress (kPa)	50	100	200



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remarks:  
slow machine reversal

CONTRACT  
**35205**

CHECKED  
**NP**

# SHEAR STRENGTH BY DIRECT SHEAR



**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No.

TP207

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION-  
PHASE 2A (1077)

SAMPLE No./TYPE

12BLK

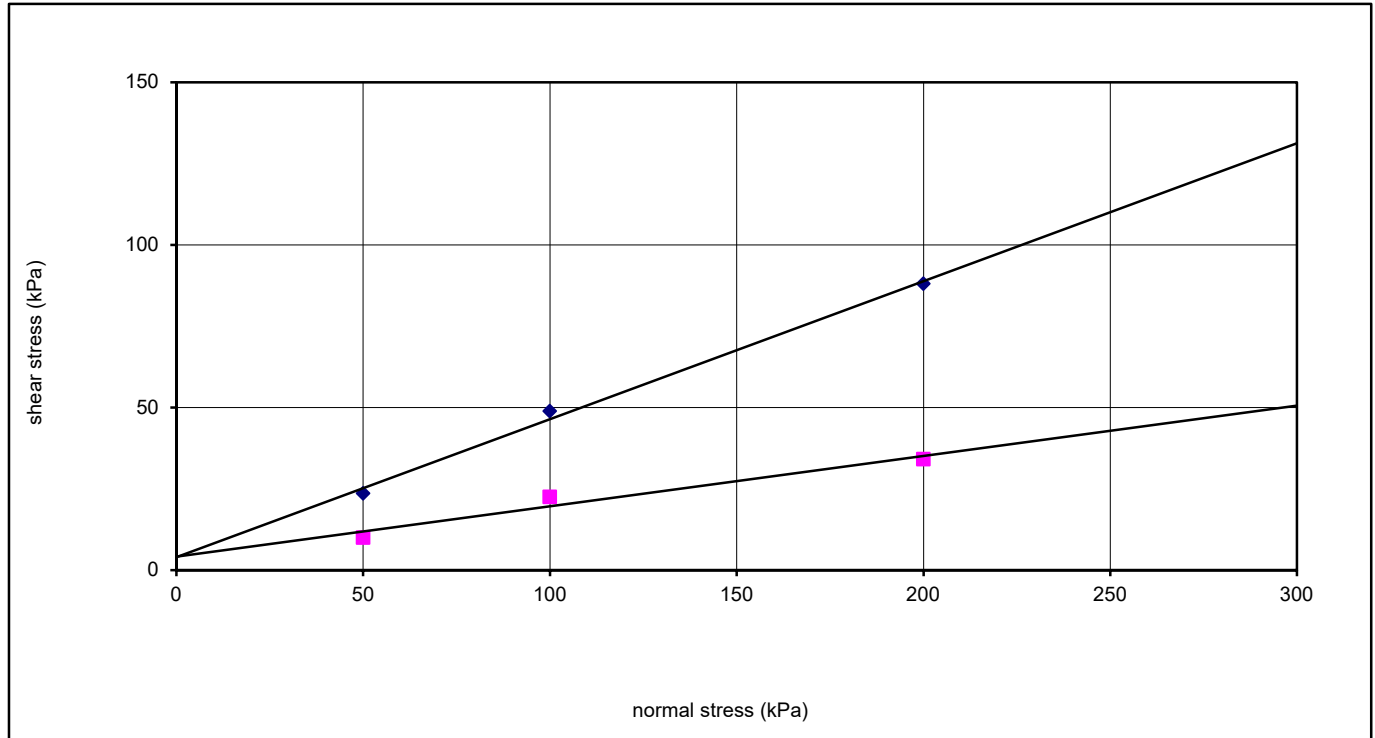
SAMPLE DEPTH (m)

3.90-4.10

SPECIMEN DEPTH (m)

3.95

DESCRIPTION Dark grey slightly gravelly slightly sandy CLAY



**INITIAL CONDITIONS**

		specimen 1	specimen 2	specimen 3
specimen size (mm)	60 Square	30.5	28.2	25.9
specimen height (mm)	19.99	1.68	1.70	1.70
particle density (Mg/m <sup>3</sup> )	2.70 #	1.29	1.33	1.35
		1.097	1.037	0.995
		75	73	70
		0.006	0.006	0.006

**SHEARING STAGES**

specimen	normal stress (kPa)	peak shear stress (kPa)	horizontal displacement (mm)	residual shear stress (kPa)	traverses (No.)	total forward displacement (mm)
1	50	23.6	4.240	10.0	3	36.000
2	100	48.9	4.200	22.5	3	36.000
3	200	88.1	4.920	34.2	3	35.980

**SHEAR STRENGTH PARAMETERS**

peak angle of shearing resistance $\phi'$	23	residual angle of shearing resistance $\phi'_r$	9
peak effective cohesion intercept, $c'$ (kPa)	4	residual effective cohesion intercept, $c'_r$ (kPa)	4

remarks: # denotes particle density has been assigned an assumed value.

CONTRACT

CHECKED

**35205**

**NP**

◆ peak ■ residual

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# RESIDUAL STRENGTH BY RING SHEAR



BS.1377 : Part 7 : 1990 : 6

CLIENT OSBORNE

BH/TP No.

CP206

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)

SAMPLE No./TYPE

18L

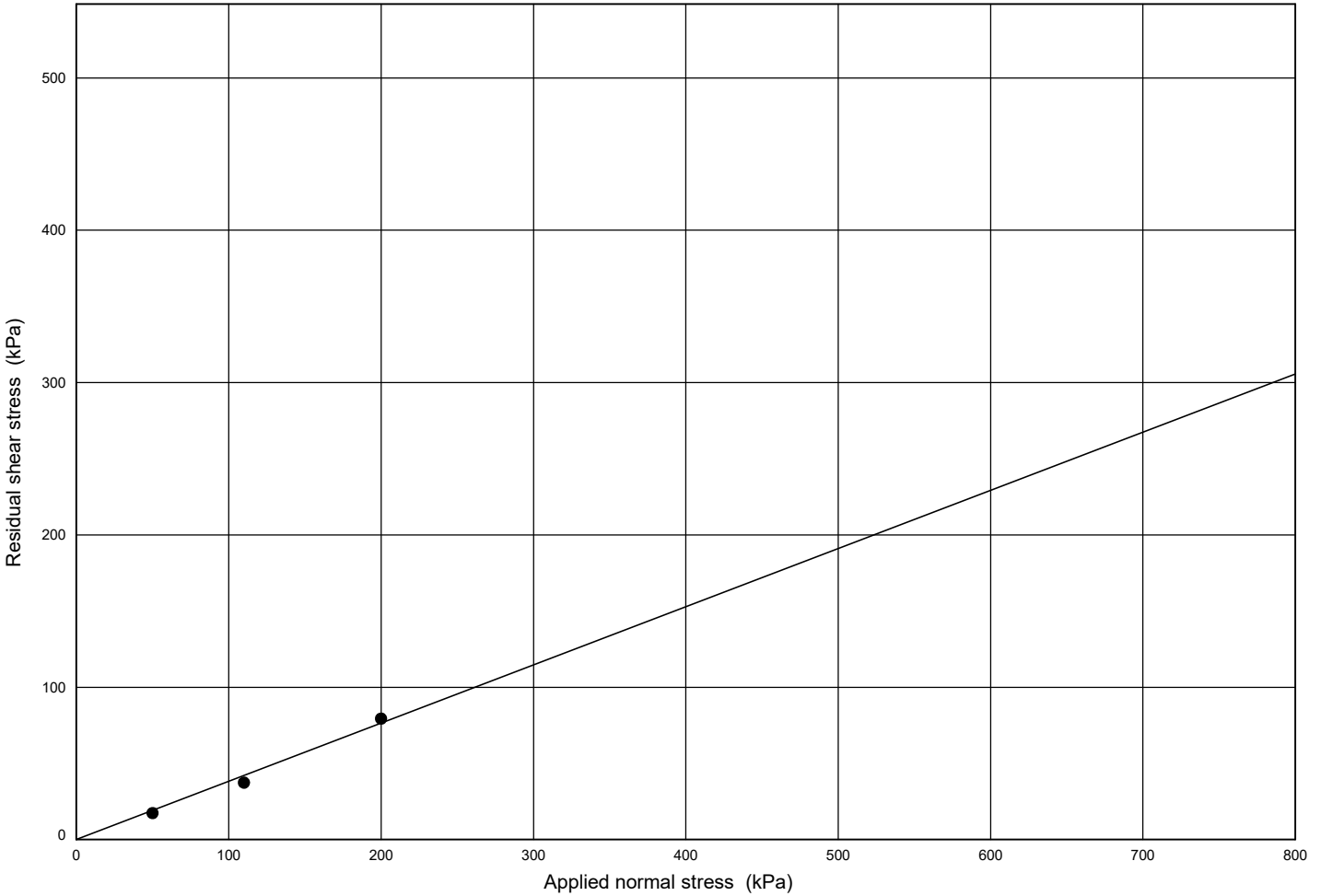
SAMPLE DEPTH (m)

4.00

DESCRIPTION Brownish grey slightly sandy silty CLAY

SPECIMEN DEPTH (m)

4.00



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GENERAL DETAILS			SHEARING STAGES			
inner radius of specimen	(mm)	35	stage	normal stress (kPa)	residual shear stress (kPa)	cumulative angular displacement (degrees)
outer radius of specimen	(mm)	50	1 2 3	50 110 200	17.4 37.4 79.4	66 136 201
initial thickness of specimen	(mm)	5				
initial moisture content	(%)	21				
final moisture content	(%)	19.7				
rate of angular displacement	(mm/min)	0.052				
SHEAR STRENGTH PARAMETERS						
residual angle of shearing resistance $\phi_r'$	(deg)	21.0				
residual cohesion intercept $c_r'$	(kPa)	0				
remarks:					CONTRACT	CHECKED
					<b>35205</b>	<b>TB</b>

# RESIDUAL STRENGTH BY RING SHEAR



BS.1377 : Part 7 : 1990 : 6

CLIENT OSBORNE

BH/TP No.

CP208

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)

SAMPLE No./TYPE

26L

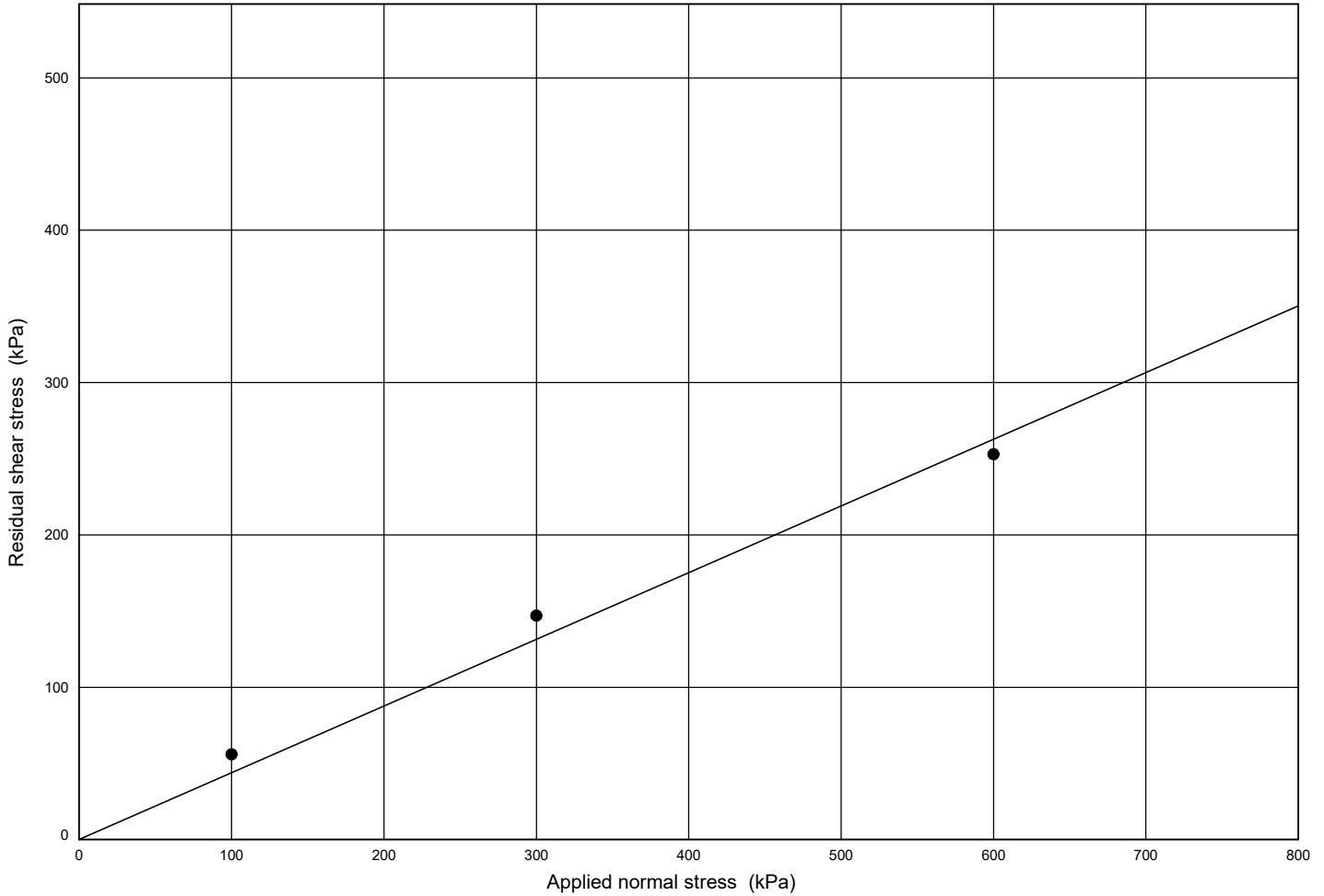
SAMPLE DEPTH (m)

9.00

DESCRIPTION Brown slightly sandy clayey SILT

SPECIMEN DEPTH (m)

9.50



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GENERAL DETAILS			SHEARING STAGES			
inner radius of specimen	(mm)	35	stage	normal stress (kPa)	residual shear stress (kPa)	cumulative angular displacement (degrees)
outer radius of specimen	(mm)	50	1	100	56.0	313
initial thickness of specimen	(mm)	5				
initial moisture content	(%)	9.5				
final moisture content	(%)	23.8	2	300	147.0	50
rate of angular displacement	(mm/min)	0.048	3	600	253.0	67
SHEAR STRENGTH PARAMETERS						
residual angle of shearing resistance $\phi_r'$	(deg)	23.5				
residual cohesion intercept $c_r'$	(kPa)	0				
remarks:					CONTRACT	CHECKED
					<b>35205</b>	<b>TB</b>

# RESIDUAL STRENGTH BY RING SHEAR



BS.1377 : Part 7 : 1990 : 6

CLIENT OSBORNE

BH/TP No.

CP212

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)

SAMPLE No./TYPE

27Cs

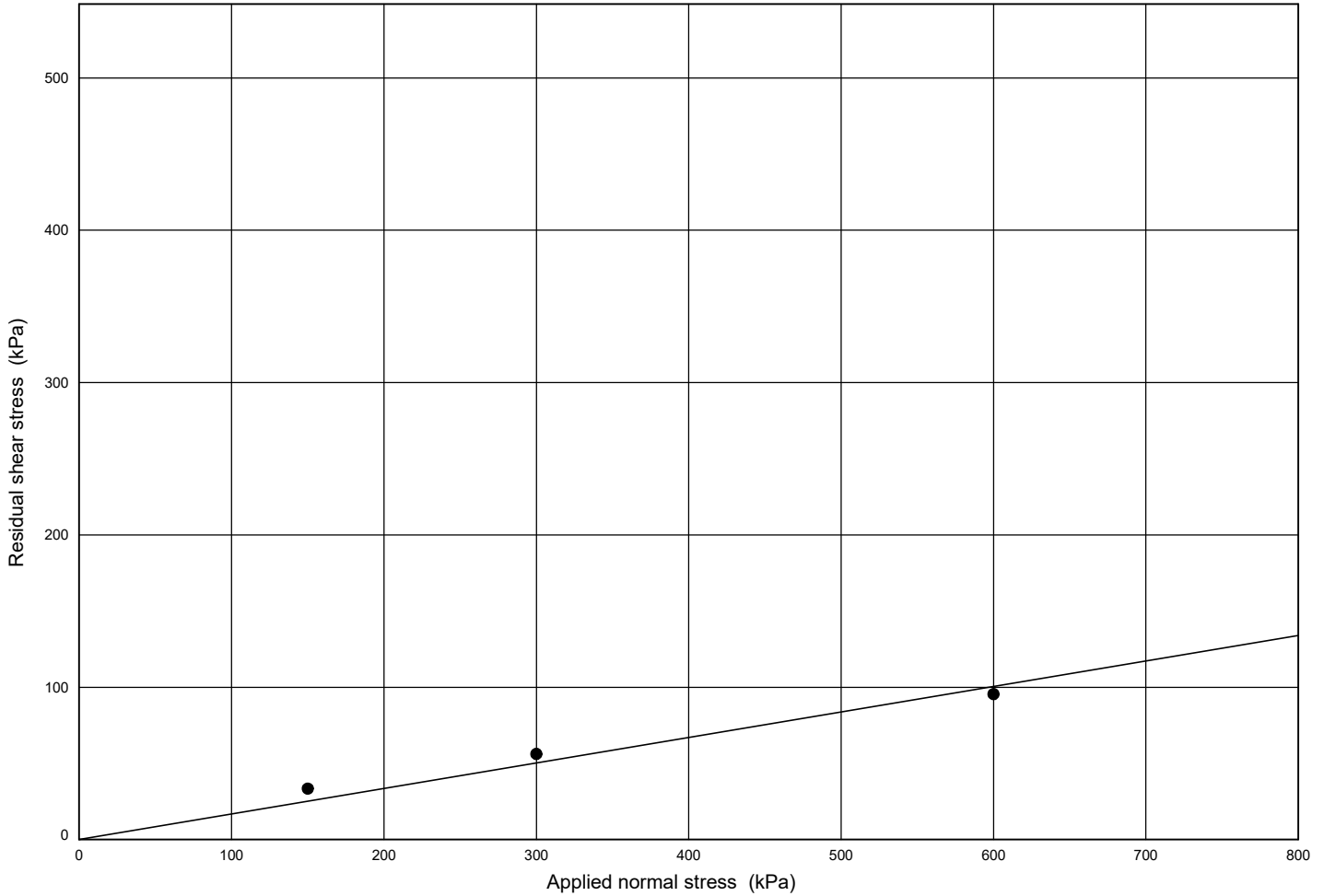
SAMPLE DEPTH (m)

13.90

DESCRIPTION Dark grey slightly sandy silty CLAY

SPECIMEN DEPTH (m)

13.90



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GENERAL DETAILS			SHEARING STAGES															
inner radius of specimen (mm)	35	<table border="1"> <thead> <tr> <th>stage</th> <th>normal stress (kPa)</th> <th>residual shear stress (kPa)</th> <th>cumulative angular displacement (degrees)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>150</td> <td>33.5</td> <td>61</td> </tr> <tr> <td>2</td> <td>300</td> <td>56.2</td> <td>131</td> </tr> <tr> <td>3</td> <td>600</td> <td>95.5</td> <td>191</td> </tr> </tbody> </table>	stage	normal stress (kPa)	residual shear stress (kPa)	cumulative angular displacement (degrees)	1	150	33.5	61	2	300	56.2	131	3	600	95.5	191
stage	normal stress (kPa)		residual shear stress (kPa)	cumulative angular displacement (degrees)														
1	150		33.5	61														
2	300		56.2	131														
3	600		95.5	191														
outer radius of specimen (mm)	50																	
initial thickness of specimen (mm)	5																	
initial moisture content (%)	25.2																	
final moisture content (%)	33.5																	
rate of angular displacement (mm/min)	0.048																	
SHEAR STRENGTH PARAMETERS																		
residual angle of shearing resistance $\phi_r'$ (deg)	9.5																	
residual cohesion intercept $c_r'$ (kPa)	0																	
remarks:			CONTRACT		CHECKED													
			35205		TB													

# RESIDUAL STRENGTH BY RING SHEAR



BS.1377 : Part 7 : 1990 : 6

CLIENT OSBORNE

BH/TP No.

CP223

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)

SAMPLE No./TYPE

18Cs

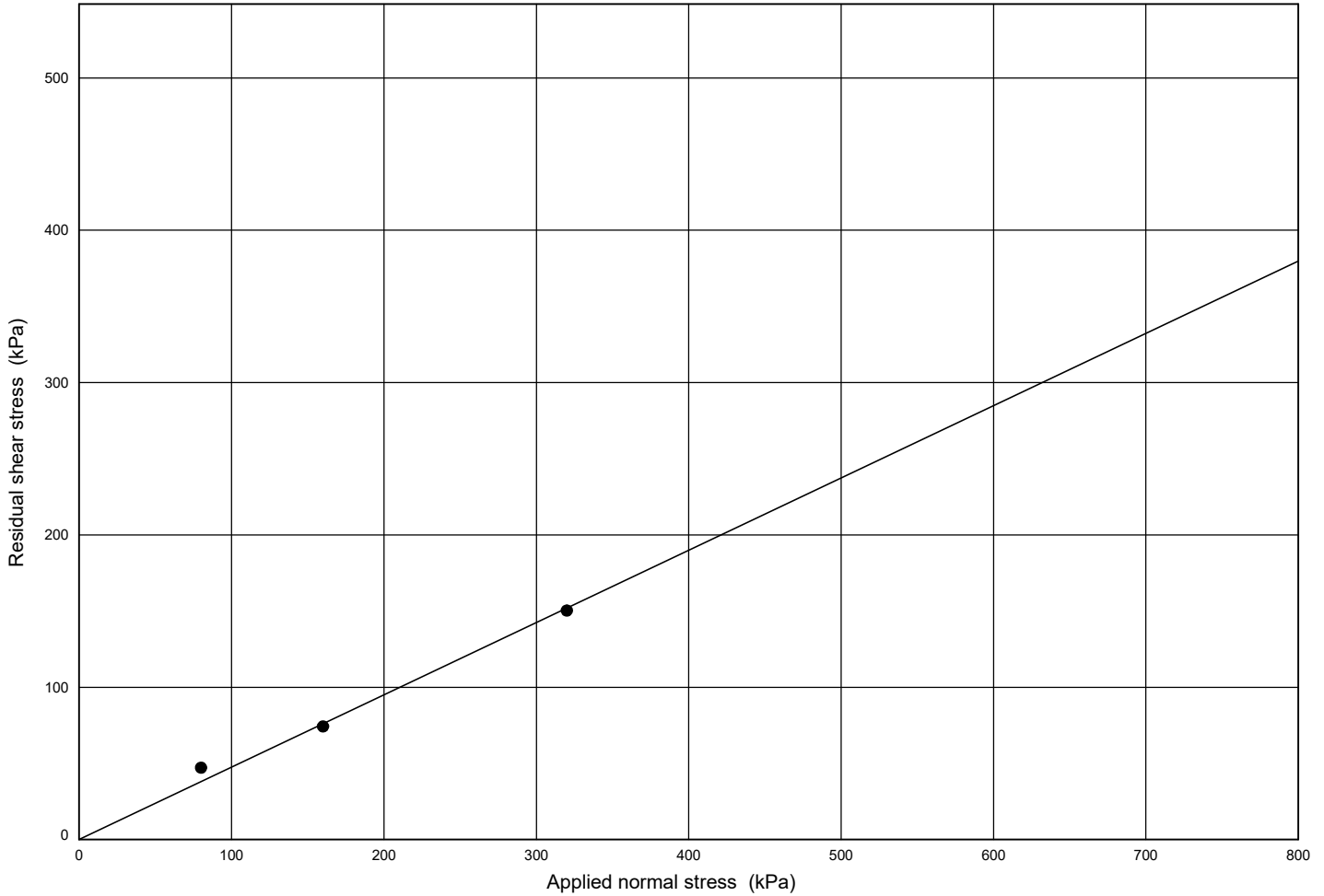
SAMPLE DEPTH (m)

7.10

DESCRIPTION Grey mottled brown and orange slightly gravelly slightly sandy silty CLAY

SPECIMEN DEPTH (m)

7.15



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GENERAL DETAILS			SHEARING STAGES			
inner radius of specimen (mm)	35		stage	normal stress (kPa)	residual shear stress (kPa)	cumulative angular displacement (degrees)
outer radius of specimen (mm)	50					
initial thickness of specimen (mm)	5		1	80	47.2	198
initial moisture content (%)	20.3		2	160	74.3	258
final moisture content (%)	25.3		3	320	150.4	314
rate of angular displacement (mm/min)	0.048					
SHEAR STRENGTH PARAMETERS						
residual angle of shearing resistance $\phi_r'$ (deg)	25.5					
residual cohesion intercept $c_r'$ (kPa)	0					
remarks:					CONTRACT	CHECKED
					<b>35205</b>	<b>TB</b>

# RESIDUAL STRENGTH BY RING SHEAR



BS.1377 : Part 7 : 1990 : 6

CLIENT OSBORNE

BH/TP No.

DSRC224

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)

SAMPLE No./TYPE

31C

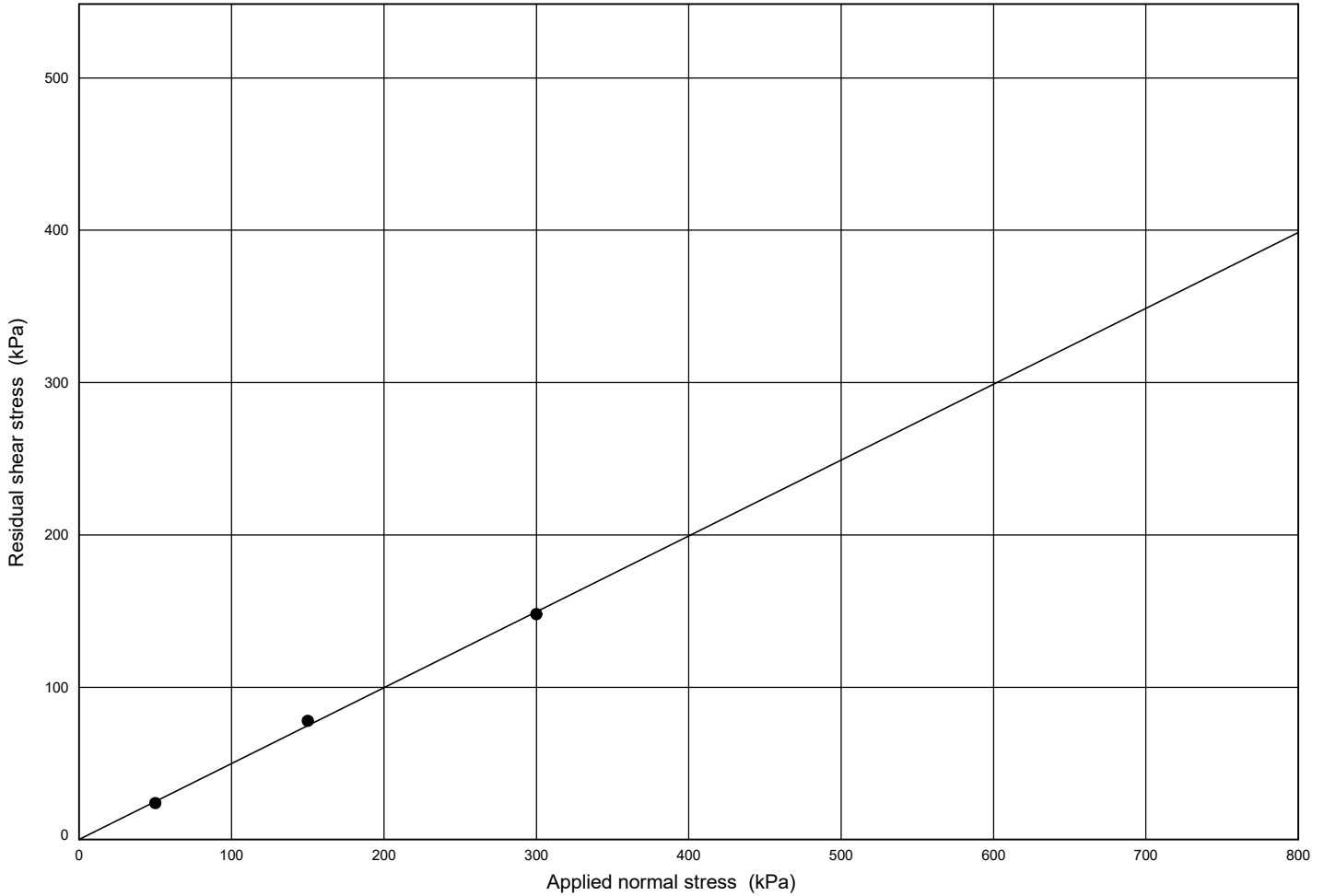
SAMPLE DEPTH (m)

13.00

DESCRIPTION Light brown slightly sandy clayey SILT

SPECIMEN DEPTH (m)

13.60



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GENERAL DETAILS			SHEARING STAGES			
inner radius of specimen (mm)	35		stage	normal stress (kPa)	residual shear stress (kPa)	cumulative angular displacement (degrees)
outer radius of specimen (mm)	50					
initial thickness of specimen (mm)	5		1	50	24.0	76
initial moisture content (%)	10.1		2	150	78.0	214
final moisture content (%)	26.8		3	300	148.0	58
rate of angular displacement (mm/min)	0.052					
SHEAR STRENGTH PARAMETERS						
residual angle of shearing resistance $\phi_r'$ (deg)	23.5					
residual cohesion intercept $c_r'$ (kPa)	0					
remarks:					CONTRACT	CHECKED
					<b>35205</b>	<b>TB</b>

# RESIDUAL STRENGTH BY RING SHEAR



BS.1377 : Part 7 : 1990 : 6

CLIENT OSBORNE

BH/TP No.

DSRC224

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)

SAMPLE No./TYPE

55C

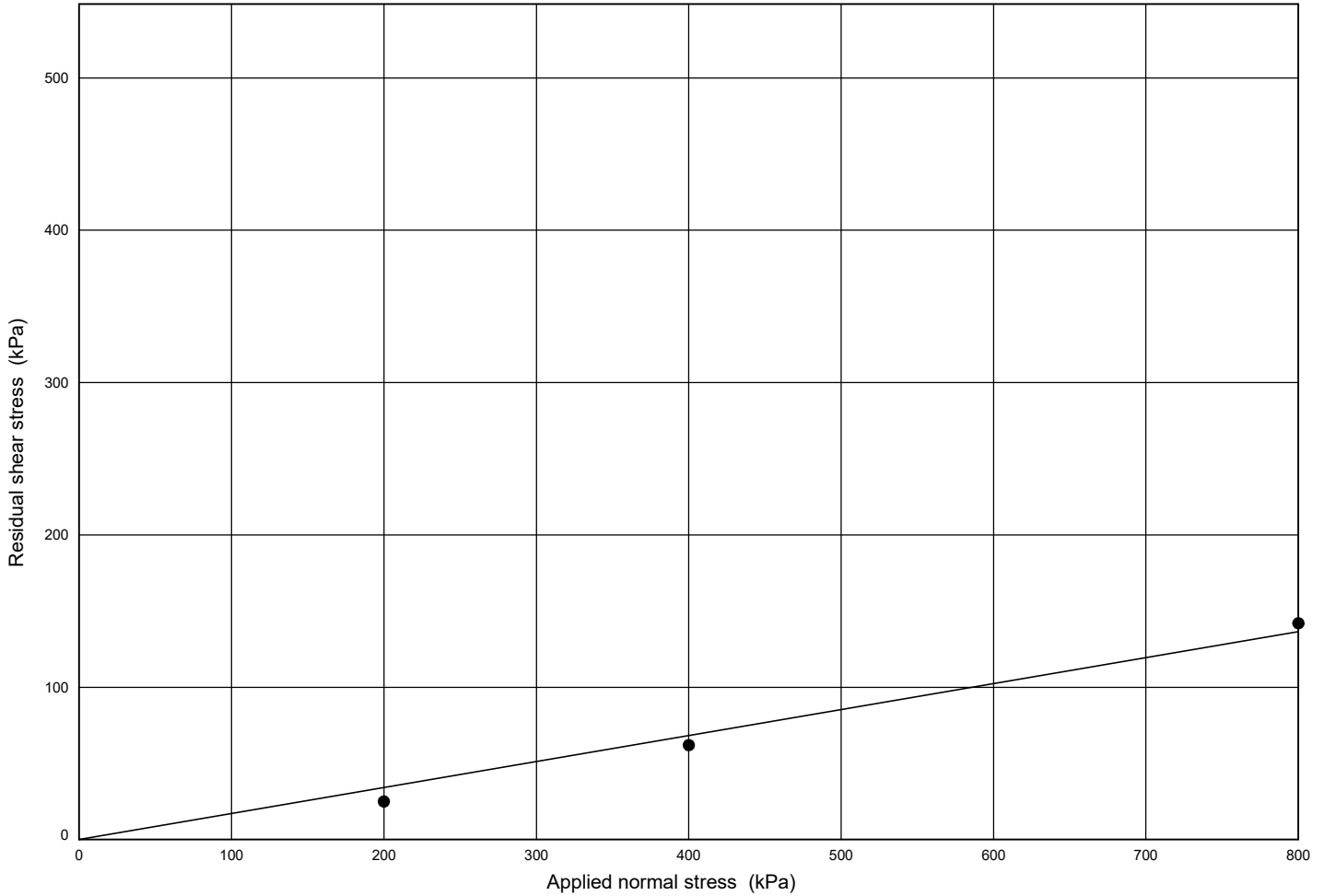
SAMPLE DEPTH (m)

34.00

DESCRIPTION Dark grey slightly sandy silty CLAY

SPECIMEN DEPTH (m)

35.40



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GENERAL DETAILS			SHEARING STAGES			
inner radius of specimen (mm)	35		stage	normal stress (kPa)	residual shear stress (kPa)	cumulative angular displacement (degrees)
outer radius of specimen (mm)	50					
initial thickness of specimen (mm)	5		1	200	25.0	73
initial moisture content (%)	5.3		2	400	62.0	206
final moisture content (%)	28.8		3	800	142.0	56
rate of angular displacement (mm/min)	0.048					
SHEAR STRENGTH PARAMETERS						
residual angle of shearing resistance $\phi_r'$ (deg)	9.5					
residual cohesion intercept $c_r'$ (kPa)	0					
remarks:					CONTRACT	CHECKED
					<b>35205</b>	<b>TB</b>

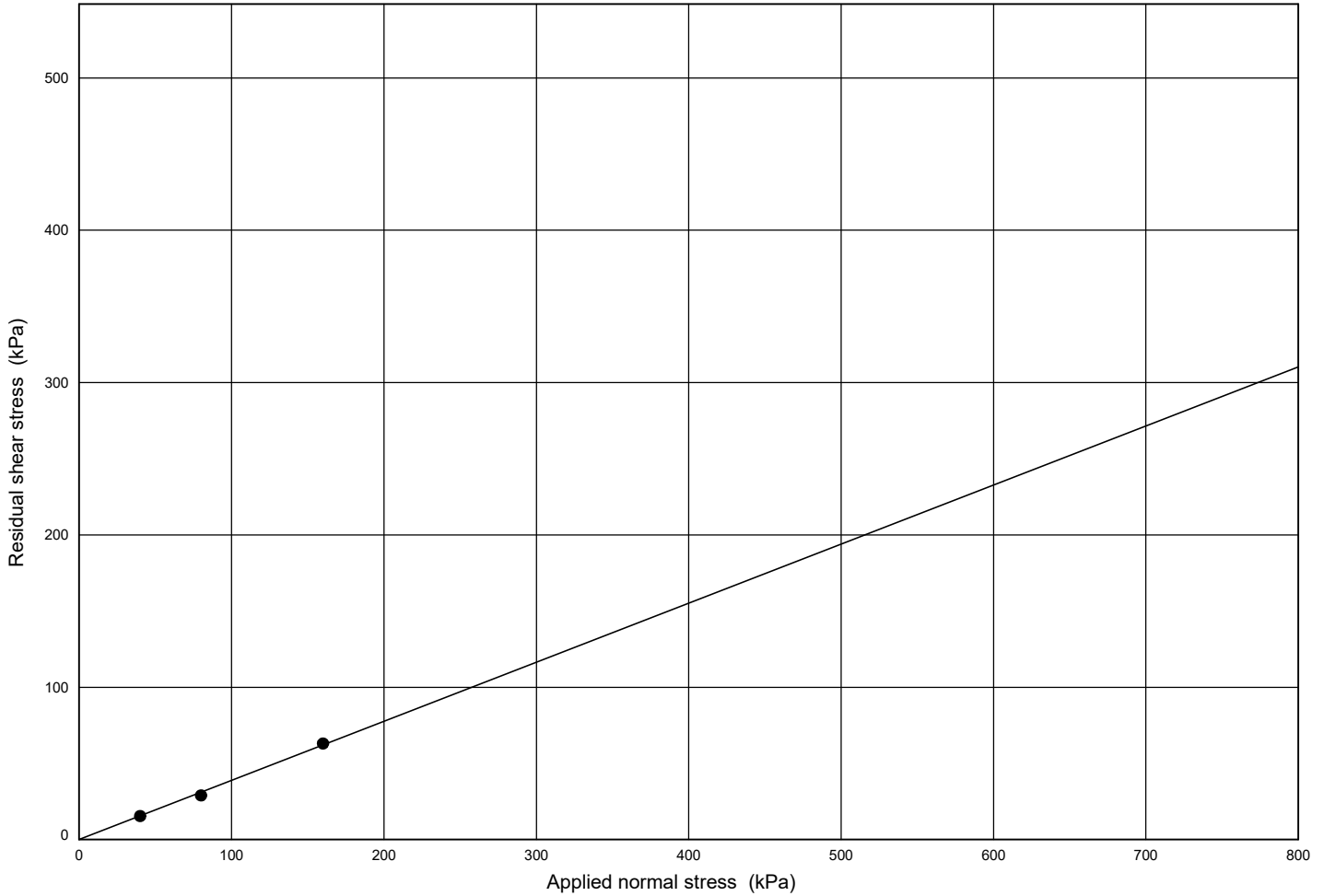
# RESIDUAL STRENGTH BY RING SHEAR



BS.1377 : Part 7 : 1990 : 6

CLIENT OSBORNE  
 SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)  
 DESCRIPTION Brown mottled grey and orange slightly gravelly slightly sandy silty CLAY

BH/TP No. TP204  
 SAMPLE No./TYPE 13BLK  
 SAMPLE DEPTH (m) 4.80  
 SPECIMEN DEPTH (m) 4.95



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GENERAL DETAILS			SHEARING STAGES			
inner radius of specimen (mm)	35		stage	normal stress (kPa)	residual shear stress (kPa)	cumulative angular displacement (degrees)
outer radius of specimen (mm)	50		1	40	15.4	207
initial thickness of specimen (mm)	5		2	80	29.0	272
initial moisture content (%)	20.8		3	160	63.1	338
final moisture content (%)	23.8					
rate of angular displacement (mm/min)	0.052					
SHEAR STRENGTH PARAMETERS						
residual angle of shearing resistance $\phi_r'$ (deg)	21.0					
residual cohesion intercept $c_r'$ (kPa)	0					
remarks:					CONTRACT	CHECKED
					<b>35205</b>	<b>TB</b>

# RESIDUAL STRENGTH BY RING SHEAR



BS.1377 : Part 7 : 1990 : 6

CLIENT OSBORNE

BH/TP No.

TP207

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1077)

SAMPLE No./TYPE

12BLK

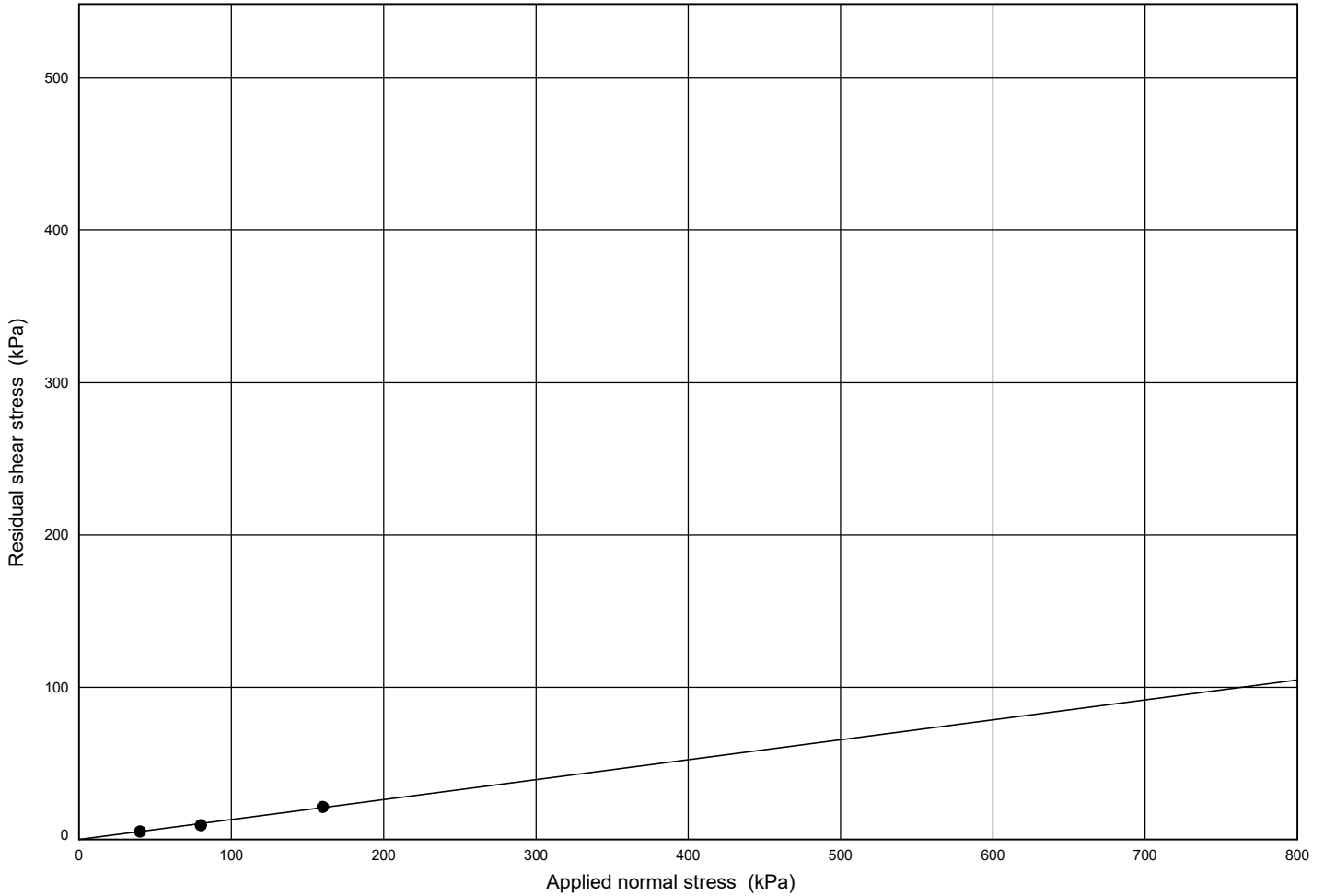
SAMPLE DEPTH (m)

3.90

DESCRIPTION Dark grey slightly sandy CLAY

SPECIMEN DEPTH (m)

3.95



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GENERAL DETAILS			SHEARING STAGES			
inner radius of specimen (mm)	35		stage	normal stress (kPa)	residual shear stress (kPa)	cumulative angular displacement (degrees)
outer radius of specimen (mm)	50					
initial thickness of specimen (mm)	5		1	40	5.3	62
initial moisture content (%)	26.6		2	80	9.4	129
final moisture content (%)	26.9		3	160	21.5	347
rate of angular displacement (mm/min)	0.052					
SHEAR STRENGTH PARAMETERS						
residual angle of shearing resistance $\phi'_r$ (deg)	7.5					
residual cohesion intercept $c'_r$ (kPa)	0					
remarks:					CONTRACT	CHECKED
					<b>35205</b>	<b>TB</b>



# UNDRAINED TRIAXIAL COMPRESSION

BS.1377 : PART 7 : 1990 : 8



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

borehole /trial pit no.	sample		specimen depth (m)	code	moisture content		dimensions		density		cell pressure (kPa)	rate of strain (%/min)	deviator stress (kPa)	failure strain (%)	failure mode	shear strength* (kPa)	description and remarks
	no./type	depth (m)			initial (%)	final (%)	length (mm)	diameter (mm)	bulk (Mg/m3)	dry (Mg/m3)							
CP106	10UT	3.00	3.05	UU100	40.7	38.9	206	104	1.83	1.30	60	2.0	63	6.3	S	31	Brown mottled orange and grey slightly gravelly slightly sandy silty CLAY Dark grey slightly sandy silty CLAY  Greyish brown slightly sandy silty CLAY
DSRC107	31Cs	10.00	10.35	UU100	14.8	15.7	178	100	2.19	1.91	200	2.0	323	6.2	S	161	
DSRC107	45Cs	18.60	18.65	UU100	13.4	15.4	206	104	2.10	1.85	300	2.0	289	1.9	S	145	
<p>general remarks:</p> <p>* shear strength taken as half deviator stress at failure for each stage membrane correction applied sample taken vertically (unless otherwise specified) strain rate 2%/min (unless otherwise specified)</p> <p>code: UU - unconsolidated undrained M - multi stage S - set of three R - remoulded</p> <p>failure mode: B - barrel (plastic failure) S - shear (brittle failure) I - intermediate O - other (see remarks)</p> <p>membrane type/thickness: latex membrane used (unless otherwise specified) 38 - 0.2mm 70 - 0.4mm 100 - 0.4mm</p>																	
															CONTRACT	CHECKED	
															<b>35205</b>	<b>TB</b>	



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC107
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-PHASE 2A (1077)	SAMPLE No./TYPE	35CS
		SAMPLE DEPTH (m)	12.50-13.00
DESCRIPTION	Greyish brown silty CLAY with rare shell fragments	SPECIMEN DEPTH (m)	12.60-12.81

**TYPE OF SPECIMEN** Undisturbed / Vertical  
**TYPE OF TEST** Single Specimen Multistage  
**SIDE DRAINS FITTED** Yes  
**DRAINAGE CONDITIONS** One end and radial boundary

		STAGE	1	2	3
<b>INITIAL CONDITIONS</b>	Length	mm	206.05	197.17 *	187.39 *
	Diameter	mm	102.35	100.22 *	100.22 *
	Moisture Content	%	15		
	Bulk Density	Mg/m <sup>3</sup>	2.18		
	Dry Density	Mg/m <sup>3</sup>	1.90		
<b>FINAL CONDITIONS</b>	Moisture Content	%			15
	Bulk Density	Mg/m <sup>3</sup>			2.33
	Dry Density	Mg/m <sup>3</sup>			2.02
<b>SATURATION</b> (by cell pressure and back pressure increments)	Initial PWP	kPa	0		
	Saturated PWP	kPa	384		
	Final Cell Pressure	kPa	400		
	B Value		0.96		
<b>CONSOLIDATION</b>	Cell Pressure	kPa	465	590	
	Back Pressure	kPa	340	340	
	Initial PWP	kPa	445	483	
	Final PWP	kPa	343	427	
<b>COMPRESSION</b>	Cell Pressure	kPa	465	590	
	Back Pressure	kPa	340	340	
	$\sigma_3$	kPa	125	250	
	Rate of Strain	%/hr	0.093	0.0064	
<b>FAILURE CONDITIONS</b> (based on maximum deviator stress in stage three)	Axial Strain ( $\epsilon$ )	%	2.2	1.9	
	$\delta U_f$	kPa	57	60	
	$\sigma_{3f}$	kPa	68	190	
	$(\sigma_1' - \sigma_3')_f$	kPa	183	323	
	$(\sigma_1'/\sigma_3')_f$		3.7	2.7	

Membrane correction of 0.1kPa/% strain applied to deviator stress.

Side drain correction of 3.5kPa applied to deviator stress (100mm diameter)

<b>FAILURE MODE</b> (also see photo)	<b>SHEAR</b>	<b>EFFECTIVE STRESS PARAMETERS</b>	<b>c' kPa :</b>	<b><math>\phi'</math> deg :</b>
			<b>36.0</b>	<b>21.4</b>
remarks	* Calculated values Consolidation stage 2 stopped early and the test terminated on completion of shear stage 2 at the request of the client.		<b>CONTRACT</b>	<b>CHECKED</b>
			<b>35205</b>	<b>NP</b>

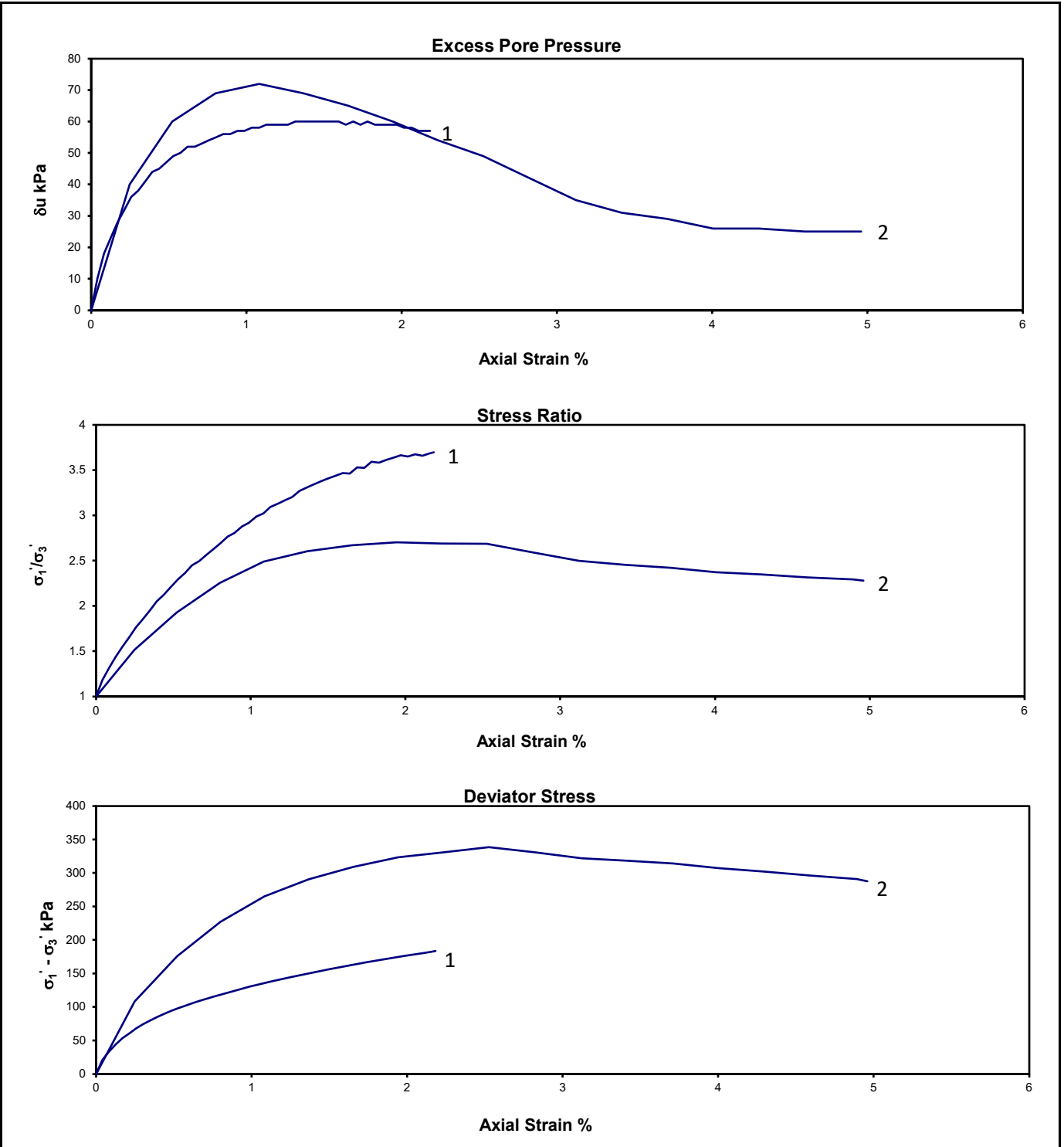
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# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC107
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-SAMPLE No./TYPE		35CS
	PHASE 2A (1077)	SAMPLE DEPTH (m)	12.50-13.00
		SPECIMEN DEPTH (m)	12.60-12.81



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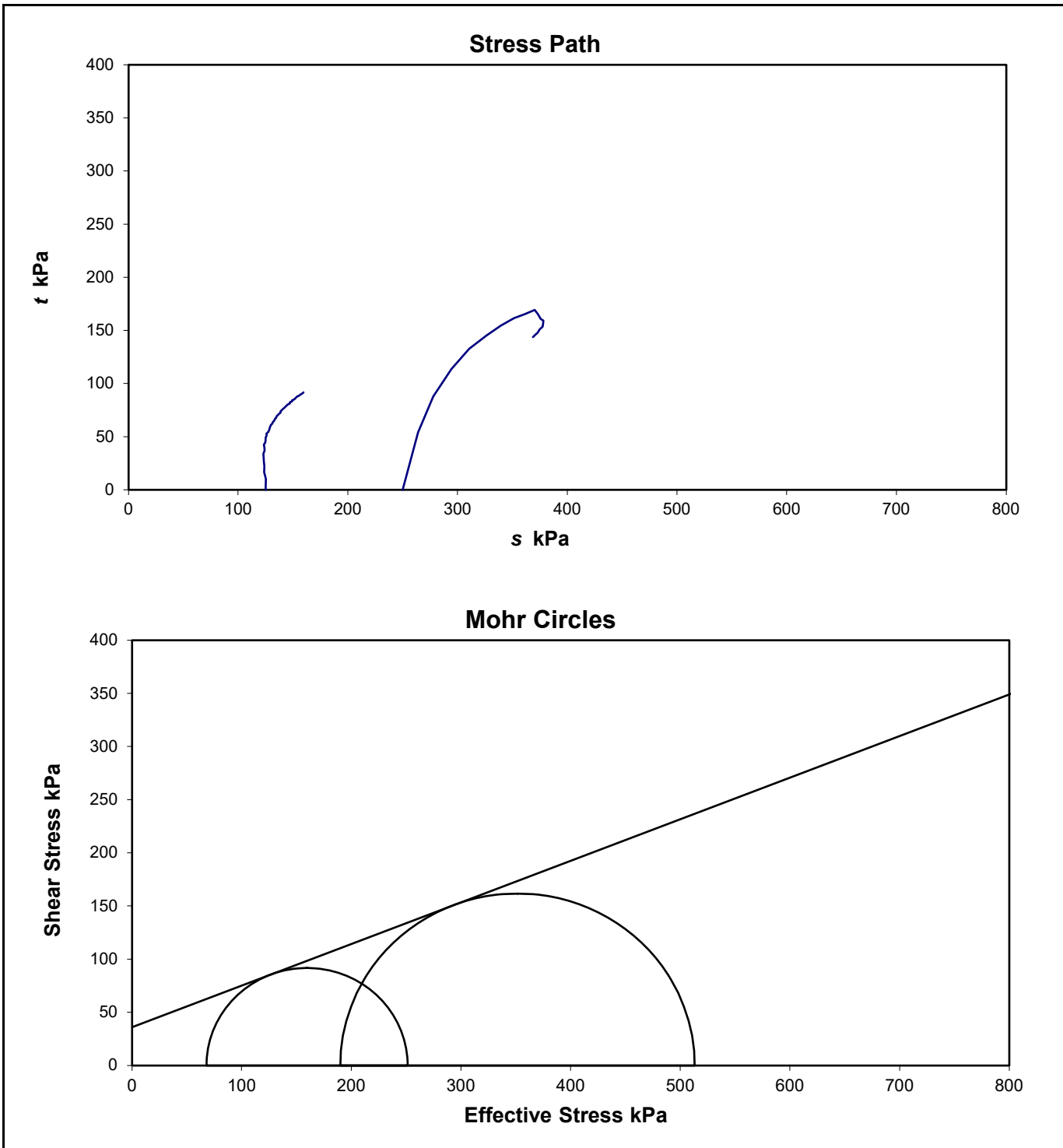
remarks	Consolidation stage 2 stopped early and the test terminated on completion of shear stage 2 at the request of the client.	CONTRACT	CHECKED
		<b>35205</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC107
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-SAMPLE No./TYPE		35CS
	PHASE 2A (1077)	SAMPLE DEPTH (m)	12.50-13.00
		SPECIMEN DEPTH (m)	12.60-12.81



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remarks	Consolidation stage 2 stopped early and the test terminated on completion of shear stage 2 at the request of the client.	CONTRACT	CHECKED
		<b>35205</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC107
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-SAMPLE No./TYPE		35CS
	PHASE 2A (1077)	SAMPLE DEPTH (m)	12.50-13.00
		SPECIMEN DEPTH (m)	12.60-12.81



Failure Mode SHEAR

remarks Consolidation stage 2 stopped early and the test terminated on completion of shear stage 2 at the request of the client.

CONTRACT

CHECKED

**35205**

**NP**

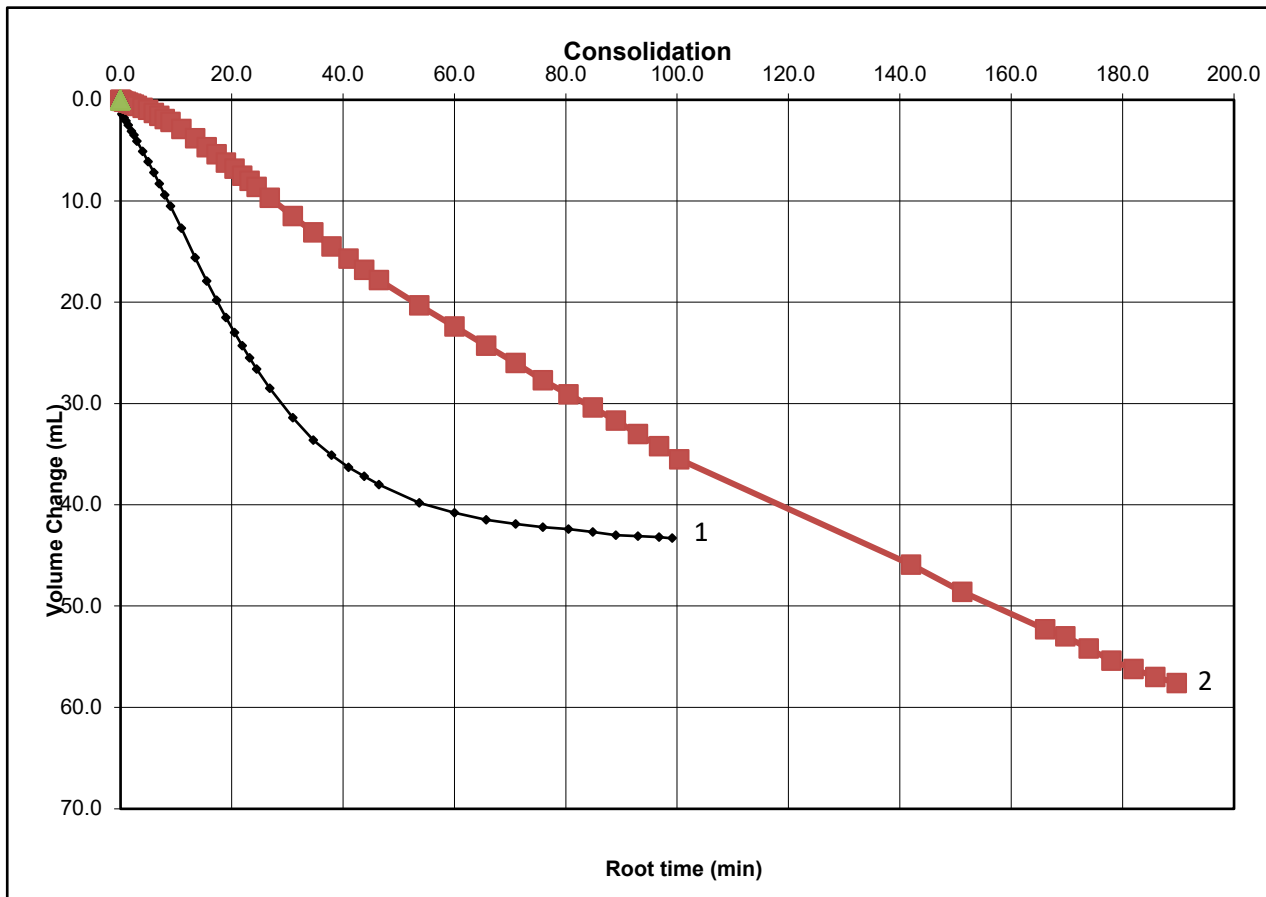
Please note the photo is intended to show the mode of failure only.



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC107
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-SAMPLE No./TYPE		35CS
	PHASE 2A (1077)	SAMPLE DEPTH (m)	12.50-13.00
		SPECIMEN DEPTH (m)	12.60-12.81



Stage 1      Stage 2      Stage 3

Cell pressure	kPa	465	590	
Back pressure	kPa	340	340	
Effective pressure	kPa	125	250	
Initial PWP	kPa	445	483	
Final PWP	kPa	343	427	
PWP Dissipation	%	97.14	39.16	
Volume change	mL	43.3	57.6	
t100		1432.78	20992.18	

remarks Consolidation stage 2 stopped early and the test terminated on completion of shear stage 2 at the request of the client.

CONTRACT  
**35205**

CHECKED  
**NP**



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC108
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-SAMPLE No./TYPE		17UT
	PHASE 2A (1077)	SAMPLE DEPTH (m)	5.20-5.65
DESCRIPTION	Orangish brown mottled grey slightly sandy clayey SILT	SPECIMEN DEPTH (m)	5.35-5.56

**TYPE OF SPECIMEN** Undisturbed / Vertical  
**TYPE OF TEST** Single Specimen Multistage  
**SIDE DRAINS FITTED** Yes  
**DRAINAGE CONDITIONS** One end and radial boundary

		STAGE	1	2	3
<b>INITIAL CONDITIONS</b>	Length	mm	205.69	206	205
	Diameter	mm	104.76	105	105
	Moisture Content	%	20		
	Bulk Density	Mg/m <sup>3</sup>	2.06		
	Dry Density	Mg/m <sup>3</sup>	1.72		
<b>FINAL CONDITIONS</b>	Moisture Content	%			20
	Bulk Density	Mg/m <sup>3</sup>			2.07
	Dry Density	Mg/m <sup>3</sup>			1.73
<b>SATURATION</b> (by cell pressure and back pressure increments)	Initial PWP	kPa	-1		
	Saturated PWP	kPa	150		
	Final Cell Pressure	kPa	160		
	B Value		0.95		
<b>CONSOLIDATION</b>	Cell Pressure	kPa	350	400	500
	Back Pressure	kPa	300	300	300
	Initial PWP	kPa	338	355	415
	Final PWP	kPa	297	297	302
<b>COMPRESSION</b>	Cell Pressure	kPa	350	400	500
	Back Pressure	kPa	300	300	300
	$\sigma_3$	kPa	50	100	200
	Rate of Strain	%/hr	0.498	0.498	0.094
<b>FAILURE CONDITIONS</b> (based on maximum deviator stress in stage three)	Axial Strain ( $\epsilon$ )	%	2.8	1.9	1.8
	$\delta U_f$	kPa	7	9	58
	$\sigma_{3f}$	kPa	43	91	142
	$(\sigma_1' - \sigma_3')_f$	kPa	222	375	535
	$(\sigma_1'/\sigma_3')_f$		6.2	5.1	4.8

Membrane correction of 0.1kPa/% strain applied to deviator stress.

Side drain correction of 3.5kPa applied to deviator stress (100mm diameter)

<b>FAILURE MODE</b> (also see photo)	SHEAR	<b>EFFECTIVE STRESS PARAMETERS</b>	<b>c' kPa :</b>	<b><math>\phi'</math> deg :</b>
			<b>21.1</b>	<b>37.8</b>
remarks	* Calculated values		CONTRACT	CHECKED
			<b>35205</b>	<b>NP</b>

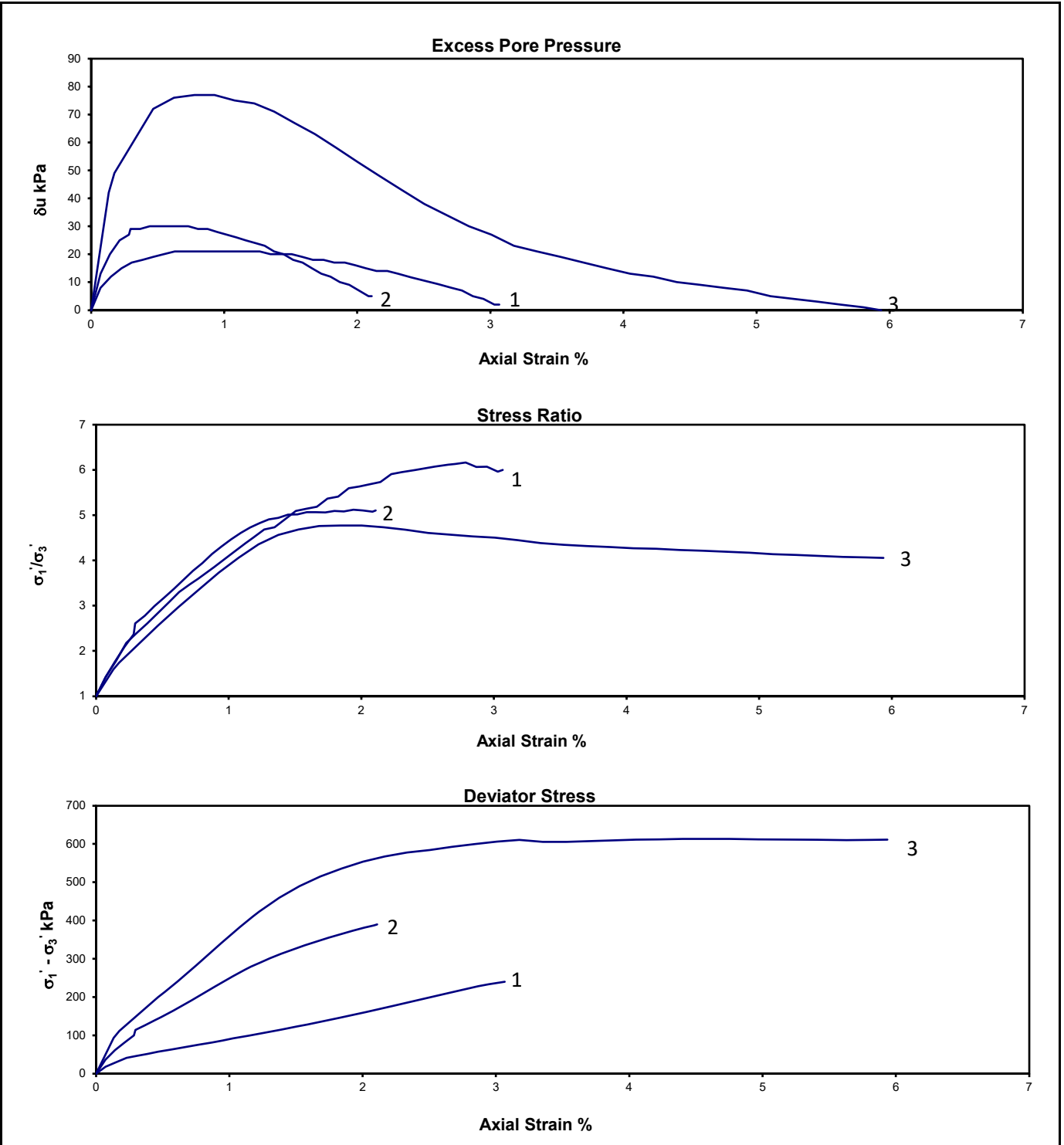
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# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC108
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-SAMPLE No./TYPE		17UT
	PHASE 2A (1077)	SAMPLE DEPTH (m)	5.20-5.65
		SPECIMEN DEPTH (m)	5.35-5.56



Geotechnical Engineering Ltd, Centurion House, Olympus Park, Quedgeley, Gloucester, GL2 4NF, Tel - 01452 527743

remarks	CONTRACT	CHECKED
	<b>35205</b>	<b>NP</b>

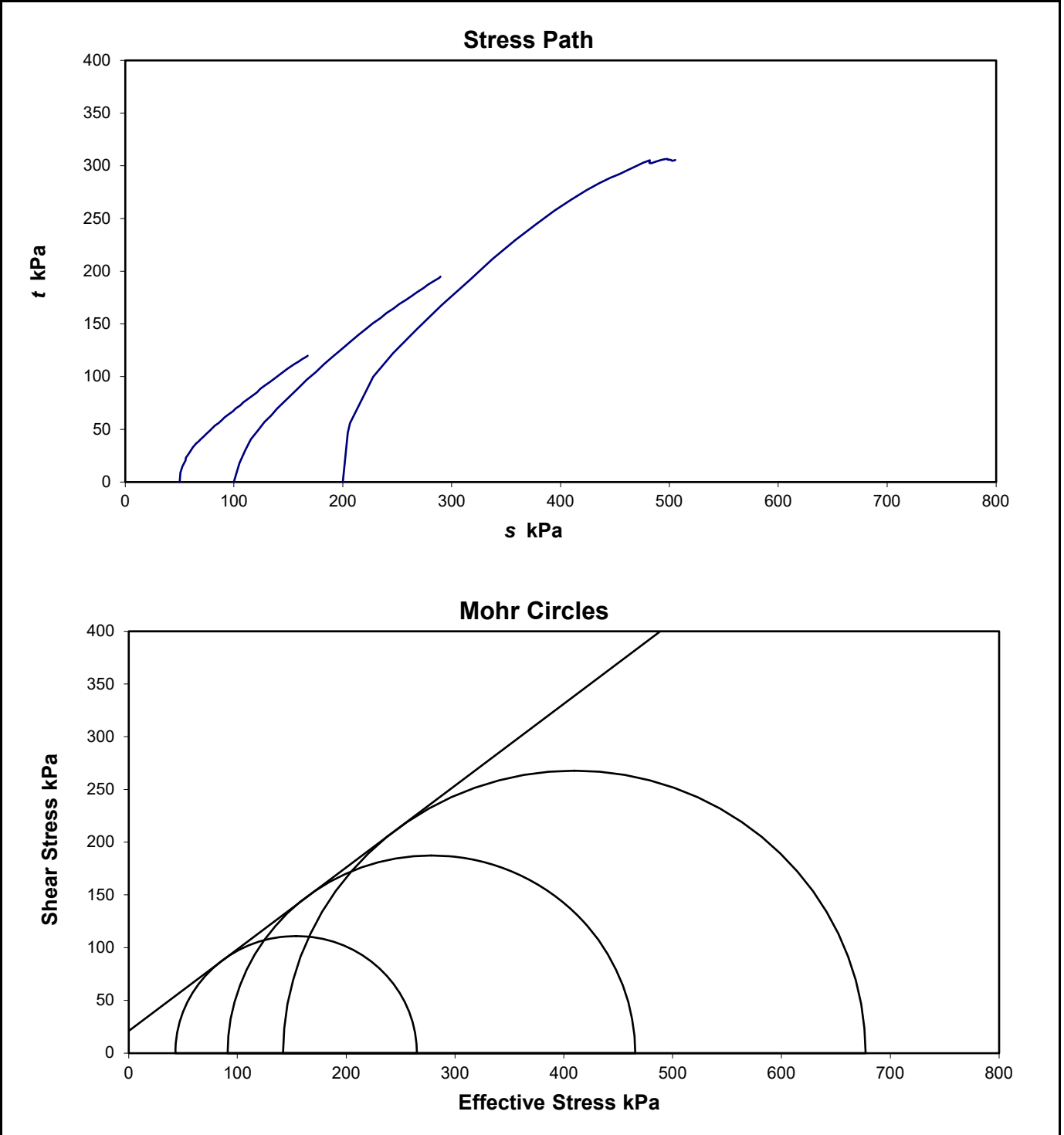




# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC108
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-SAMPLE No./TYPE		17UT
	PHASE 2A (1077)	SAMPLE DEPTH (m)	5.20-5.65
		SPECIMEN DEPTH (m)	5.35-5.56



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remarks	CONTRACT	CHECKED
	<b>35205</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC108
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-SAMPLE No./TYPE		17UT
	PHASE 2A (1077)	SAMPLE DEPTH (m)	5.20-5.65
		SPECIMEN DEPTH (m)	5.35-5.56



Failure Mode SHEAR

remarks

Please note the photo is intended to show the mode of failure only.

CONTRACT

**35205**

CHECKED

**NP**

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION-SAMPLE No./TYPE

PHASE 2A (1077)

BH/TP No.

SAMPLE DEPTH (m)

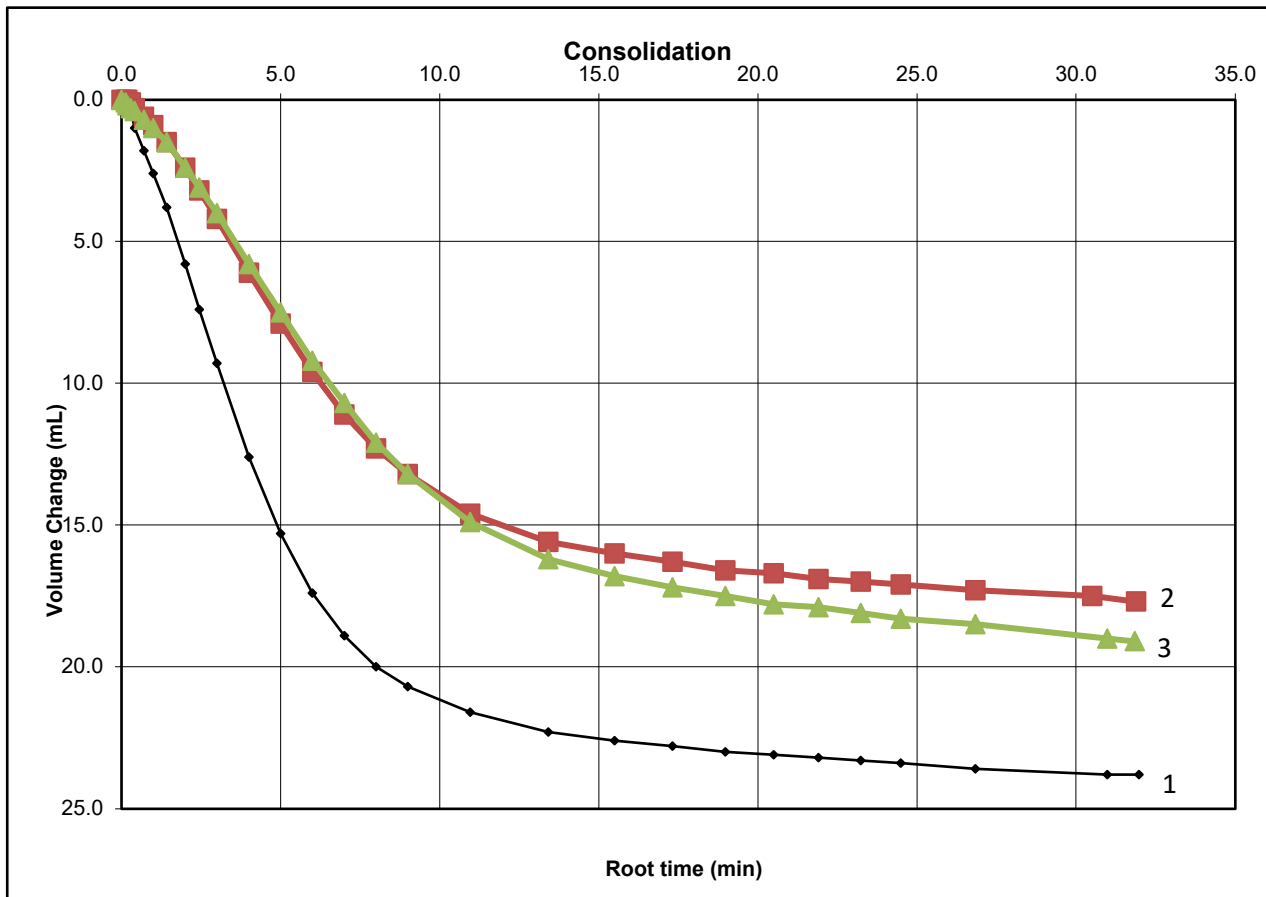
SPECIMEN DEPTH (m)

DSRC108

17UT

5.20-5.65

5.35-5.56



Stage 1      Stage 2      Stage 3

Cell pressure	kPa	350	400	500
Back pressure	kPa	300	300	300
Effective pressure	kPa	50	100	200
Initial PWP	kPa	338	355	415
Final PWP	kPa	297	297	302
PWP Dissipation	%	107.89	105.45	98.26
Volume change	mL	23.8	17.7	19.1
	t100	51.13	102.9	134.66

remarks

CONTRACT

**35205**

CHECKED

**NP**



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC207
SITE	H5551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	25CS
		SAMPLE DEPTH (m)	12.00-12.40
DESCRIPTION	Dark grey slightly sandy slightly gravelly silty CLAY	SPECIMEN DEPTH (m)	12.05-12.26

**TYPE OF SPECIMEN** Undisturbed / Vertical  
**TYPE OF TEST** Single Specimen Single Stage  
**SIDE DRAINS FITTED** Yes  
**DRAINAGE CONDITIONS** One end and radial boundary

		SPECIMEN	1
<b>INITIAL CONDITIONS</b>	Length	mm	205.36
	Diameter	mm	102.41
	Moisture Content	%	16
	Bulk Density	Mg/m <sup>3</sup>	2.12
	Dry Density	Mg/m <sup>3</sup>	1.82
<b>FINAL CONDITIONS</b>	Moisture Content	%	16
	Bulk Density	Mg/m <sup>3</sup>	2.21
	Dry Density	Mg/m <sup>3</sup>	1.90
<b>SATURATION</b> (by cell pressure and back pressure increments)	Initial PWP	kPa	0
	Saturated PWP	kPa	342
	Final Cell Pressure	kPa	350
	B Value		1
<b>CONSOLIDATION</b>	Cell Pressure	kPa	550
	Back Pressure	kPa	300
	Initial PWP	kPa	540
	Final PWP	kPa	312
<b>COMPRESSION</b>	Cell Pressure	kPa	550
	Back Pressure	kPa	300
	$\sigma_3$	kPa	250
	Rate of Strain	%/hr	0.242
<b>FAILURE CONDITIONS</b> (based on maximum deviator stress)	Strain ( $\epsilon$ )	%	10.0
	$\delta u$	kPa	19
	$\sigma_{3f}$	kPa	231
	$(\sigma_1' - \sigma_3)_f$	kPa	369
<p>Membrane correction of 0.1kPa/% strain applied to deviator stress.                      Side drain correction of 3.5kPa applied to deviator stress (100mm diameter)</p>			

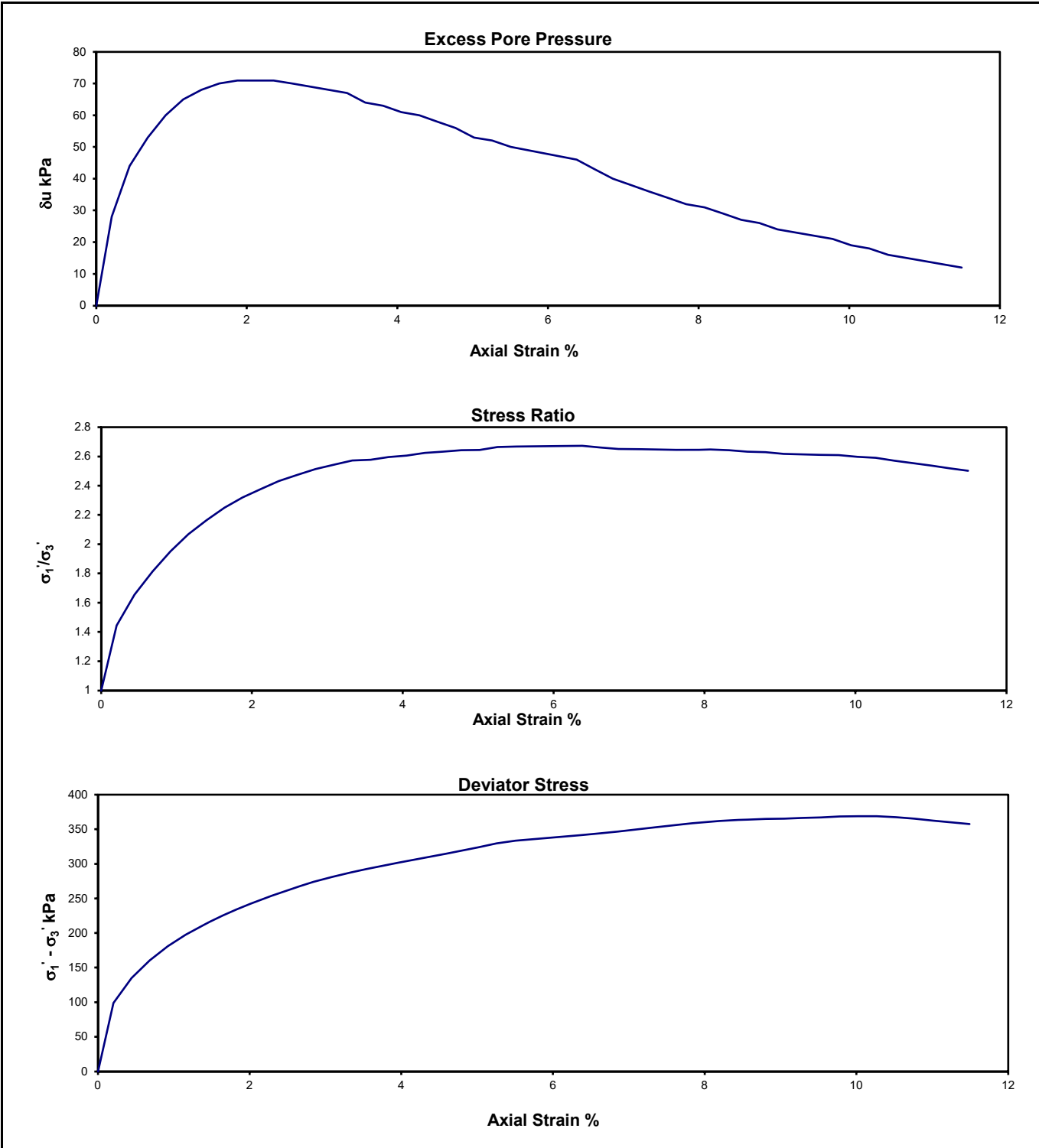
<b>FAILURE MODE</b> (see photo)	SHEAR	<b>EFFECTIVE STRESS PARAMETERS</b>	<b>c' kPa :</b>	<b><math>\phi'</math> deg :</b>
			CONTRACT	CHECKED
remarks			<b>35205</b>	<b>NP</b>

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC207
SITE	H5551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	25CS
		SAMPLE DEPTH (m)	12.00-12.40
		SPECIMEN DEPTH (m)	12.05-12.26



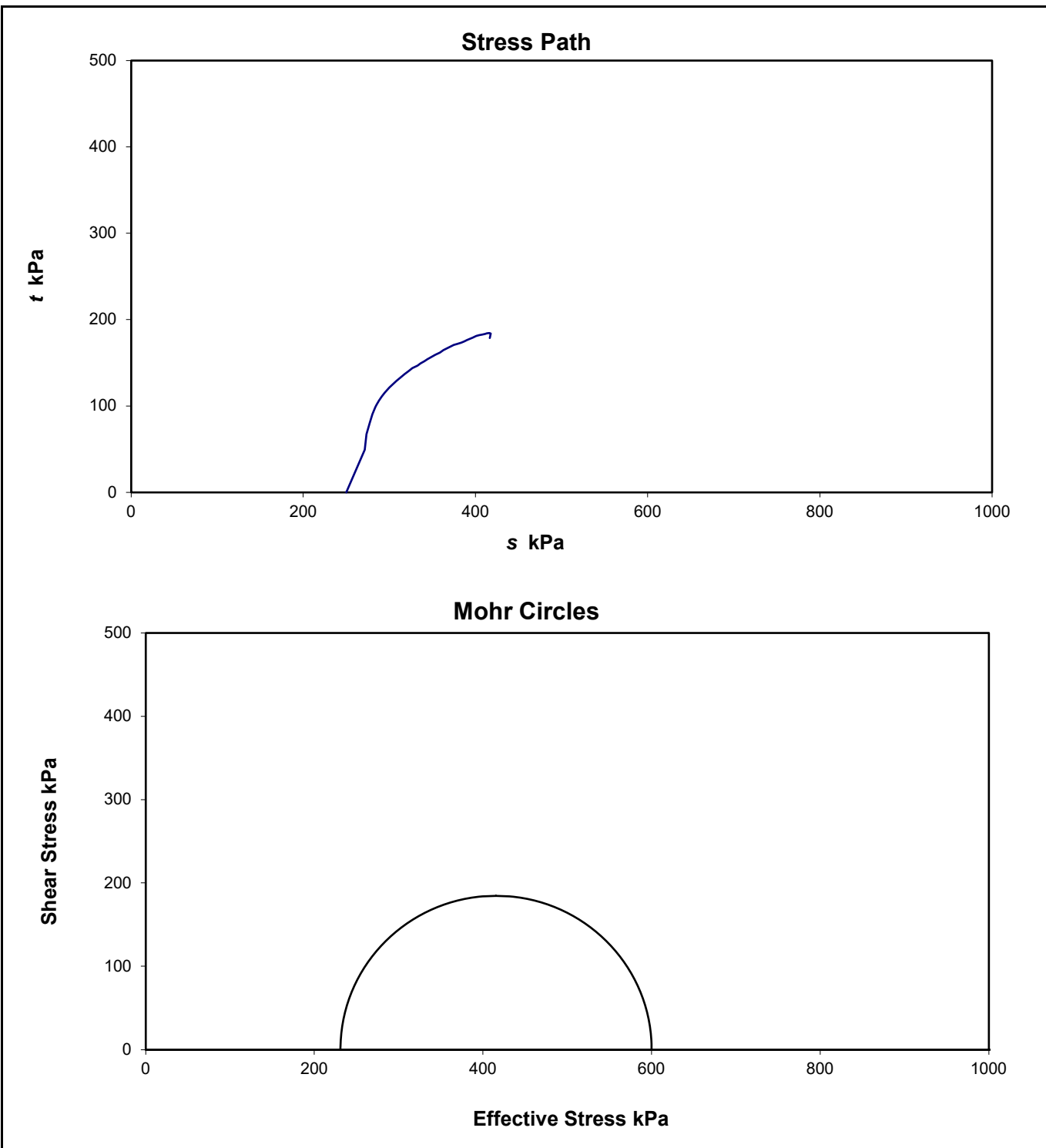
remarks	CONTRACT	CHECKED
	<b>35205</b>	<b>NP</b>

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC207
SITE	H5551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	25CS
		SAMPLE DEPTH (m)	12.00-12.40
		SPECIMEN DEPTH (m)	12.05-12.26



remarks	CONTRACT	CHECKED
	<b>35205</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC207
SITE	H5551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	25CS
		SAMPLE DEPTH (m)	12.00-12.40
		SPECIMEN DEPTH (m)	12.05-12.26



Failure Mode SHEAR

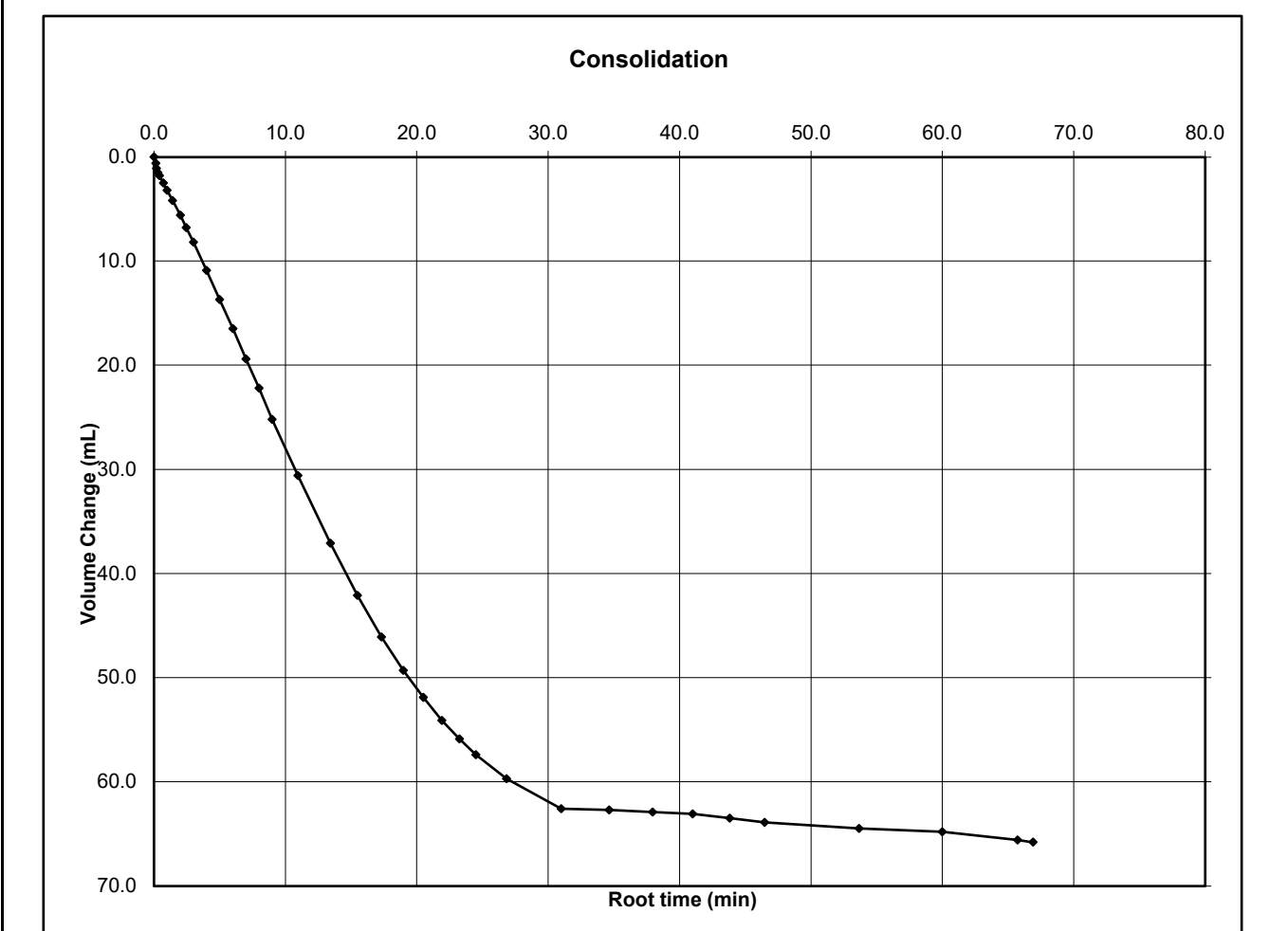
remarks Please note the photos are intended to show the mode of failure only.	CONTRACT	CHECKED
	<b>35205</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC207
SITE	H5551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)	SAMPLE No./TYPE	25CS
		SAMPLE DEPTH (m)	12.00-12.40
		SPECIMEN DEPTH (m)	12.05-12.26



Cell pressure	kPa	550
Back pressure	kPa	300
Effective pressure	kPa	250
Initial PWP	kPa	540
Final PWP	kPa	312
PWP Dissipation	%	95.00
Volume change	mL	65.8
	t100	552.05

remarks	CONTRACT	CHECKED
	<b>35205</b>	<b>NP</b>





# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC207
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-PHASE 2A (1077)	SAMPLE No./TYPE	31CS
		SAMPLE DEPTH (m)	15.45-15.85
DESCRIPTION	Brown mottled grey slightly gravelly slightly sandy silty CLAY	SPECIMEN DEPTH (m)	15.55-15.76

**TYPE OF SPECIMEN** Undisturbed / Vertical  
**TYPE OF TEST** Single Specimen Multistage  
**SIDE DRAINS FITTED** Yes  
**DRAINAGE CONDITIONS** One end and radial boundary

		STAGE	1	2	3
<b>INITIAL CONDITIONS</b>	Length	mm	205.53	196.19 *	189.57 *
	Diameter	mm	103.4	101.49 *	100.42 *
	Moisture Content	%	20		
	Bulk Density	Mg/m <sup>3</sup>	2.10		
	Dry Density	Mg/m <sup>3</sup>	1.75		
<b>FINAL CONDITIONS</b>	Moisture Content	%			18
	Bulk Density	Mg/m <sup>3</sup>			2.26
	Dry Density	Mg/m <sup>3</sup>			1.92
<b>SATURATION</b> (by cell pressure and back pressure increments)	Initial PWP	kPa	-3		
	Saturated PWP	kPa	389		
	Final Cell Pressure	kPa	400		
	B Value		0.98		
<b>CONSOLIDATION</b>	Cell Pressure	kPa	490	640	940
	Back Pressure	kPa	340	340	340
	Initial PWP	kPa	477	529	731
	Final PWP	kPa	346	346	359
<b>COMPRESSION</b>	Cell Pressure	kPa	490	640	940
	Back Pressure	kPa	340	340	340
	$\sigma_3$	kPa	150	300	600
	Rate of Strain	%/hr	0.097	0.043	0.014
<b>FAILURE CONDITIONS</b> (based on maximum deviator stress in stage three)	Axial Strain ( $\epsilon$ )	%	2.7	2.2	2.9
	$\delta U_f$	kPa	45	119	241
	$\sigma_{3f}$	kPa	105	181	359
	$(\sigma_1' - \sigma_3')_f$	kPa	154	287	530
	$(\sigma_1'/\sigma_3')_f$		2.5	2.6	2.5

Membrane correction of 0.1kPa/% strain applied to deviator stress.

Side drain correction of 3.5kPa applied to deviator stress (100mm diameter)

<b>FAILURE MODE</b> (also see photo)	SHEAR	<b>EFFECTIVE STRESS PARAMETERS</b>	c' kPa :	$\phi'$ deg :
			3.2	24.9
remarks	* Calculated values		CONTRACT	CHECKED
			<b>35205</b>	<b>NP</b>

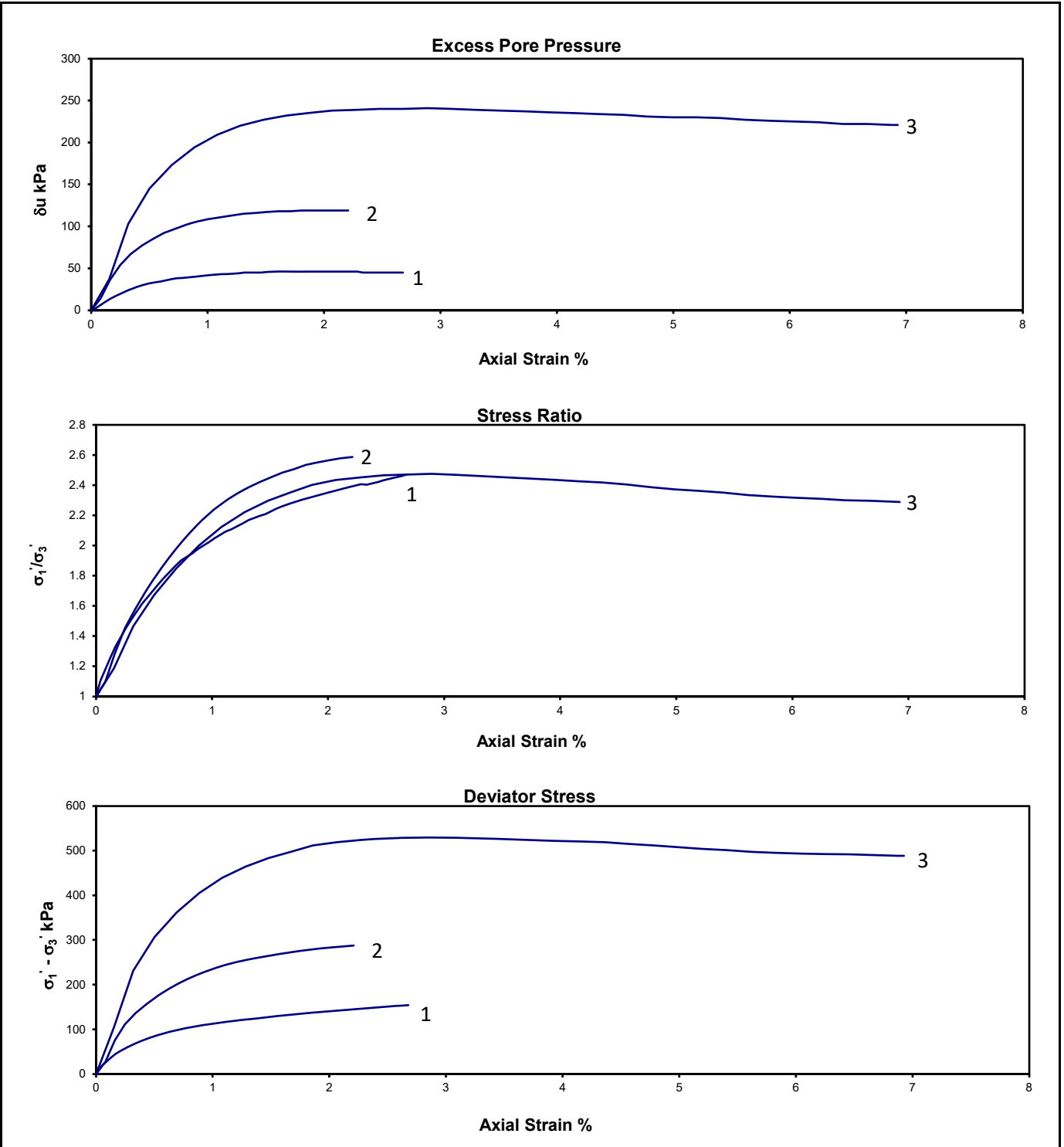
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# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC207
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-SAMPLE No./TYPE		31CS
	PHASE 2A (1077)	SAMPLE DEPTH (m)	15.45-15.85
		SPECIMEN DEPTH (m)	15.55-15.76



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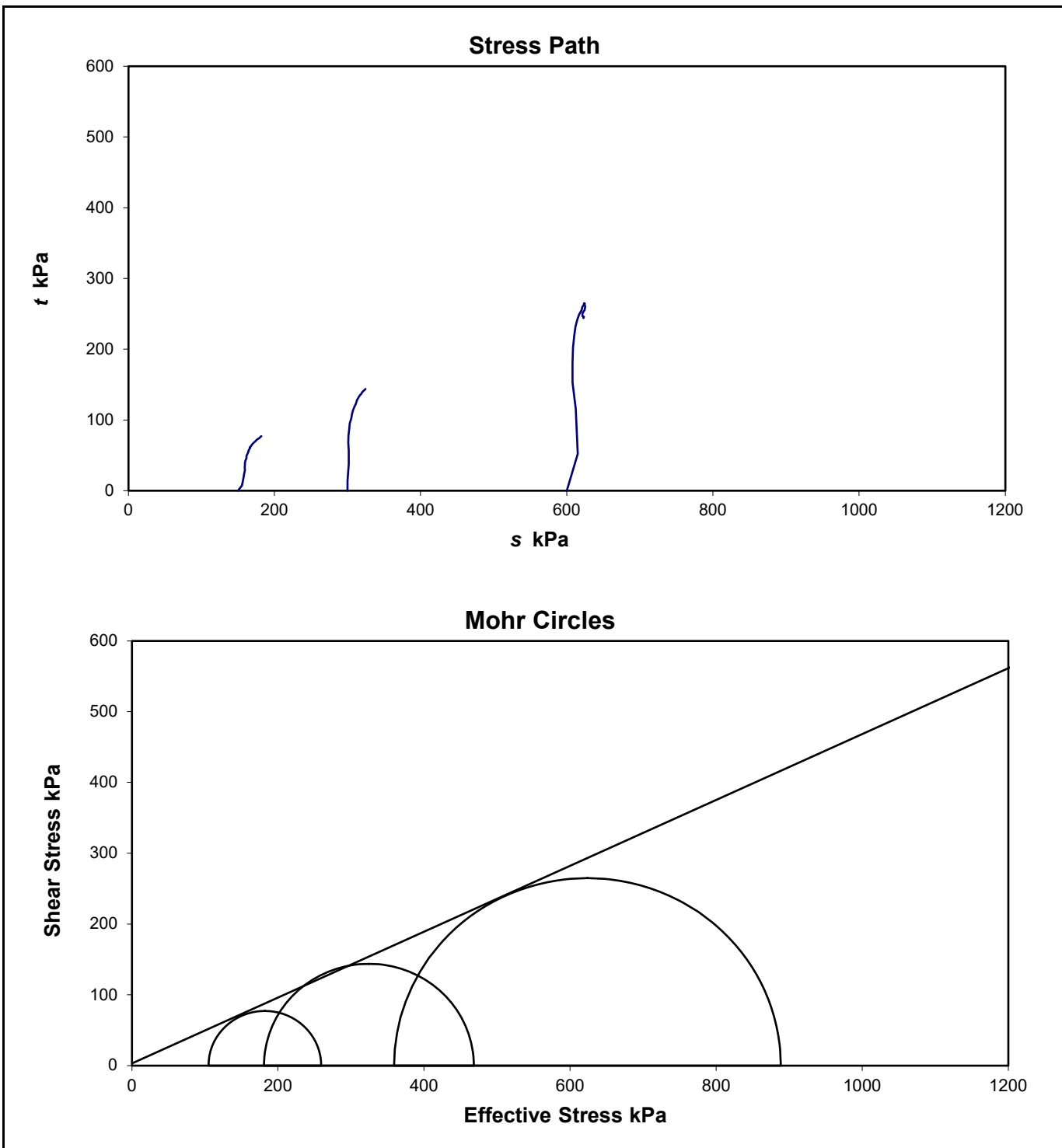
remarks	CONTRACT	CHECKED
	<b>35205</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC207
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-SAMPLE No./TYPE		31CS
	PHASE 2A (1077)	SAMPLE DEPTH (m)	15.45-15.85
		SPECIMEN DEPTH (m)	15.55-15.76



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remarks	CONTRACT	CHECKED
	<b>35205</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC207
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-SAMPLE No./TYPE		31CS
	PHASE 2A (1077)	SAMPLE DEPTH (m)	15.45-15.85
		SPECIMEN DEPTH (m)	15.55-15.76



Failure Mode SHEAR

remarks

Please note the photo is intended to show the mode of failure only.

CONTRACT	CHECKED
<b>35205</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION-SAMPLE No./TYPE

PHASE 2A (1077)

BH/TP No.

SAMPLE DEPTH (m)

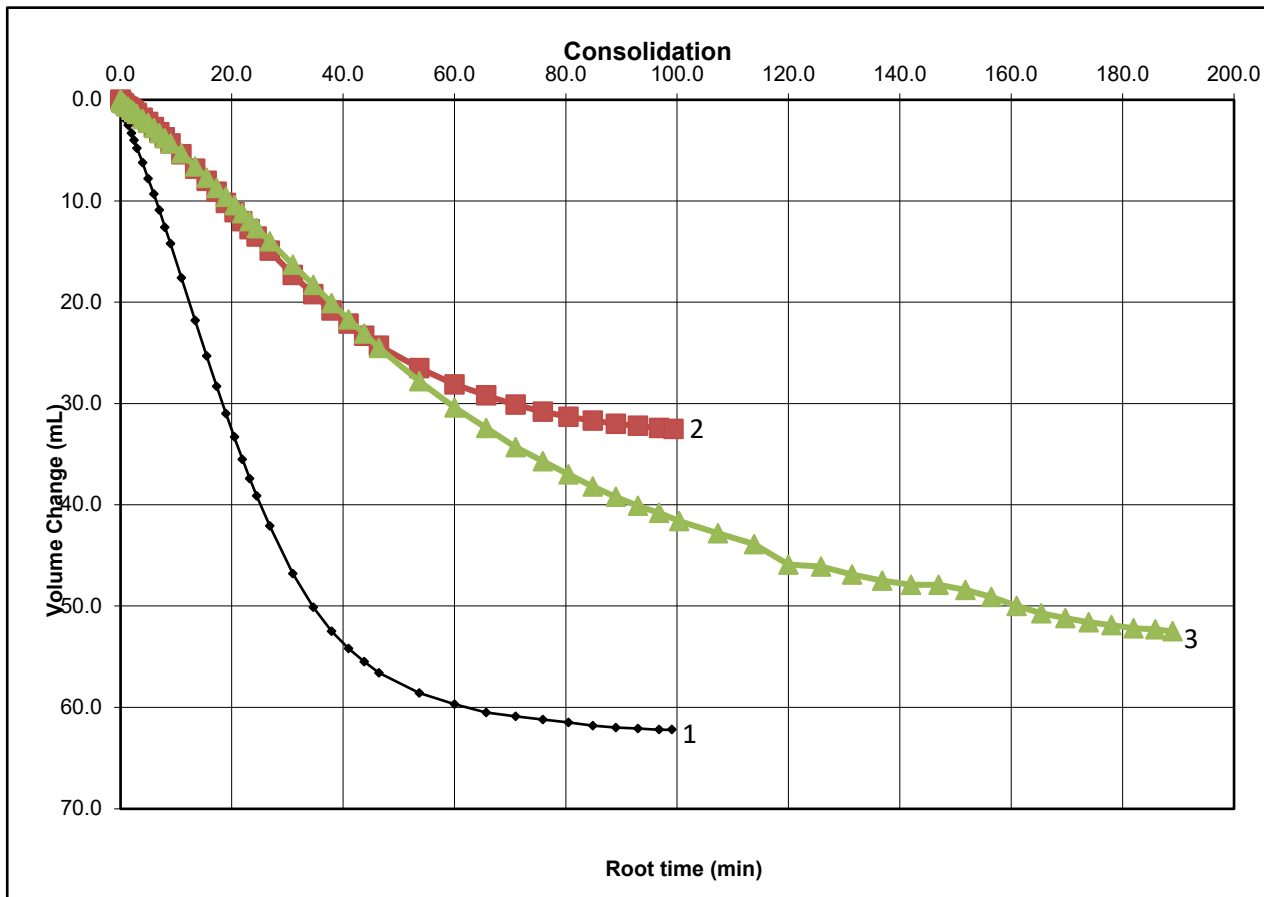
SPECIMEN DEPTH (m)

DSRC207

31CS

15.45-15.85

15.55-15.76



Stage 1      Stage 2      Stage 3

Cell pressure	kPa	490	640	940
Back pressure	kPa	340	340	340
Effective pressure	kPa	150	300	600
Initial PWP	kPa	477	529	731
Final PWP	kPa	346	346	359
PWP Dissipation	%	95.62	96.83	95.14
Volume change	mL	62.2	32.5	48.4
t100		1380.89	3108.22	9526.59

remarks

CONTRACT

**35205**

CHECKED

**NP**

# UNIAXIAL COMPRESSIVE STRENGTH OF ROCK

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

borehole /trial pit no.	sample		specimen depth (m)	diameter D (mm)	height H (mm)	H/D	moisture content (%)	bulk density (Mg/m3)	loading rate (kN/min)	time to failure (min:sec)	UCS (MPa)	description, codes and remarks
	no./type	depth (m)										
CP230	30Cs	18.70	18.74	116.0	251.4	2.17	17.5	2.13	1	04:23	0.42	Grey mottled greenish brown MUDSTONE, N, Sh. H/D ratio falls outside of ISRM specification Grey SILTSTONE, N, AxCa
CP230	44Cs	30.80	30.84	116.2	291.3	2.51	9.9	2.27	10	05:03	4.78	
DSRC108	39Cs	15.50	15.50	100.9	273.8	2.71	12.7	2.25	2	05:56	1.49	
DSRC207	58Cs	36.45	36.54	99.1	261.3	2.64	12.6	2.21	5	05:02	3.27	

general remarks

sample obtained from vertically drilled core (unless specified), test machine - VJT6000

coding:	moisture condition	sample storage	failure mode
	N - natural moisture content	U - not wrapped	Ax - axial cleavage
	F - fully saturated	F - wrapped in cling film/foil	Ca - cataclasis
	S - soaked	W - waxed	Sh - shear
	P - air/partially dried	G - contained in sealed Geoline	Ex - explosive
			Ot - other

CONTRACT	CHECKED
<b>35205</b>	<b>TB</b>

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
CP209	17.00	D	Y	N		50	110	0.44	110.00	0.04	1.43	0.05	Greyish brown MUDSTONE
CP209	31.85	D	Y	N		60	115	1.79	115.00	0.14	1.45	0.20	Light grey SILTSTONE
CP216	16.70	D	Y	N		35	100	0.17	100.00	0.02	1.37	0.02	Grey SILTSTONE
CP223	19.05	D	Y	N		50	100	0.28	100.00	0.03	1.37	0.04	Greyish brown SILTSTONE
CP223	21.75	D	Y	N		45	100	0.03	100.00	0.00	1.37	0.00	Brownish grey SILTSTONE
CP223	24.00	D	Y	N		40	100	0.29	100.00	0.03	1.37	0.04	Grey MUDSTONE
CP230	10.25	I	X	N		80	100	8.67	71.36	1.70	1.17	2.00	Light grey SANDSTONE
CP230	18.70	A	X	N		115	35	0.27	71.59	0.05	1.18	0.06	Grey mottled greenish brown MUDSTONE
CP230	18.90	A	X	N		115	50	0.61	85.56	0.08	1.27	0.11	Grey mottled greenish brown MUDSTONE
CP230	18.99	A	X	N		115	10	0.14	38.27	0.10	0.89	0.08	Grey mottled greenish brown MUDSTONE
CP230	23.40	D	Y	N		50	115	0.42	115.00	0.03	1.45	0.05	Grey SILTSTONE
CP230	29.50	D	Y	N		70	115	0.48	115.00	0.04	1.45	0.05	Light grey MUDSTONE
DSRC108	16.25	A	X	P		105	80	16.39	103.42	1.53	1.39	2.13	Grey LIMESTONE
DSRC108	16.25	D	Y	P		80	105	4.17	105.00	0.38	1.40	0.53	Grey LIMESTONE
DSRC108	18.80	A	X	N		105	65	0.82	93.22	0.09	1.32	0.12	Grey MUDSTONE
DSRC108	18.80	D	Y	N		50	105	0.72	105.00	0.07	1.40	0.09	Grey MUDSTONE
DSRC108	18.89	A	X	N		105	40	0.86	73.13	0.16	1.19	0.19	Grey MUDSTONE
DSRC108	18.89	D	Y	N		45	105	1.02	105.00	0.09	1.40	0.13	Grey MUDSTONE
DSRC108	18.98	A	X	N		105	60	0.92	89.56	0.11	1.30	0.15	Grey MUDSTONE
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02													
test type		test orientation relative to discontinuities				moisture condition				CONTRACT	CHECKED		
A - axial		X - perpendicular		U - unknown		N - natural moisture content				<b>35205</b>	<b>TB</b>		
D - diametral		Y - parallel		P - partially air dried									
I - irregular lump		Z - oblique		S - soaked									

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
DSRC108	18.98	D	Y	N		65	105	1.09	105.00	0.10	1.40	0.14	Grey MUDSTONE
DSRC108	19.07	A	X	N	105		60	0.75	89.56	0.09	1.30	0.12	Grey MUDSTONE
DSRC108	19.07	D	Y	N		60	105	0.98	105.00	0.09	1.40	0.12	Grey MUDSTONE
DSRC108	19.16	A	X	N	105		50	0.69	81.76	0.10	1.25	0.13	Grey MUDSTONE
DSRC108	19.16	D	Y	N		40	105	0.74	105.00	0.07	1.40	0.09	Grey MUDSTONE
DSRC108	22.65	D	Y	N		50	100	0.98	100.00	0.10	1.37	0.13	Dark grey MUDSTONE
DSRC108	38.50	A	X	N	100		90	2.79	107.05	0.24	1.41	0.34	Grey MUDSTONE
DSRC108	38.50	D	Y	N		90	100	0.67	100.00	0.07	1.37	0.09	Grey MUDSTONE
DSRC207	36.45	A	X	N	100		35	0.43	66.76	0.10	1.14	0.11	Grey SILTSTONE
DSRC207	36.49	A	X	N	100		50	0.81	79.79	0.13	1.23	0.16	Grey SILTSTONE
DSRC207	36.49	D	Y	N		30	100	0.76	100.00	0.08	1.37	0.10	Grey SILTSTONE
DSRC207	36.74	A	X	N	100		40	0.75	71.36	0.15	1.17	0.17	Grey SILTSTONE
DSRC207	36.74	D	Y	N		40	100	0.53	100.00	0.05	1.37	0.07	Grey SILTSTONE
DSRC207	36.78	A	X	N	100		20	0.72	50.46	0.28	1.00	0.28	Grey SILTSTONE
DSRC207	36.82	A	X	N	100		45	0.83	75.69	0.14	1.21	0.17	Grey SILTSTONE
DSRC207	36.82	D	Y	N		40	100	0.40	100.00	0.04	1.37	0.05	Grey SILTSTONE
DSRC207	36.86	A	X	N	100		40	0.67	71.36	0.13	1.17	0.15	Grey SILTSTONE
DSRC224	22.25	D	Y	N		30	100	0.58	100.00	0.06	1.37	0.08	Grey MUDSTONE
DSRC224	27.10	A	X	N	105		70	1.03	96.74	0.11	1.35	0.15	Grey MUDSTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular      U - unknown	N - natural moisture content	<b>35205</b>	<b>WJ</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		



# POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (1077)

borehole /trial pit no.	sample depth (m)	test type	test orientation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
DSRC224	31.55	A	X	N	105		80	0.69	103.42	0.06	1.39	0.09	Grey MUDSTONE
DSRC224	36.60	D	Y	N		50	105	0.63	105.00	0.06	1.40	0.08	Grey MUDSTONE

general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35205</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		



## Final Report

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**Report No.:** 19-33242-1

**Initial Date of Issue:** 10-Oct-2019

**Client:** Geotechnical Engineering Ltd

**Client Address:** Centurion House  
Olympus Park  
Quedgeley  
Gloucester  
Gloucestershire  
GL2 4NF

**Contact(s):** GEL  
Wendy Jones

**Project:** 35205/B H5551505 A417 Missing Link  
Ground Investigation

**Quotation No.:** **Date Received:** 04-Oct-2019

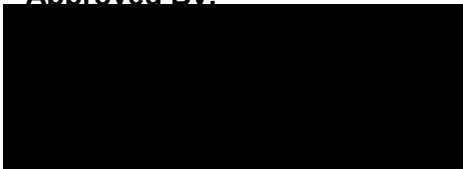
**Order No.:** 35205/WJ **Date Instructed:** 04-Oct-2019

**No. of Samples:** 16

**Turnaround (Wkdays):** 5 **Results Due:** 10-Oct-2019

**Date Approved:** 10-Oct-2019

**Approved By:**



**Details:** Ken Scally, Technical Director

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**Project: 35205/B H5551505 A417 Missing Link Ground Investigation**

<b>Client: Geotechnical Engineering Ltd</b>		<b>Chemtest Job No.:</b>											
Quotation No.:	<b>Chemtest Sample ID.:</b>	19-33242	19-33242	19-33242	19-33242	19-33242	19-33242	19-33242	19-33242	19-33242	19-33242	19-33242	
	Client Sample ID.:	900006	900007	900008	900009	900010	900011	900012	900013	900014			
	Sample Location:	7D	23D	2B	7D	17D	35D	16D	4D	8L			
	Sample Type:	CP105	CP105	CP106	CP106	CP106	CP106	CP216	DSRC107	DSRC107			
	Top Depth (m):	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
	Bottom Depth (m):	1.20	5.80	0.50	2.00	4.80	10.50	6.20	0.60	1.20			
	Date Sampled (\$):	1.73	5.90	0.70	2.45	5.00	10.95	6.65	0.90	2.20			
		02-Oct-2019	02-Oct-2019	02-Oct-2019	02-Oct-2019	02-Oct-2019	02-Oct-2019	02-Oct-2019	02-Oct-2019	02-Oct-2019	03-Oct-2019		
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>									
Moisture	N	2030	%	0.020	18	16	7.8	21	21	15	16	13	2.3
pH (2.5:1)	N	2010		N/A	7.8	8.2	8.9	8.1	6.3	7.7	8.2	8.3	8.6
Magnesium (Water Soluble)	N	2120	g/l	0.010	< 0.010	< 0.010	0.016	< 0.010	0.035	0.063	< 0.010		
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	< 0.010	0.19	0.10	1.4	1.4	0.016	0.010	< 0.010
Total Sulphur	U	2175	%	0.010	0.057	0.022	0.27	0.091	1.4	0.79	0.059	0.083	0.029
Chloride (Water Soluble)	U	2220	g/l	0.010	< 0.010	< 0.010	< 0.010	0.017	< 0.010	0.011	< 0.010		
Nitrate (Water Soluble)	N	2220	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010		
Sulphate (Acid Soluble)	U	2430	%	0.010	0.073	< 0.010	0.079	0.079	0.57	0.43	0.090	0.060	0.034
Organic Matter	U	2625	%	0.40									

**Project: 35205/B H5551505 A417 Missing Link Ground Investigation**

<b>Client: Geotechnical Engineering Ltd</b>		<b>Chemtest Job No.:</b>		19-33242	19-33242	19-33242	19-33242	19-33242	19-33242	19-33242	
Quotation No.:		<b>Chemtest Sample ID.:</b>		900015	900016	900017	900018	900019	900020	900021	
		Client Sample ID.:		33D	17C	2D	3D	8D	12BLK	4D	
		Sample Location:		DSRC107	DSRC207	TP204	TP205	TP205	TP207	TP601	
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	
		Top Depth (m):		11.00	5.20	0.30	0.50	2.40	3.90	1.50	
		Bottom Depth (m):		11.10	6.00	0.40	0.70	2.50	4.10	1.60	
		Date Sampled (\$):		02-Oct-2019	03-Oct-2019	02-Oct-2019	02-Oct-2019	02-Oct-2019	02-Oct-2019	02-Oct-2019	
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>							
Moisture	N	2030	%	0.020	11	0.21	20	18	26	16	15
pH (2.5:1)	N	2010		N/A	8.1	9.2	7.9	7.4	8.2	7.8	7.1
Magnesium (Water Soluble)	N	2120	g/l	0.010		< 0.010	< 0.010	< 0.010	< 0.010	0.013	< 0.010
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.39	< 0.010	< 0.010	< 0.010	< 0.010	0.56	0.035
Total Sulphur	U	2175	%	0.010	0.29	0.018	0.052	0.039	0.055	3.9	0.062
Chloride (Water Soluble)	U	2220	g/l	0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Nitrate (Water Soluble)	N	2220	g/l	0.010		< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Sulphate (Acid Soluble)	U	2430	%	0.010	0.12	0.026	0.067	0.060	0.087	0.19	0.066
Organic Matter	U	2625	%	0.40							1.9

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measurement by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.

## **Report Information**

### **Key**

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- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"
- § This information has been supplied by the client and can affect the integrity of test data.

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

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- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:  
[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



## Final Report

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**Report No.:** 19-33765-1

**Initial Date of Issue:** 16-Oct-2019

**Client:** Geotechnical Engineering Ltd

**Client Address:** Centurion House  
Olympus Park  
Quedgeley  
Gloucester  
Gloucestershire  
GL2 4NF

**Contact(s):** GEL  
Wendy Jones

**Project:** 35205/B H5551505 A417 Missing Link  
Ground Investigation

**Quotation No.:** **Date Received:** 09-Oct-2019

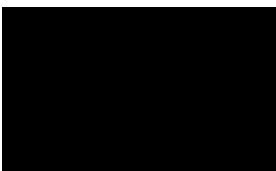
**Order No.:** 35205/WJ **Date Instructed:** 09-Oct-2019

**No. of Samples:** 1

**Turnaround (Wkdays):** 5 **Results Due:** 15-Oct-2019

**Date Approved:** 16-Oct-2019

**Approved By:**



Amy Parekh-Pross, Technical Projects  
Manager

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**Project: 35205/B H5551505 A417 Missing Link Ground Investigation**

<b>Client: Geotechnical Engineering Ltd</b>	<b>Chemtest Job No.:</b> 19-33765				
Quotation No.:	<b>Chemtest Sample ID.:</b> 902689				
	Client Sample ID.: 25Cs				
	Sample Location: DSRC207				
	Sample Type: SOIL				
	Top Depth (m): 12.00				
	Bottom Depth (m): 12.40				
	Date Sampled (\$): 07-Oct-2019				
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>	
Moisture	N	2030	%	0.020	15
pH (2.5:1)	N	2010		N/A	8.6
Magnesium (Water Soluble)	N	2120	g/l	0.010	< 0.010
Sulphate (2:1 Water Soluble) as SO <sub>4</sub>	U	2120	g/l	0.010	0.14
Total Sulphur	U	2175	%	0.010	0.38
Chloride (Water Soluble)	U	2220	g/l	0.010	0.032
Nitrate (Water Soluble)	N	2220	g/l	0.010	< 0.010
Sulphate (Acid Soluble)	U	2430	%	0.010	0.045



SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measurement by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
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---

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2718



GEOTECHNICAL ENGINEERING LIMITED

For the attention of Edward Crimp/ David Owen

Version No. 3

Page No. 1 of 41

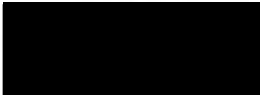
Date of Issue 09/04/2020

**TEST REPORT**

PROJECT/SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)	Samples received	02/08/2019
GEL REPORT NUMBER	35371/01	Schedule received	02/08/2019
Test report refers to	All Schedules	Testing commenced	02/08/2019
		Status	Final

**SUMMARY OF RESULTS ATTACHED**

TEST METHOD & DESCRIPTION	QUANTITY	ACCREDITED TEST
BS EN ISO 17892-1: 2014:5. Water Content	48	YES
BS EN ISO 17892-1: 2014:5. Water Content (Subcontracted)	2	YES
BS1377: Part 2: 1990:4.2-4.4&5.2-5.4, Liquid & Plastic Limits	48	YES
BS EN ISO 17892-12:2018: Liquid & Plastic Limits (Subcontracted)	2	YES
BS EN ISO 17892-4: 2016: 5.2, Particle Size Distribution - Wet Sieve	6	YES
BS EN ISO 17892-4: 2016: 5.4, Particle Size Distribution - Pipette	6	YES
BS EN ISO 17892-5: 2017, Oedometer (Subcontracted)	1	YES
BS1377: Part 7: 1990:6, Residual Strength by Ring Shear	6	NO
BS1377: Part 7: 1990:8&9, Undrained Triaxial Compression	1	YES
BS EN ISO 17892-8:2018 Undrained Triaxial Compression (Subcontracted)	1	YES
BS1377: Part 8: 1990: Effective Stress Testing (Subcontracted)	2	YES
ISRM: Suggested Methods: 2007: Uniaxial Compressive Strength of Rock	8	YES
ISRM: 2007: Point Load Strength Test	30	YES

Remarks This report may not be partially reproduced without written permission from this laboratory.  The results reported relate to samples received in the laboratory	Approved Signatories: <b>T Best (Deputy Laboratory Manager)</b> E Crimp (Senior Engineer) J Hanson (Director) N Parry (Director) 
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Doc TR01 Rev No. 22 Revision date 02/01/20 DC:JH

**Geotechnical Engineering Ltd**

Centurion House  
Olympus Park, Quedgeley  
Gloucester GL2 4NF

[www.geoeng.co.uk](http://www.geoeng.co.uk)

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Registered number: 00700739  
VAT Number: 682 5857 89

Payments: Geotechnical Engineering Limited  
Sort code: 16-22-11 Bank account: 11125135

# LIQUID AND PLASTIC LIMITS

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
CP102	2B	0.70	0.70	28.3	BXE	7	60	23	37	Orangish brown slightly gravelly slightly sandy silty CLAY
CP102	6D	1.80	1.80	23.1	BXE	4	39	20	19	Orangish brown mottled grey slightly gravelly slightly sandy silty CLAY
CP102	9D	2.80	2.80	23.9	BXE	0	56	24	32	Light brown mottled orange and grey slightly sandy silty CLAY
CP102	12D	3.60	3.60	19.9	BXE	2	45	20	25	Orangish brown mottled grey slightly gravelly slightly sandy silty CLAY
CP102	13D	4.00	4.00	26.6	BXE	15	40	20	20	Orangish brown mottled grey slightly gravelly slightly sandy silty CLAY
CP102	15D	4.80	4.80	20.9	BXE	6	40	20	20	Brown mottled grey slightly gravelly slightly sandy silty CLAY
CP102	18D	5.80	5.80	26.4	BXE	0	60	25	35	Grey mottled brown slightly sandy silty CLAY
CP102	21D	6.80	6.80	19.4	BXE	12	49	22	27	Greyish brown slightly sandy slightly gravelly silty CLAY
CP102	24D	7.80	7.80	22.2	BXE	8	48	22	26	Light brown slightly gravelly slightly sandy silty CLAY
CP102	26D	9.10	9.10	21.5	BXE	4	50	25	25	Light brown mottled orange slightly gravelly slightly sandy silty CLAY
CP102	28D	9.80	9.80	21	BXE	1	50	26	24	Brown mottled orange slightly sandy silty CLAY
CP102	32D	11.80	11.80	19.9	BXE	0	53	26	27	Grey slightly sandy silty CLAY
CP102	34C	13.00	13.50	18	BXE	0	53	25	28	Grey slightly sandy silty CLAY
CP102	35C	14.50	15.00	15.8	BXE	0	54	25	29	Grey slightly sandy silty CLAY
CP102	36C	16.00	16.50	15.7	BXE	0	51	26	25	Grey slightly sandy silty CLAY
CP102	37C	17.50	18.00	13.8	BXE	2	54	27	27	Grey slightly gravelly slightly sandy silty CLAY
CP104	1B	0.50	0.50	23.7	BXE	3	43	20	23	Orangish brown slightly gravelly slightly sandy silty CLAY
CP104	18UT	7.00	7.00	28.6	BXE	1	58	25	33	Dark grey slightly sandy silty CLAY
CP104	23UT	9.00	9.00	23.5	BXE	2	49	22	27	Dark grey slightly sandy silty CLAY

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

specimen preparation	test method	CONTRACT	CHECKED
A - as received	X - cone penetrometer (test 4.3)	<b>35371/01</b>	<b>TB</b>
B - washed on 0.425mm sieve	Y - cone penetrometer (test 4.4)		
C - air dried	Z - casagrande apparatus (test 4.5)		
D - oven dried (60oC)			
E - oven dried (105oC)			
F - not known			

# LIQUID AND PLASTIC LIMITS

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
CP104	29UT	12.00	12.05	22.8	BXE	11	46	22	24	Dark grey slightly gravelly slightly sandy silty CLAY
CP200	2D	0.30	0.30	9.1	BYE	84	35	22	13	Brown sandy clayey GRAVEL with rare rootlets
CP200	5D	1.80	1.80	40.7	BXE	1	58	28	30	Grey and brown slightly sandy silty CLAY
CP200	8D	2.80	2.80	69.4	BXD	0	69	34	35	Grey and brown slightly sandy silty organic CLAY
CP200	11D	4.00	4.00	54.5	BXE	15	70	31	39	Brown mottled grey slightly gravelly slightly sandy silty organic CLAY
CP200	16D	5.80	5.80	40.2	BXE	1	58	24	34	Grey and brown slightly gravelly slightly sandy silty CLAY
CP200	19D	6.80	6.80	38.1	BYE	38	46	27	19	Brown mottled grey slightly sandy slightly gravelly SILT/CLAY
CP200	30D	10.20	10.20	14.1	BXE	48	43	21	22	Brown mottled grey slightly sandy slightly gravelly silty CLAY
CP200	34D	12.40	12.40	17.6	BXE	0	52	25	27	Grey slightly sandy silty CLAY
CP202	6D	1.00	1.00	32.2	BXE	1	59	23	36	Brown mottled orange and grey slightly gravelly slightly sandy silty CLAY
CP202	10D	2.00	2.00	33.4	BXE	0	60	24	36	Brown mottled grey slightly sandy silty CLAY
CP202	14L	3.00	3.50	22.4	BXE	1	42	24	18	Yellowish brown mottled orange slightly sandy silty CLAY
CP202	18D	4.70	4.70	23	BXE	7	45	25	20	Orangish brown mottled grey slightly gravelly slightly sandy silty CLAY
CP202	21D	5.80	5.80	20.6	BXE	13	51	25	26	Orangish brown and grey slightly gravelly slightly sandy silty CLAY
CP202	24Cs	6.90	7.20	26.5	BXE	25	51	25	26	Brown mottled orange and grey slightly gravelly slightly sandy silty CLAY
CP202	26C	8.00	9.00	17.4	BXE	21	49	25	24	Brown mottled grey slightly sandy slightly gravelly silty CLAY
CP204	3B	0.60	0.60	33.5	BXE	8	71	33	38	Orangish brown slightly gravelly slightly sandy silty CLAY
CP204	9D	1.80	1.80	26.3	BXE	11	58	25	33	Orangish brown mottled grey slightly gravelly slightly sandy silty CLAY
CP204	12D	2.80	2.80	21.8	BXE	9	52	25	27	Greyish brown slightly gravelly slightly sandy silty CLAY

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

specimen preparation	test method	CONTRACT	CHECKED
A - as received	X - cone penetrometer (test 4.3)	<b>35371/01</b>	<b>TB</b>
B - washed on 0.425mm sieve	Y - cone penetrometer (test 4.4)		
C - air dried	Z - casagrande apparatus (test 4.5)		
D - oven dried (60oC)			
E - oven dried (105oC)			
F - not known			

# LIQUID AND PLASTIC LIMITS

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
CP204	15D	3.80	3.80	27.6	BXE	2	56	22	34	Grey mottled orangish brown slightly gravelly slightly sandy silty CLAY
CP204	18D	4.80	4.80	28.2	BXE	1	58	23	35	Grey slightly sandy silty CLAY
CP204	21D	5.80	5.80	24	BXE	1	56	23	33	Grey slightly gravelly slightly sandy silty CLAY
CP204	24D	6.80	6.80	25.6	BXE	1	45	23	22	Greyish brown slightly sandy silty CLAY
CP204	27D	7.80	7.80	27.6	BXE	51	57	34	23	Brown slightly sandy slightly gravelly clayey SILT
CP204	29D	8.80	8.80	27.9	BXE	14	58	31	27	Brown slightly gravelly slightly sandy clayey SILT
CP204	31D	9.80	9.80	24.2	BXE	0	58	26	32	Brown mottled orange slightly sandy silty CLAY
CP204	32D	10.80	10.80	20.9	BXE	0	52	21	31	Greyish brown slightly sandy silty CLAY
CP204	37C	14.00	14.50	18.9	BXE	2	49	23	26	Brown mottled orange slightly gravelly slightly sandy silty CLAY
CP204	40D	15.80	15.80	17.3	BXE	1	51	23	28	Greyish brown mottled orange slightly sandy silty CLAY

general remarks  
 natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)  
 NP denotes non plastic  
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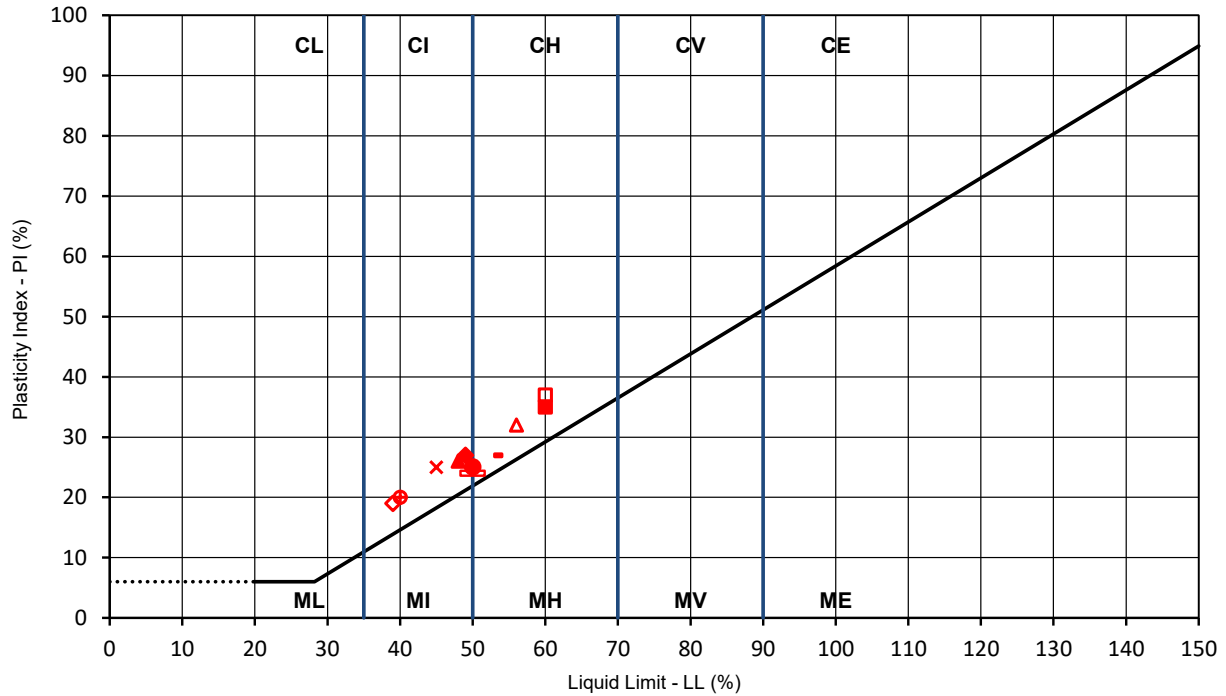
specimen preparation	test method	CONTRACT	CHECKED
A - as received	D - oven dried (60oC)	<b>35371/01</b>	<b>TB</b>
B - washed on 0.425mm sieve	E - oven dried (105oC)		
C - air dried	F - not known		
	X - cone penetrometer (test 4.3)		
	Y - cone penetrometer (test 4.4)		
	Z - casagrande apparatus (test 4.5)		

Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)



BH/TP No.	depth (m)	LL	PL	PI	remarks	
□	CP102	0.70	60	23	37	
◇	CP102	1.80	39	20	19	
△	CP102	2.80	56	24	32	
×	CP102	3.60	45	20	25	
+	CP102	4.00	40	20	20	
○	CP102	4.80	40	20	20	
■	CP102	5.80	60	25	35	
◆	CP102	6.80	49	22	27	
▲	CP102	7.80	48	22	26	
●	CP102	9.10	50	25	25	
▢	CP102	9.80	50	26	24	
▪	CP102	11.80	53	26	27	

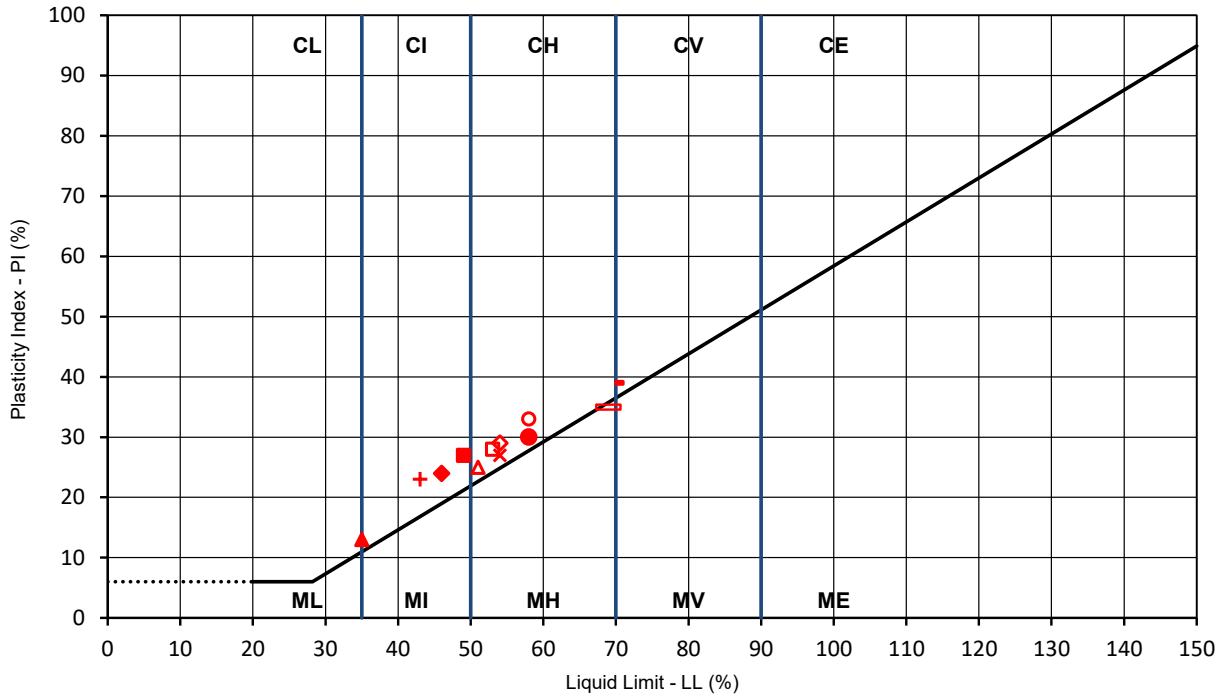
CONTRACT	CHECKED
<b>35371/01</b>	<b>TB</b>

Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)



BH/TP No.	depth (m)	LL	PL	PI	remarks	
□	CP102	13.50	53	25	28	
◇	CP102	15.00	54	25	29	
△	CP102	16.50	51	26	25	
×	CP102	18.00	54	27	27	
+	CP104	0.50	43	20	23	
○	CP104	7.00	58	25	33	
■	CP104	9.00	49	22	27	
◆	CP104	12.05	46	22	24	
▲	CP200	0.30	35	22	13	
●	CP200	1.80	58	28	30	
▣	CP200	2.80	69	34	35	
▪	CP200	4.00	70	31	39	

CONTRACT	CHECKED
<b>35371/01</b>	<b>TB</b>

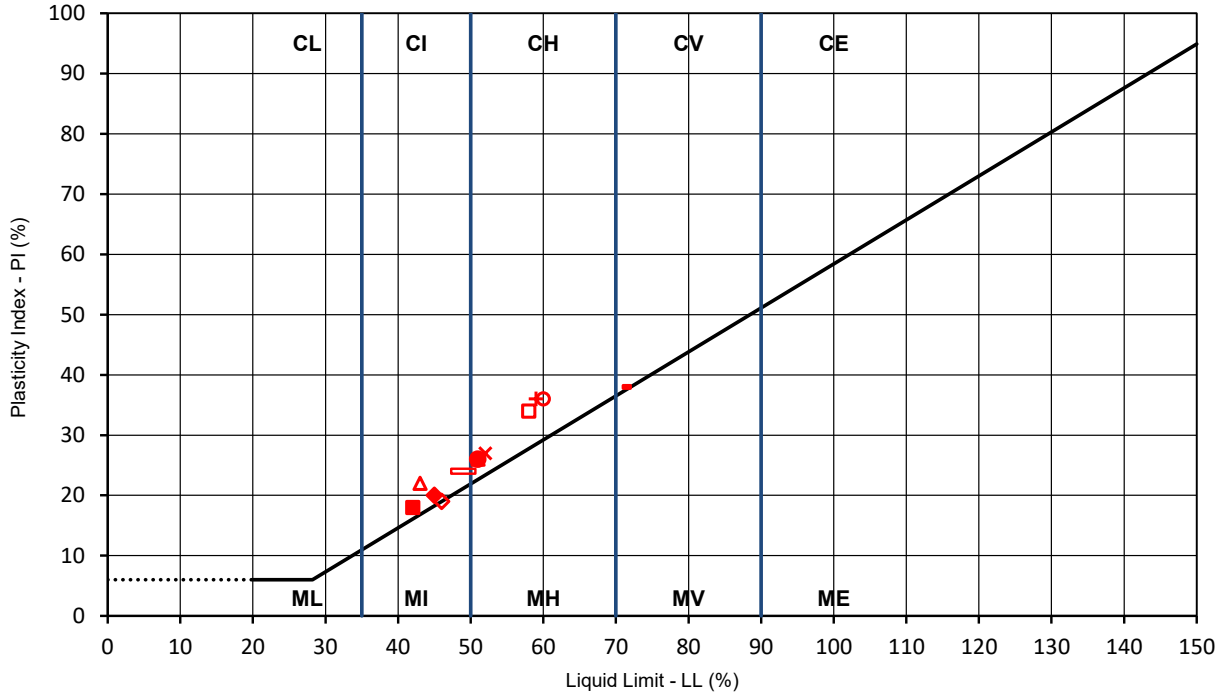


Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)



BH/TP No.	depth (m)	LL	PL	PI	remarks	
□	CP200	5.80	58	24	34	
◇	CP200	6.80	46	27	19	
△	CP200	10.20	43	21	22	
×	CP200	12.40	52	25	27	
+	CP202	1.00	59	23	36	
○	CP202	2.00	60	24	36	
■	CP202	3.50	42	24	18	
◆	CP202	4.70	45	25	20	
▲	CP202	5.80	51	25	26	
●	CP202	7.20	51	25	26	
▣	CP202	9.00	49	25	24	
▪	CP204	0.60	71	33	38	

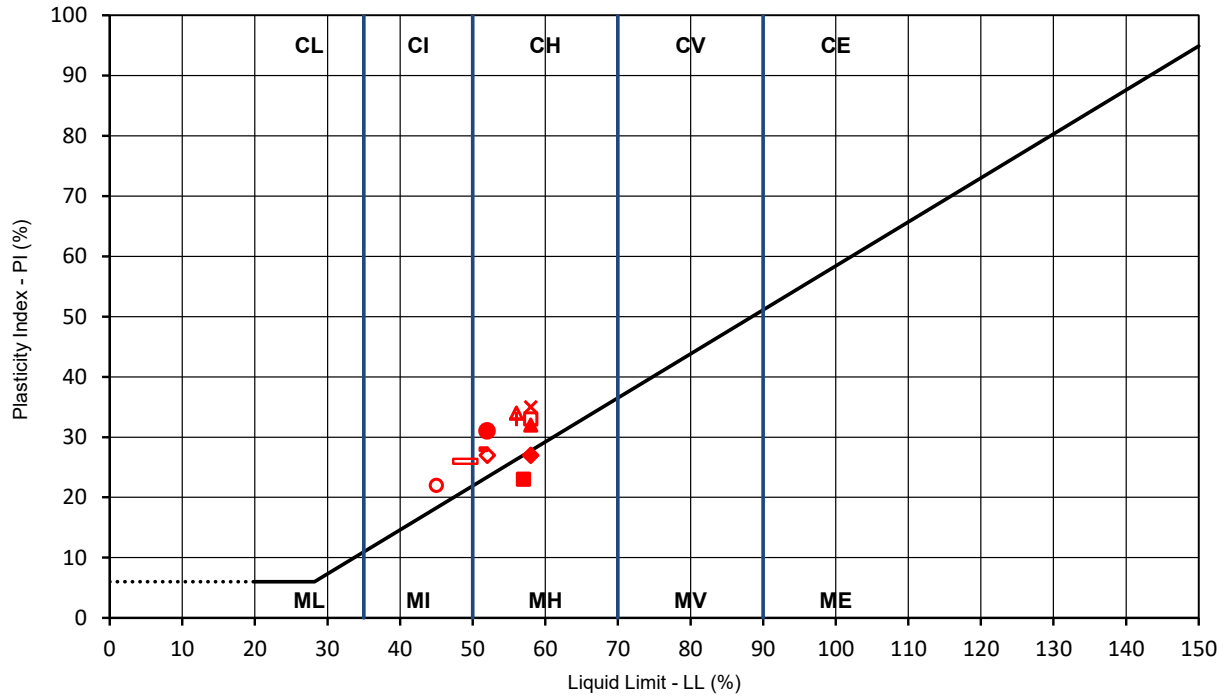
CONTRACT	CHECKED
<b>35371/01</b>	<b>TB</b>

Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)



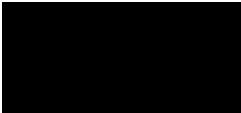

BH/TP No.	depth (m)	LL	PL	PI	remarks	
□	CP204	1.80	58	25	33	
◇	CP204	2.80	52	25	27	
△	CP204	3.80	56	22	34	
×	CP204	4.80	58	23	35	
+	CP204	5.80	56	23	33	
○	CP204	6.80	45	23	22	
■	CP204	7.80	57	34	23	
◆	CP204	8.80	58	31	27	
▲	CP204	9.80	58	26	32	
●	CP204	10.80	52	21	31	
▢	CP204	14.50	49	23	26	
▪	CP204	15.80	51	23	28	

CONTRACT	CHECKED
<b>35371/01</b>	<b>TB</b>

# SUMMARY OF GEOTECHNICAL TESTING

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression			Chemical Tests			Other tests and comments	
Location	Depth (m)	Sample Ref	Type	Description	WC (%)	LL (%)	PL (%)	PI (%)	<425 µm (%)	Bulk Mg/m³	Dry Mg/m³	Condition	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 (g/L)		W/S Mg (mg/L)
CP104	3.00-3.45	UT7	U	Firm greenish grey CLAY.	21.2	41	23	18	100										Effective Stress
TP201	1.90-2.10	BLK3	BLK	Soft grey mottled dark grey and brown silty CLAY with 2-3 mm pockets of organic matter.	61.1	72	33	39	100	1.54	0.96	Undisturbed	75	47	23				One Dimensional Consolidation Effective Stress

Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed)

Checked and Approved by  24/02/2020	Project Number: <p style="text-align: center;"><b>GEO / 30584</b></p> Project Name: <p style="text-align: center;"><b>A417 MISSING LINK 35371-01</b></p>	
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# SUMMARY OF LIQUID AND PLASTIC LIMIT TESTS

Location	Depth m	Sample Ref	Sample Type	Description	Water Content BS EN ISO 17892-1 : 2014 %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Percentage Passing 425µm %	Atterberg Classification	Test Type	Sample Condition
CP104	3.00-3.45	UT7	U	Firm greenish grey CLAY.	21.2	41	23	18	100	CI	2	1
TP201	1.90-2.10	BLK3	BLK	Soft grey mottled dark grey and brown silty CLAY with 2-3 mm pockets of organic matter.	61.1	72	33	39	100	CV	2	1

<p><b>Test Type:</b></p> <ul style="list-style-type: none"> <li>1 - 1 point 80g / 30° fall cone method.</li> <li>2 - 4 point 80g / 30° fall cone method.</li> <li>3 - Non plastic determination.</li> </ul>	<p><b>Sample condition:</b></p> <ul style="list-style-type: none"> <li>1 - As Received</li> <li>2 - Air Dried</li> <li>3 - Washed &amp; Air Dried</li> </ul>
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Checked and Approved by:

J Sturges - Operations Manager  
24/02/2020

Project Number: **GEO / 30584**

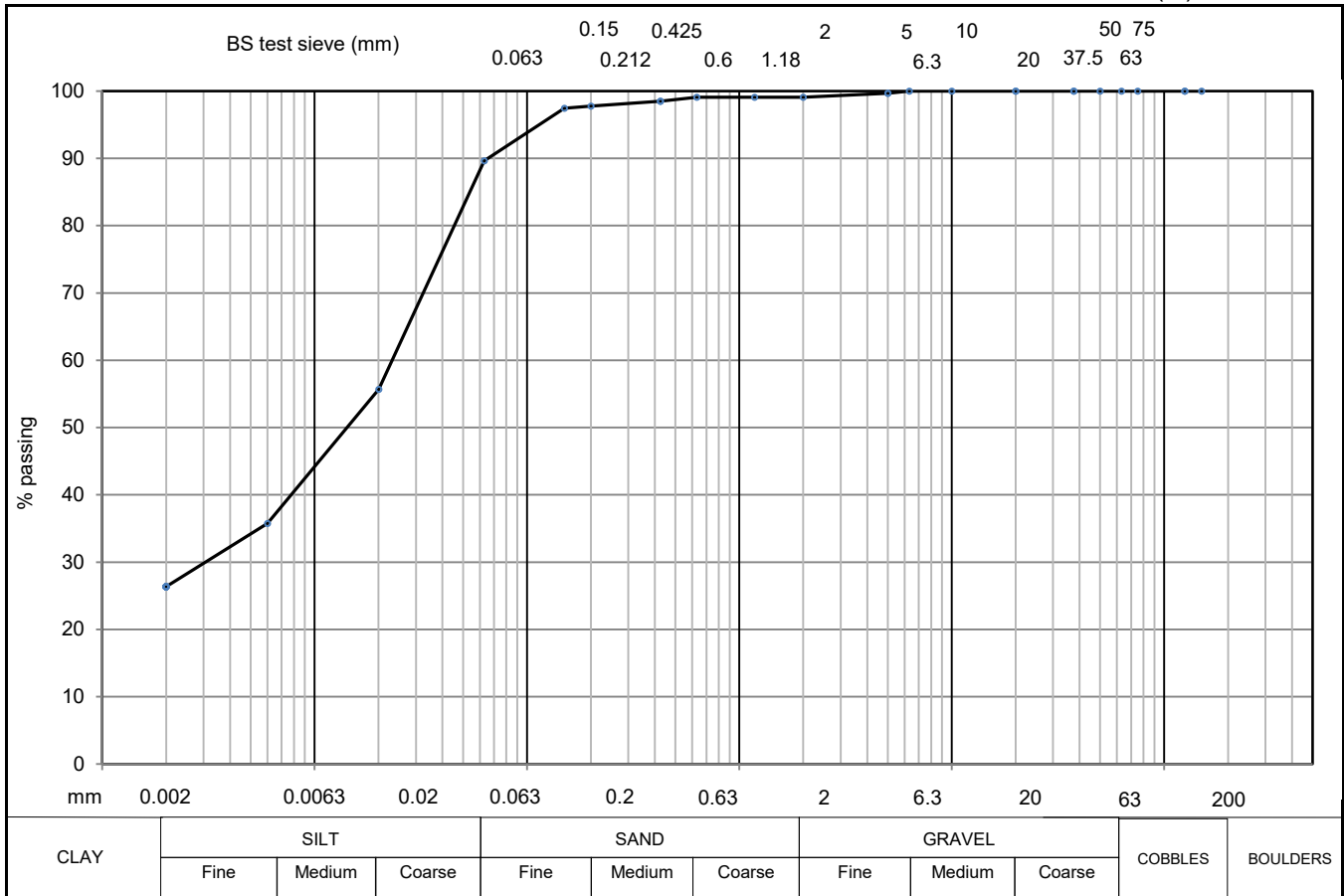
Project Name: **A417 MISSING LINK  
35371-01**



Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP104
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)	SAMPLE No./TYPE	5B
DESCRIPTION	Brown slightly gravelly slightly sandy clayey SILT	SAMPLE DEPTH (m)	2.00
		SPECIMEN TOP (m)	2.00
		SPECIMEN BASE (m)	2.30



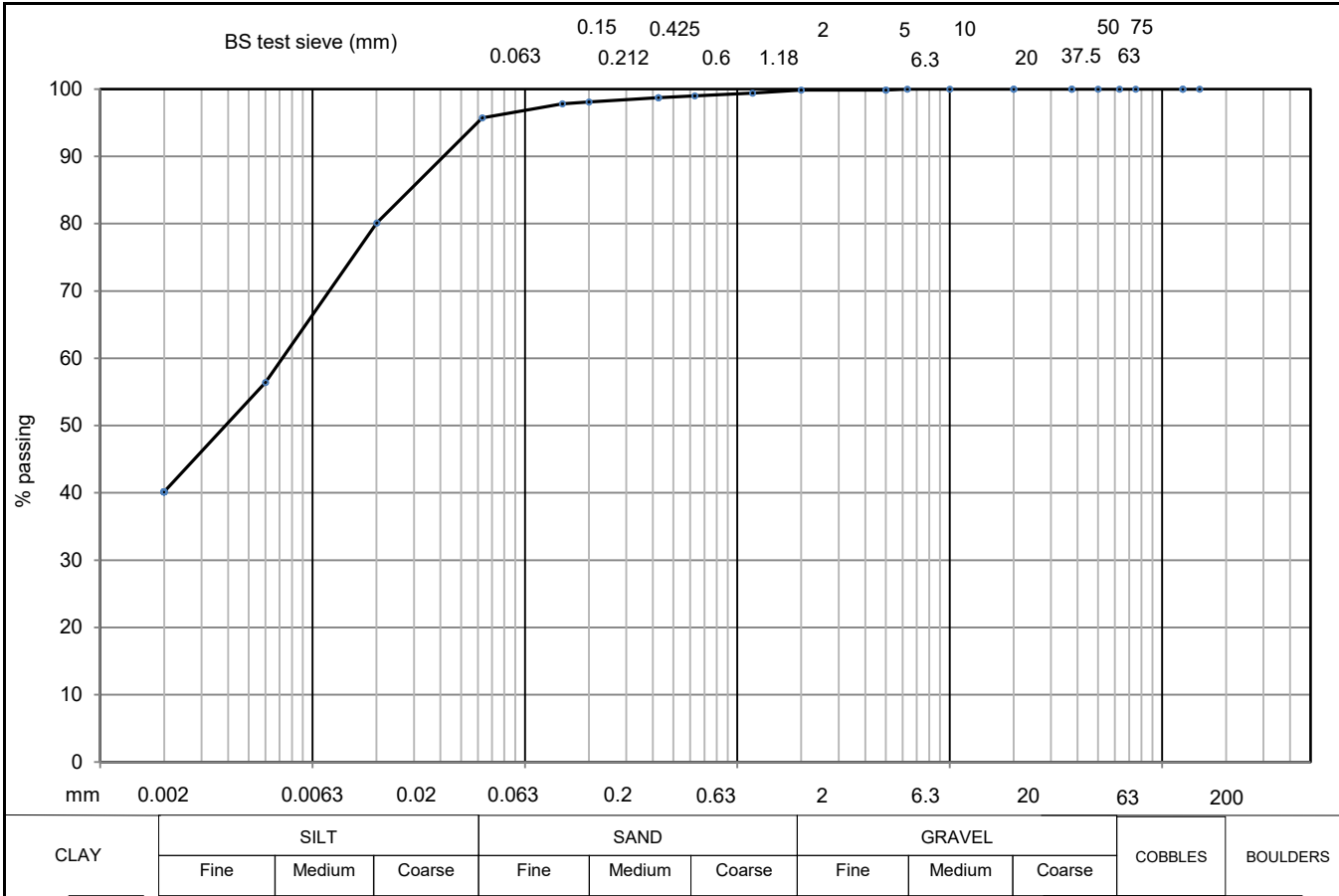
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	26						
SILT	63	150		5	100	20	56
SILT & CLAY	90						
SAND	9	75		2	99	6	36
GRAVEL	1						
COBBLE & BOULDER	0	63		1.18	99	2	26
test method(s)	5.2 & 5.4	50		0.63	99		
test method		37.5		0.425	98		
5.2 - sieving		20		0.2	98		
5.3 - sedimentation by hydrometer		10		0.15	97		
5.4 - sedimentation by pipette		6.3	100	0.063	90		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35371/01</b>	<b>CHECKED</b> <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP104
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)	SAMPLE No./TYPE	14B
DESCRIPTION	Dark grey slightly sandy silty CLAY	SAMPLE DEPTH (m)	5.50
		SPECIMEN TOP (m)	5.50
		SPECIMEN BASE (m)	6.00



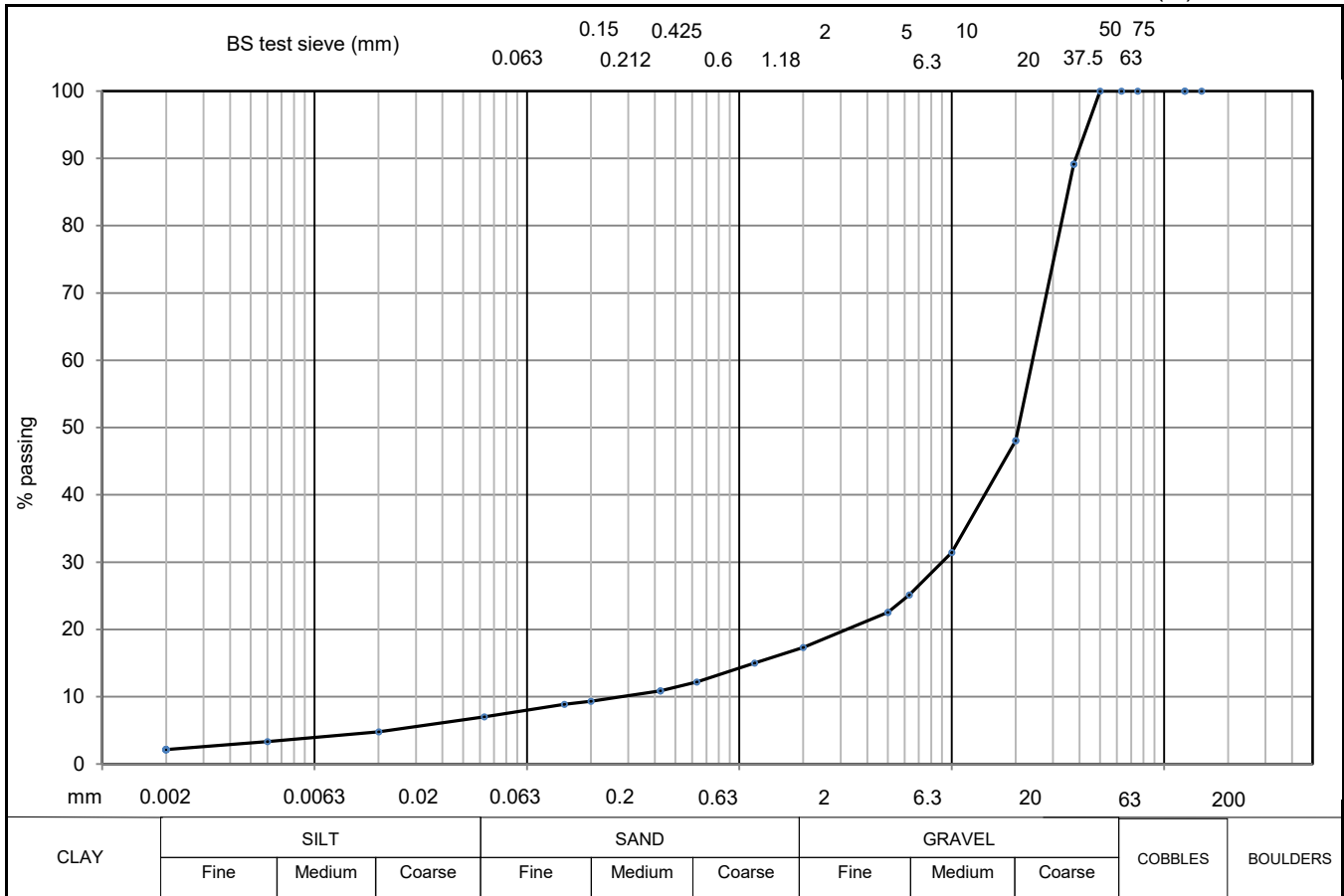
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	40						
SILT	56	150		5	100	20	80
SILT & CLAY	96						
SAND	4	75		2	100	6	56
GRAVEL	0						
COBBLE & BOULDER	0	63		1.18	99	2	40
test method(s)	5.2 & 5.4	50		0.63	99		
test method		37.5		0.425	99		
5.2 - sieving		20		0.2	98		
5.3 - sedimentation by hydrometer		10		0.15	98		
5.4 - sedimentation by pipette		6.3	100	0.063	96		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>CONTRACT</b> <b>35371/01</b>	<b>CHECKED</b> <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP200
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)	SAMPLE No./TYPE	21L
DESCRIPTION	Light brown silty sandy GRAVEL	SAMPLE DEPTH (m)	7.00
		SPECIMEN TOP (m)	7.00
		SPECIMEN BASE (m)	8.00



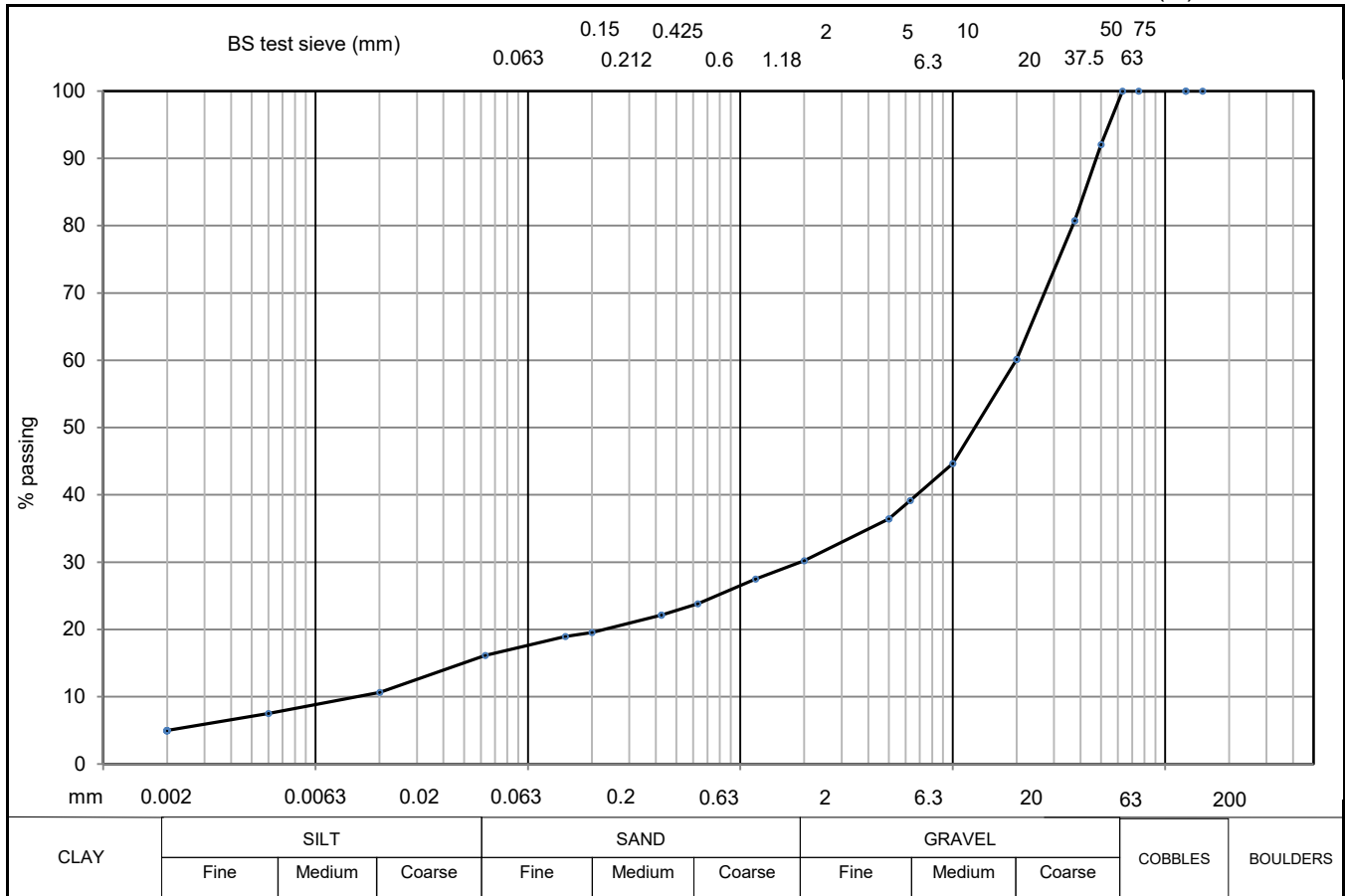
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	2						
SILT	5	150		5	23	20	5
SILT & CLAY	7						
SAND	10	75		2	17	6	3
GRAVEL	83						
COBBLE & BOULDER	0	63		1.18	15	2	2
test method(s)	5.2# & 5.4	50	100	0.63	12		
test method		37.5	89	0.425	11		
5.2 - sieving		20	48	0.2	9		
5.3 - sedimentation by hydrometer		10	31	0.15	9		
5.4 - sedimentation by pipette		6.3	25	0.063	7		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>35371/01</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP200
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)	SAMPLE No./TYPE	24L
DESCRIPTION	Brown sandy silty GRAVEL	SAMPLE DEPTH (m)	8.00
		SPECIMEN TOP (m)	8.00
		SPECIMEN BASE (m)	9.00



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	5			5	36	20	11
SILT	11	150		2	30	6	8
SILT & CLAY	16	75		1.18	27	2	5
SAND	14						
GRAVEL	70						
COBBLE & BOULDER	0						
test method(s)	5.2 & 5.4	63	100	1.18	27		
test method		50	92	0.63	24		
5.2 - sieving		37.5	81	0.425	22		
5.3 - sedimentation by hydrometer		20	60	0.2	20		
5.4 - sedimentation by pipette		10	45	0.15	19		
		6.3	39	0.063	16		

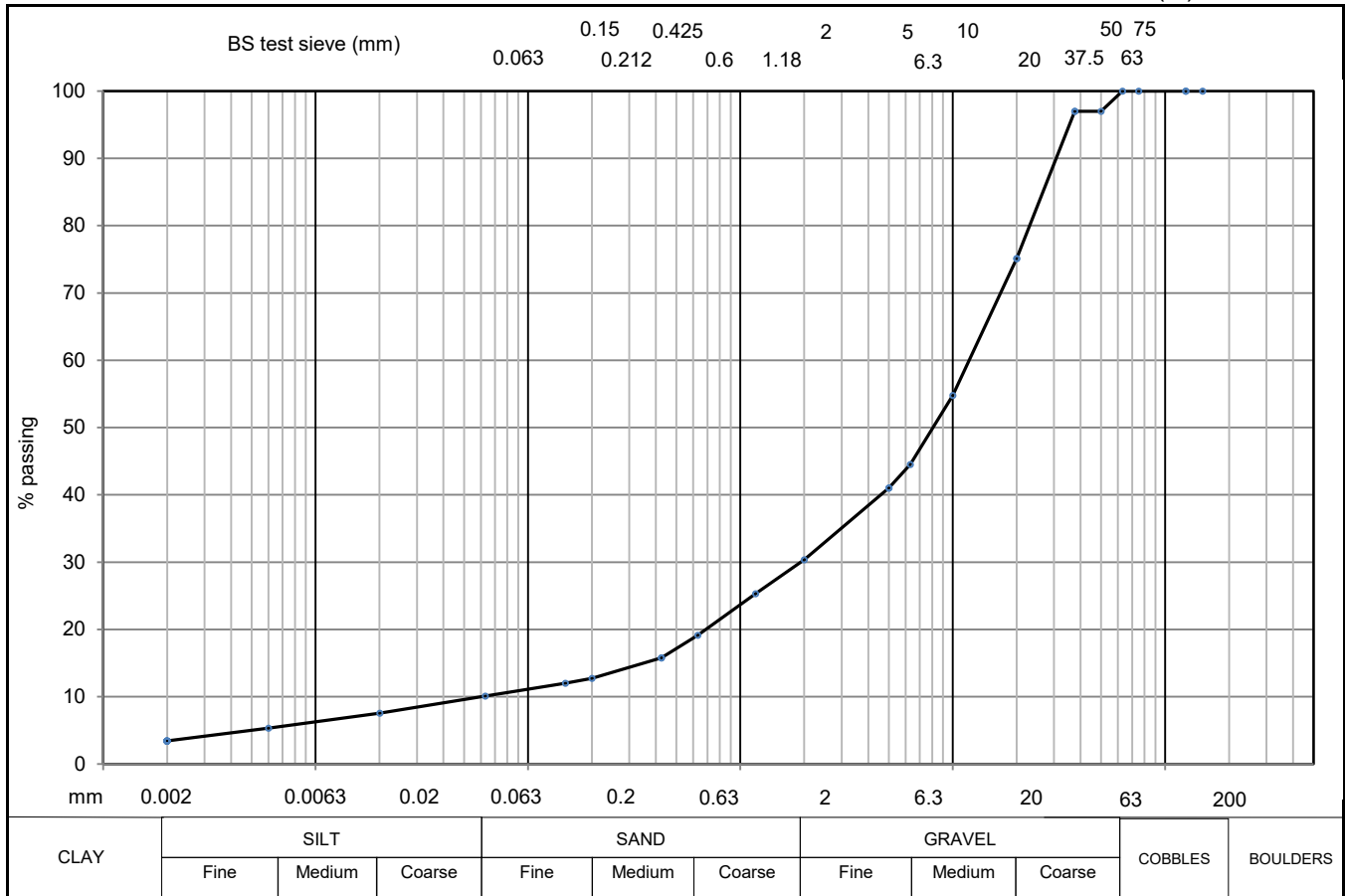
remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35371/01</b>	<b>TB</b>



Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP200
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)	SAMPLE No./TYPE	27L
DESCRIPTION	Yellowish brown clayey very sandy GRAVEL	SAMPLE DEPTH (m)	9.00
		SPECIMEN TOP (m)	9.00
		SPECIMEN BASE (m)	10.00



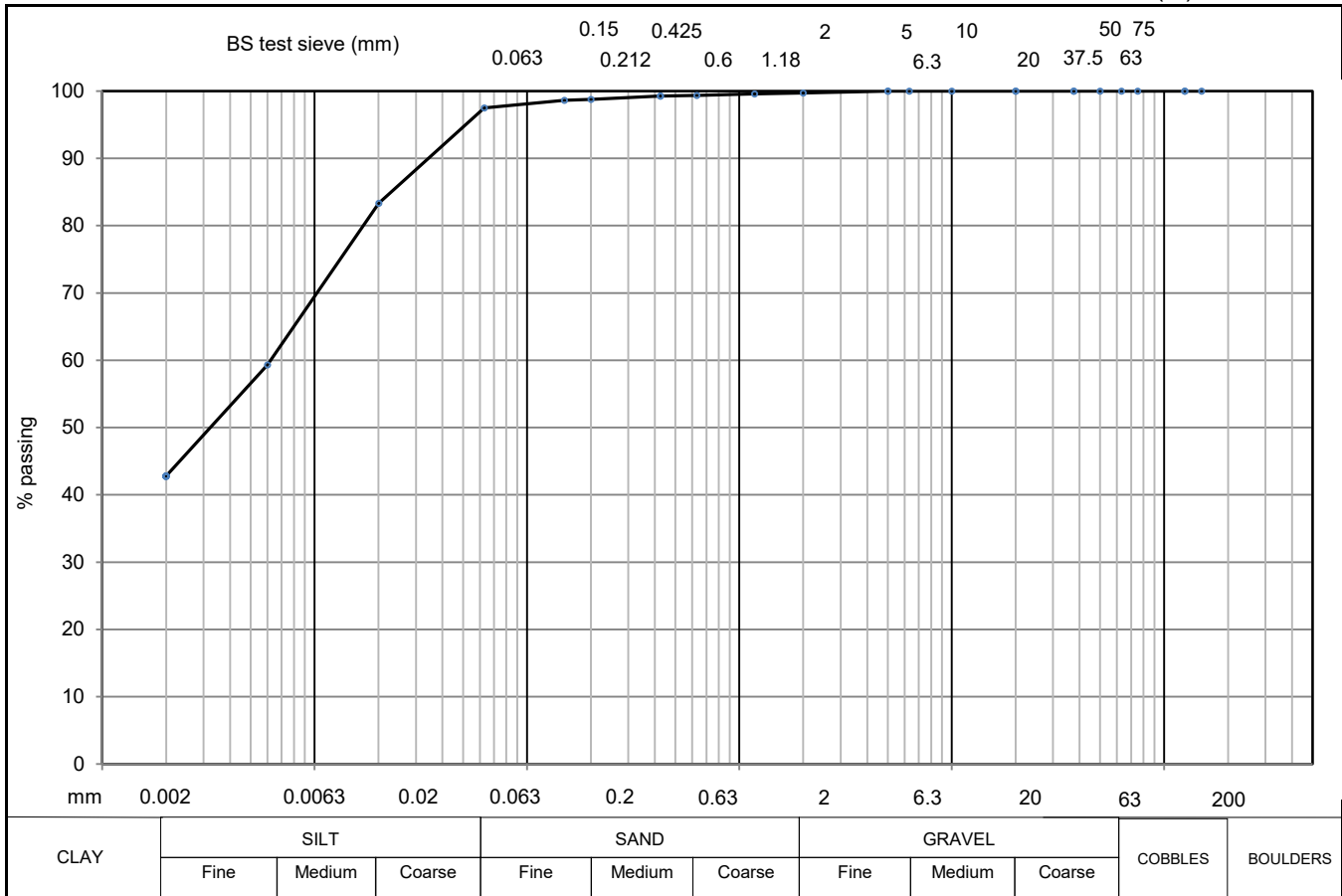
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	3						
SILT	7	150		5	41	20	8
SILT & CLAY	10						
SAND	20	75		2	30	6	5
GRAVEL	70						
COBBLE & BOULDER	0	63	100	1.18	25	2	3
test method(s)	5.2 & 5.4	50	97	0.63	19		
test method		37.5	97	0.425	16		
5.2 - sieving		20	75	0.2	13		
5.3 - sedimentation by hydrometer		10	55	0.15	12		
5.4 - sedimentation by pipette		6.3	45	0.063	10		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>35371/01</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP201
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)	SAMPLE No./TYPE	4B
DESCRIPTION	Blueish grey and brown slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	2.20
		SPECIMEN TOP (m)	2.20
		SPECIMEN BASE (m)	2.40

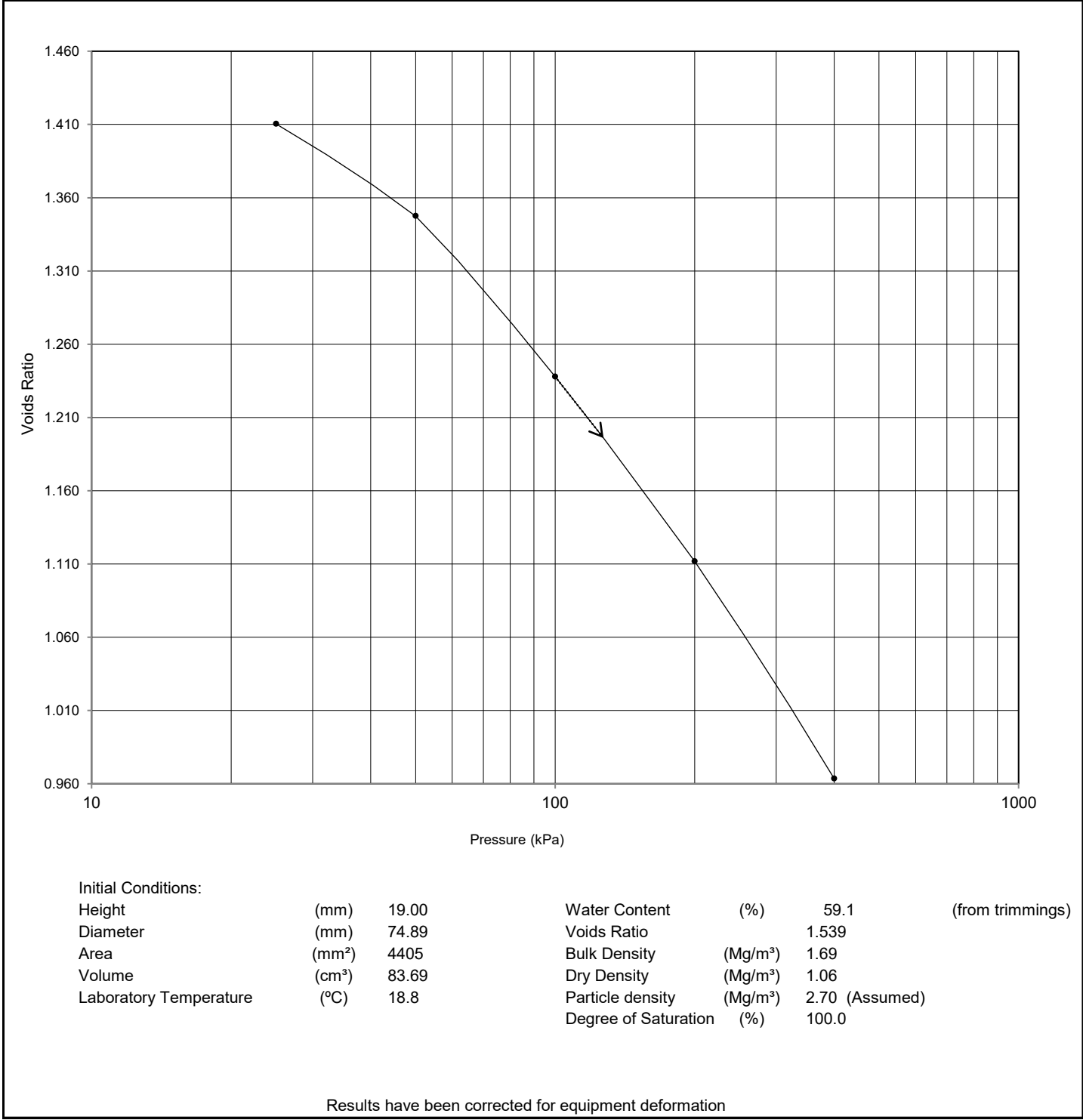


soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	43						
SILT	55	150		5	100	20	83
SILT & CLAY	97						
SAND	2	75		2	100	6	59
GRAVEL	0						
COBBLE & BOULDER	0	63		1.18	100	2	43
test method(s)	5.2 & 5.4	50		0.63	99		
test method		37.5		0.425	99		
5.2 - sieving		20		0.2	99		
5.3 - sedimentation by hydrometer		10		0.15	99		
5.4 - sedimentation by pipette		6.3		0.063	97		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35371/01</b>	<b>TB</b>

# INCREMENTAL LOADING OEDOMETER TEST

Location	TP201	Description:  Soft grey mottled dark grey and brown silty CLAY with 2-3 mm pockets of organic matter.
Sample Ref.	BLK3	
Depth (m)	1.90-2.10	
Sample Type	BLK	
Orientation within original	Vertical	
Specimen preparation	Undisturbed	



Checked and Approved by  
  
 J Sturges - Operations Manager  
 24/02/2020

Project Number:  
**GEO / 30584**

Project Name:  
**A417 MISSING LINK**  
**35371-01**



**INCREMENTAL LOADING OEDOMETER TEST**

Location TP201  
 Sample Ref. BLK3  
 Depth (m) 1.90-2.10  
 Sample Type BLK  
 Orientation within original Vertical  
 Specimen preparation Undisturbed

## Description:

Soft grey mottled dark grey and brown silty CLAY with 2-3 mm pockets of organic matter.

Pressure Range (kPa)	$m_v$ (m <sup>2</sup> /MN)	$c_v$ (m <sup>2</sup> /year)	Time Fitting		Voids Ratio
			Method	minutes	
0 - 25	2.0	2.1	t50	4.17	1.410
25 - 50	1.0	1.9	t50	4.23	1.348
50 - 100	0.93	1.3	t50	5.70	1.238
100 - 200	0.56	1.2	t50	5.55	1.112
200 - 400	0.35	1.3	t50	4.82	0.964

Checked and Approved by



J Sturges - Operations Manager  
24/02/2020

Project Number:

**GEO / 30584**

Project Name:

**A417 MISSING LINK**  
**35371-01**

**GEOLABS**®

# RESIDUAL STRENGTH BY RING SHEAR



BS.1377 : Part 7 : 1990 : 6

CLIENT OSBORNE

BH/TP No. CP102

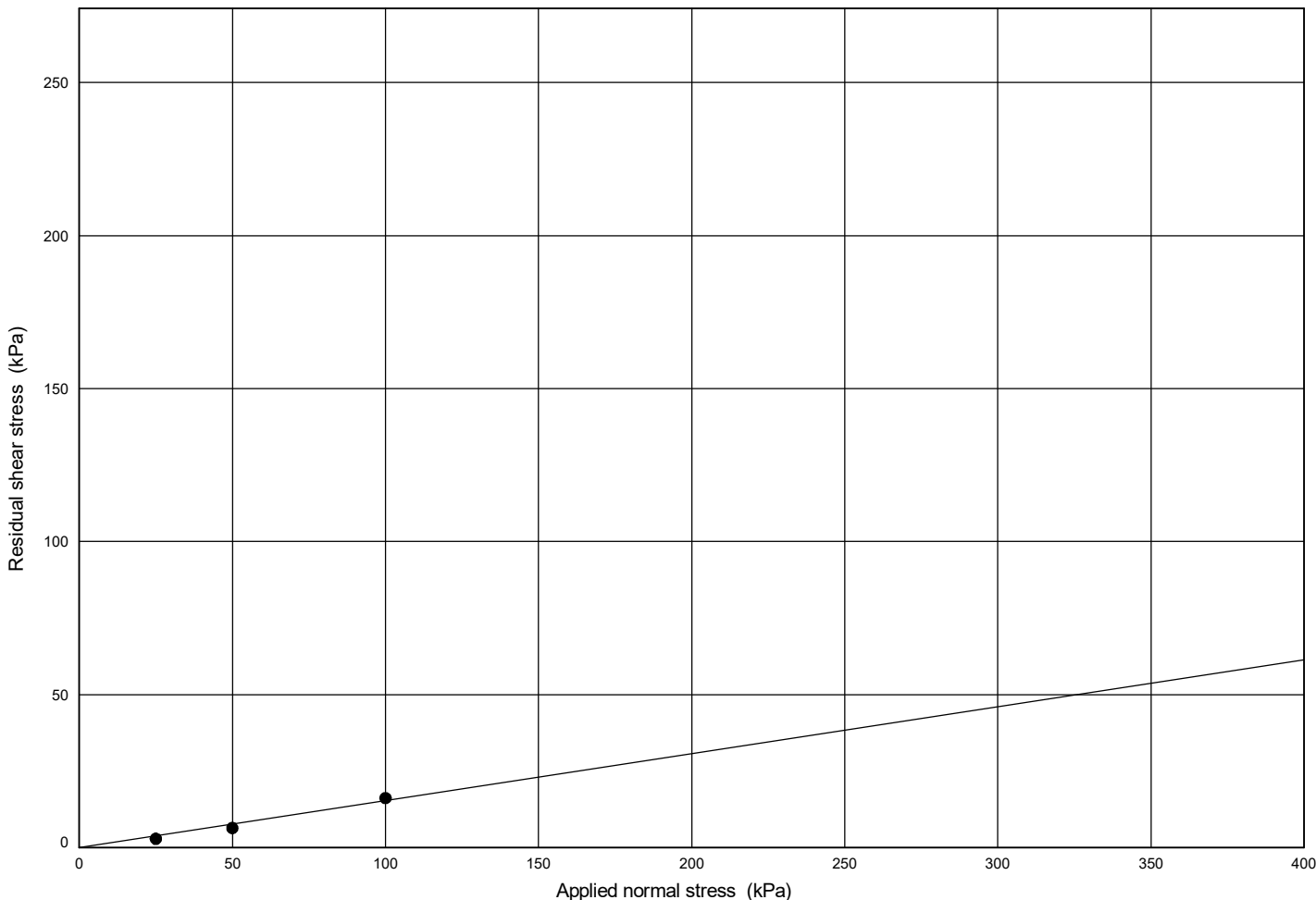
SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)

SAMPLE No./TYPE 8L

SAMPLE DEPTH (m) 2.00

DESCRIPTION Brown mottled grey and orange slightly gravelly slightly sandy silty CLAY

SPECIMEN DEPTH (m) 2.50



Geotechnical Engineering Ltd, Centurion House, Olympus Park, Quevedley, Gloucester, GL2 4NF. Tel. 01452 527743 35371-01 948.GPJ 20/04/2020 11:03:11

GENERAL DETAILS			SHEARING STAGES															
inner radius of specimen (mm)	35	<table border="1"> <thead> <tr> <th>stage</th> <th>normal stress (kPa)</th> <th>residual shear stress (kPa)</th> <th>cumulative angular displacement (degrees)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25</td> <td>2.9</td> <td>64</td> </tr> <tr> <td>2</td> <td>50</td> <td>6.4</td> <td>129</td> </tr> <tr> <td>3</td> <td>100</td> <td>16.2</td> <td>345</td> </tr> </tbody> </table>	stage	normal stress (kPa)	residual shear stress (kPa)	cumulative angular displacement (degrees)	1	25	2.9	64	2	50	6.4	129	3	100	16.2	345
stage	normal stress (kPa)		residual shear stress (kPa)	cumulative angular displacement (degrees)														
1	25		2.9	64														
2	50		6.4	129														
3	100		16.2	345														
outer radius of specimen (mm)	50																	
initial thickness of specimen (mm)	5																	
initial moisture content (%)	22.4																	
final moisture content (%)	22.9																	
rate of angular displacement (mm/min)	0.052																	
SHEAR STRENGTH PARAMETERS																		
residual angle of shearing resistance $\phi'_r$ (deg)	8.0																	
residual cohesion intercept $c'_r$ (kPa)	0																	
remarks:			CONTRACT <b>35371/01</b>		CHECKED <b>WJ</b>													

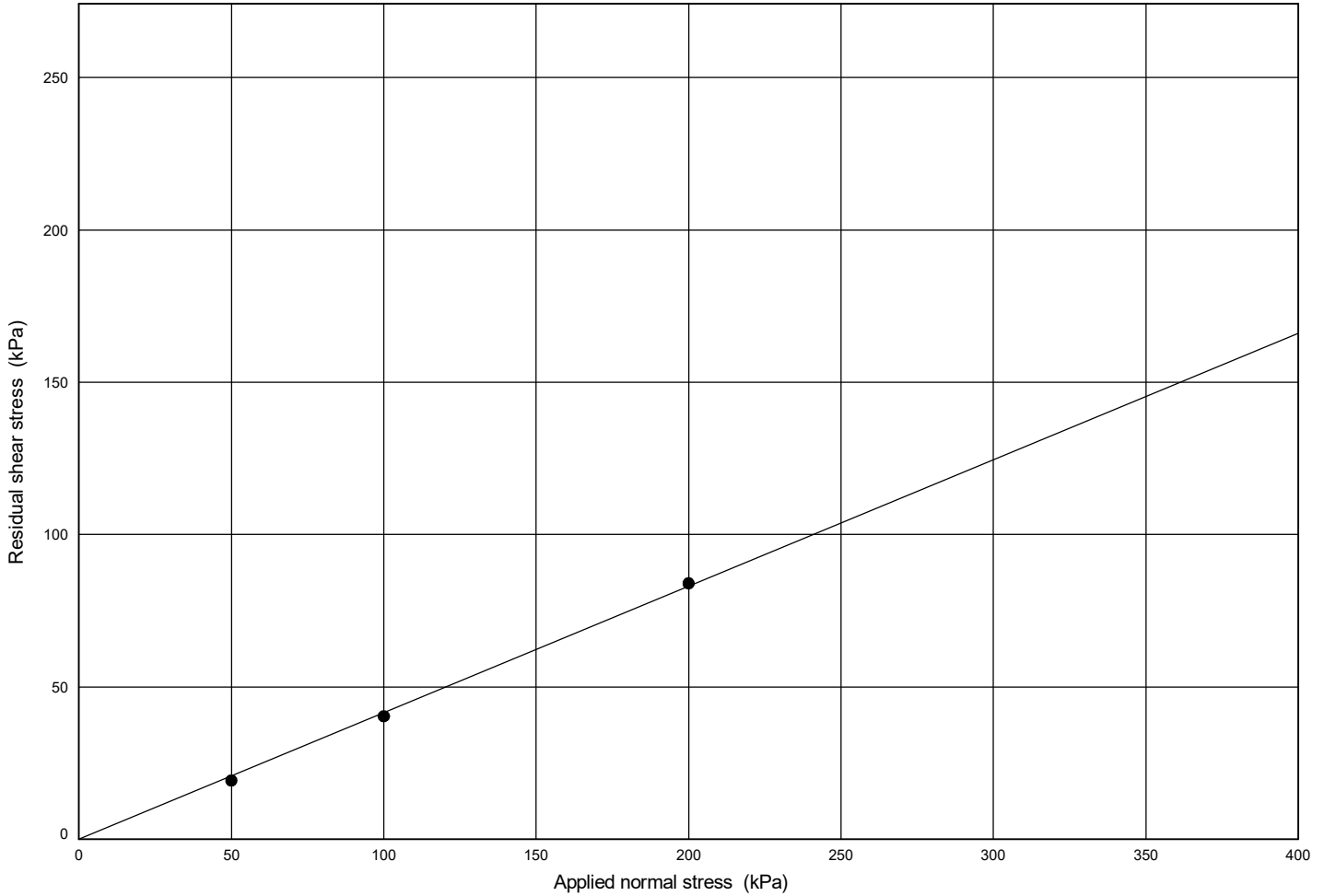
# RESIDUAL STRENGTH BY RING SHEAR



BS.1377 : Part 7 : 1990 : 6

CLIENT OSBORNE  
 SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)  
 DESCRIPTION Greyish brown slightly sandy clayey SILT

BH/TP No. CP102  
 SAMPLE No./TYPE 14L  
 SAMPLE DEPTH (m) 4.00  
 SPECIMEN DEPTH (m) 4.90



Geotechnical Engineering Ltd, Centurion House, Olympus Park, Quevedley, Gloucester, GL2 4NF. Tel. 01452 527743, 35371-01 948.GPJ 20/04/2020 11:03:12

GENERAL DETAILS			SHEARING STAGES			
inner radius of specimen	(mm)	35	stage	normal stress (kPa)	residual shear stress (kPa)	cumulative angular displacement (degrees)
outer radius of specimen	(mm)	50	1	50	19.3	64
initial thickness of specimen	(mm)	5				
initial moisture content	(%)	21.4				
final moisture content	(%)	23.9				
rate of angular displacement	(mm/min)	0.048	2	100	40.4	275
SHEAR STRENGTH PARAMETERS			3	200	84.0	345
			residual angle of shearing resistance $\phi'_r$ (deg)	22.5		
residual cohesion intercept $c'_r$	(kPa)	0				
remarks:					CONTRACT	CHECKED
					<b>35371/01</b>	<b>WJ</b>

# RESIDUAL STRENGTH BY RING SHEAR



BS.1377 : Part 7 : 1990 : 6

CLIENT OSBORNE

BH/TP No.

CP200

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)

SAMPLE No./TYPE

12L

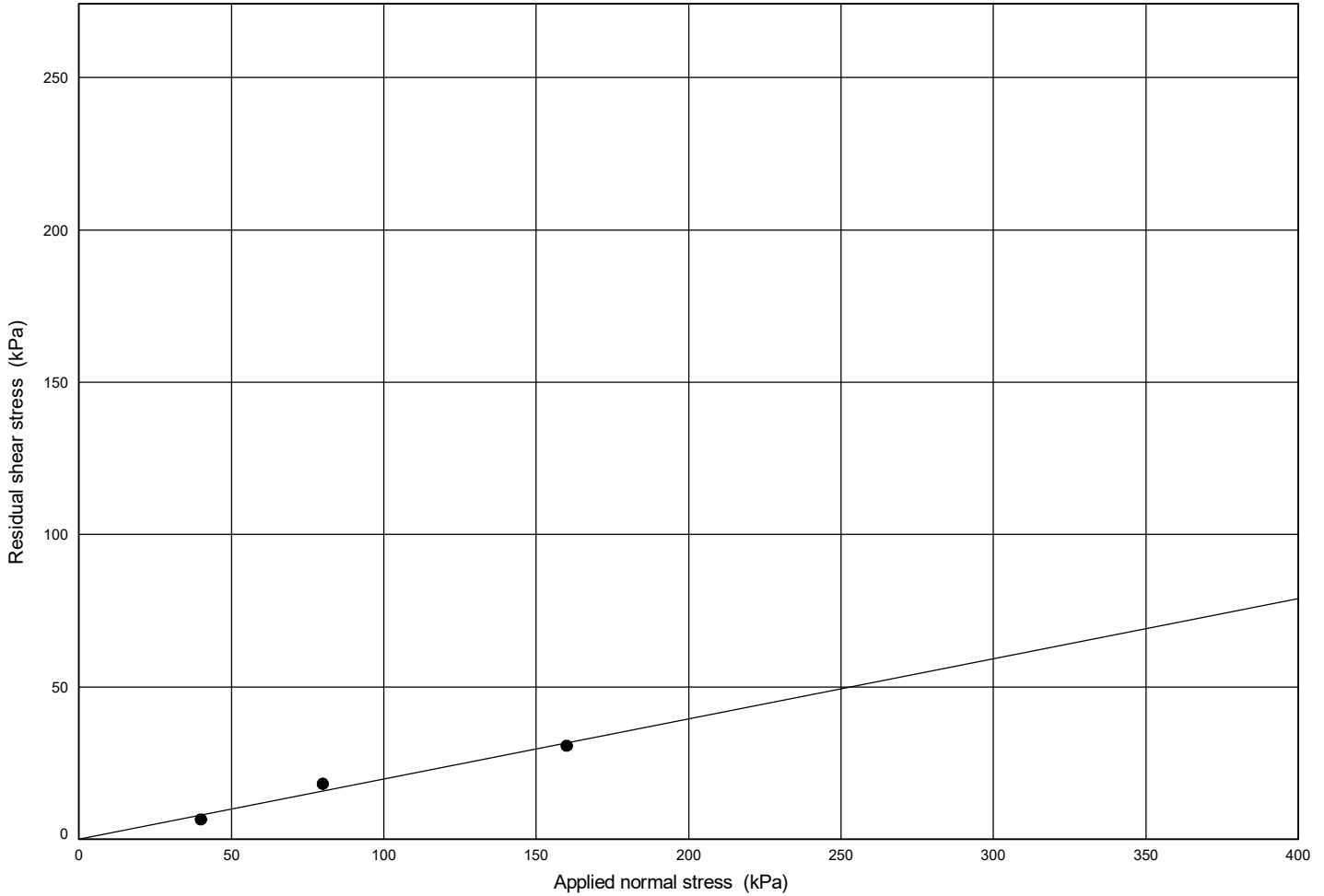
SAMPLE DEPTH (m)

4.00

DESCRIPTION Greyish brown slightly gravelly slightly sandy silty CLAY

SPECIMEN DEPTH (m)

4.00



Geotechnical Engineering Ltd, Centurion House, Olympus Park, Quevedley, Gloucester, GL2 4NF. Tel: 01452 527743 35371-01 948.GPJ 20/04/2020 11:03:13

GENERAL DETAILS			SHEARING STAGES			
inner radius of specimen	(mm)	35	stage	normal stress (kPa)	residual shear stress (kPa)	cumulative angular displacement (degrees)
outer radius of specimen	(mm)	50	1	40	6.5	67
initial thickness of specimen	(mm)	5				
initial moisture content	(%)	42.9				
final moisture content	(%)	37.2				
rate of angular displacement	(mm/min)	0.052	2	80	18.2	287
SHEAR STRENGTH PARAMETERS			3	160	30.7	361
			residual angle of shearing resistance $\phi'_r$ (deg)	11.0		
residual cohesion intercept $c'_r$	(kPa)	0				
remarks:					CONTRACT	CHECKED
					<b>35371/01</b>	<b>WJ</b>

# RESIDUAL STRENGTH BY RING SHEAR



BS.1377 : Part 7 : 1990 : 6

CLIENT OSBORNE

BH/TP No. CP200

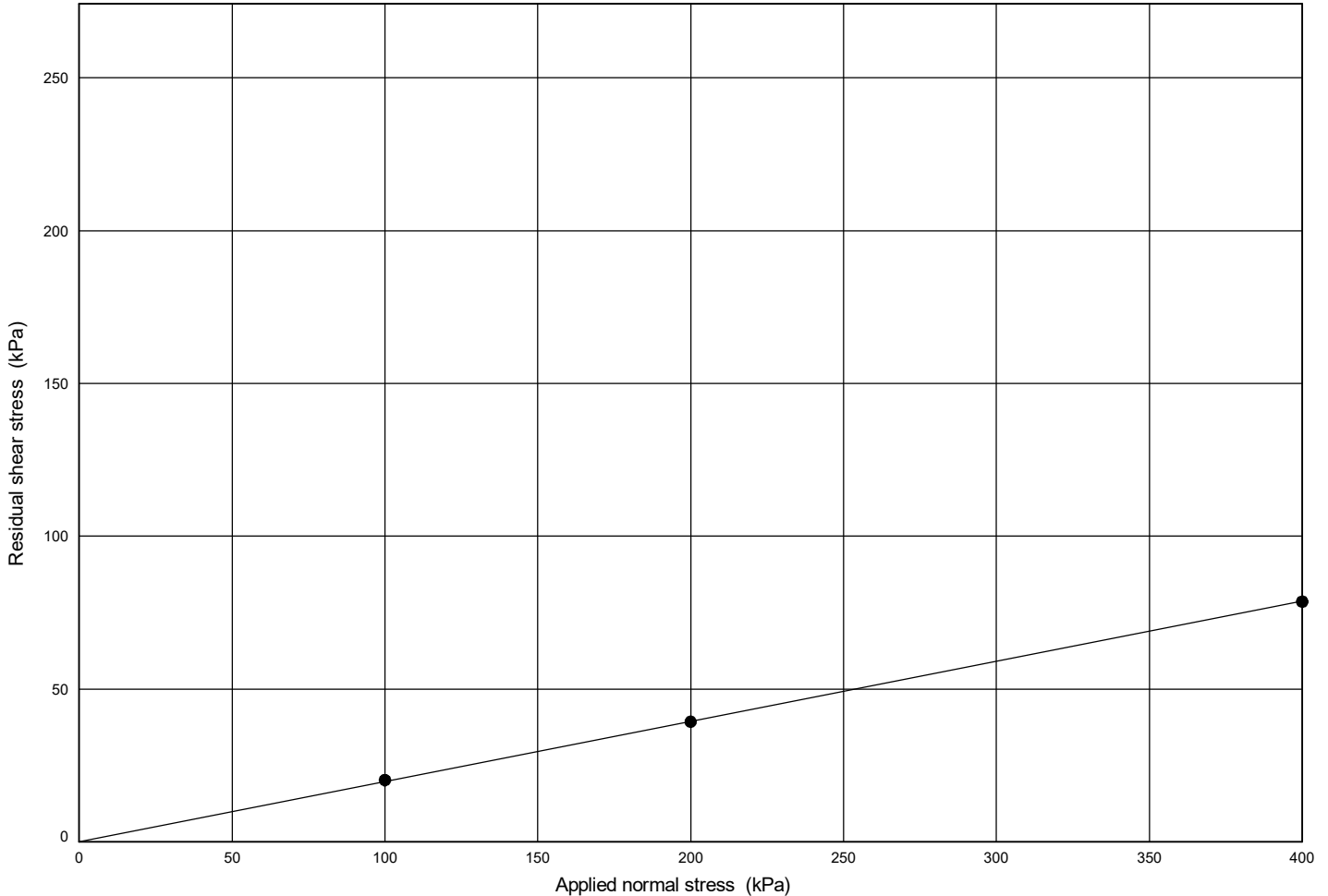
SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)

SAMPLE No./TYPE 29C

SAMPLE DEPTH (m) 10.00

DESCRIPTION

SPECIMEN DEPTH (m) 10.35



Geotechnical Engineering Ltd, Centurion House, Olympus Park, Quevedley, Gloucester, GL2 4NF. Tel. 01452 527743 35371-01 948.GPJ 20/04/2020 11:03:13

GENERAL DETAILS			SHEARING STAGES			
inner radius of specimen	(mm)	35	stage	normal stress (kPa)	residual shear stress (kPa)	cumulative angular displacement (degrees)
outer radius of specimen	(mm)	50	1 2 3	100 200 400	20.2 39.3 78.6	59 118 192
initial thickness of specimen	(mm)	5				
initial moisture content	(%)	27.4				
final moisture content	(%)	25.4				
rate of angular displacement	(mm/min)	0.052				
SHEAR STRENGTH PARAMETERS						
residual angle of shearing resistance $\phi'_r$	(deg)	11.0				
residual cohesion intercept $c'_r$	(kPa)	0				
remarks:					CONTRACT	CHECKED
					<b>35371/01</b>	<b>WJ</b>



# RESIDUAL STRENGTH BY RING SHEAR



BS.1377 : Part 7 : 1990 : 6

CLIENT OSBORNE

BH/TP No.

CP204

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)

SAMPLE No./TYPE

17L

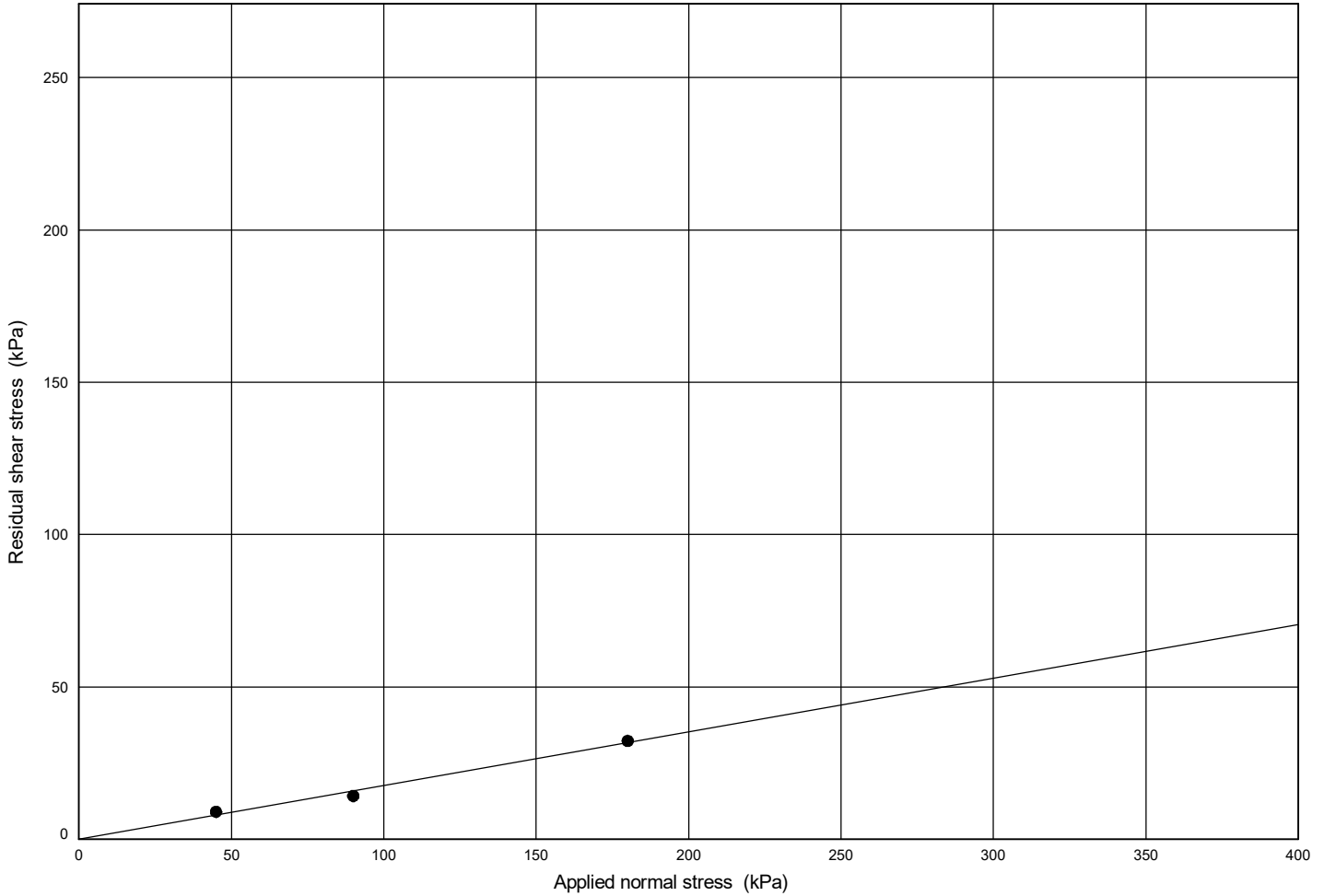
SAMPLE DEPTH (m)

4.00

DESCRIPTION Grey mottled brown slightly sandy silty CLAY

SPECIMEN DEPTH (m)

4.50



Geotechnical Engineering Ltd, Centurion House, Olympus Park, Quevedley, Gloucester, GL2 4NF. Tel: 01452 527743 35371-01 948.GPJ 20/04/2020 11:03:14

GENERAL DETAILS			SHEARING STAGES			
inner radius of specimen	(mm)	35	stage	normal stress (kPa)	residual shear stress (kPa)	cumulative angular displacement (degrees)
outer radius of specimen	(mm)	50	1	45	9.0	62
initial thickness of specimen	(mm)	5				
initial moisture content	(%)	25.0				
final moisture content	(%)	27.7				
rate of angular displacement	(mm/min)	0.048	2	90	14.2	124
SHEAR STRENGTH PARAMETERS			3	180	32.3	333
			residual angle of shearing resistance $\phi'_r$ (deg)	10.0		
residual cohesion intercept $c'_r$	(kPa)	0				
remarks:					CONTRACT	CHECKED
					<b>35371/01</b>	<b>WJ</b>

# RESIDUAL STRENGTH BY RING SHEAR



BS.1377 : Part 7 : 1990 : 6

CLIENT OSBORNE

BH/TP No.

CP204

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)

SAMPLE No./TYPE

23L

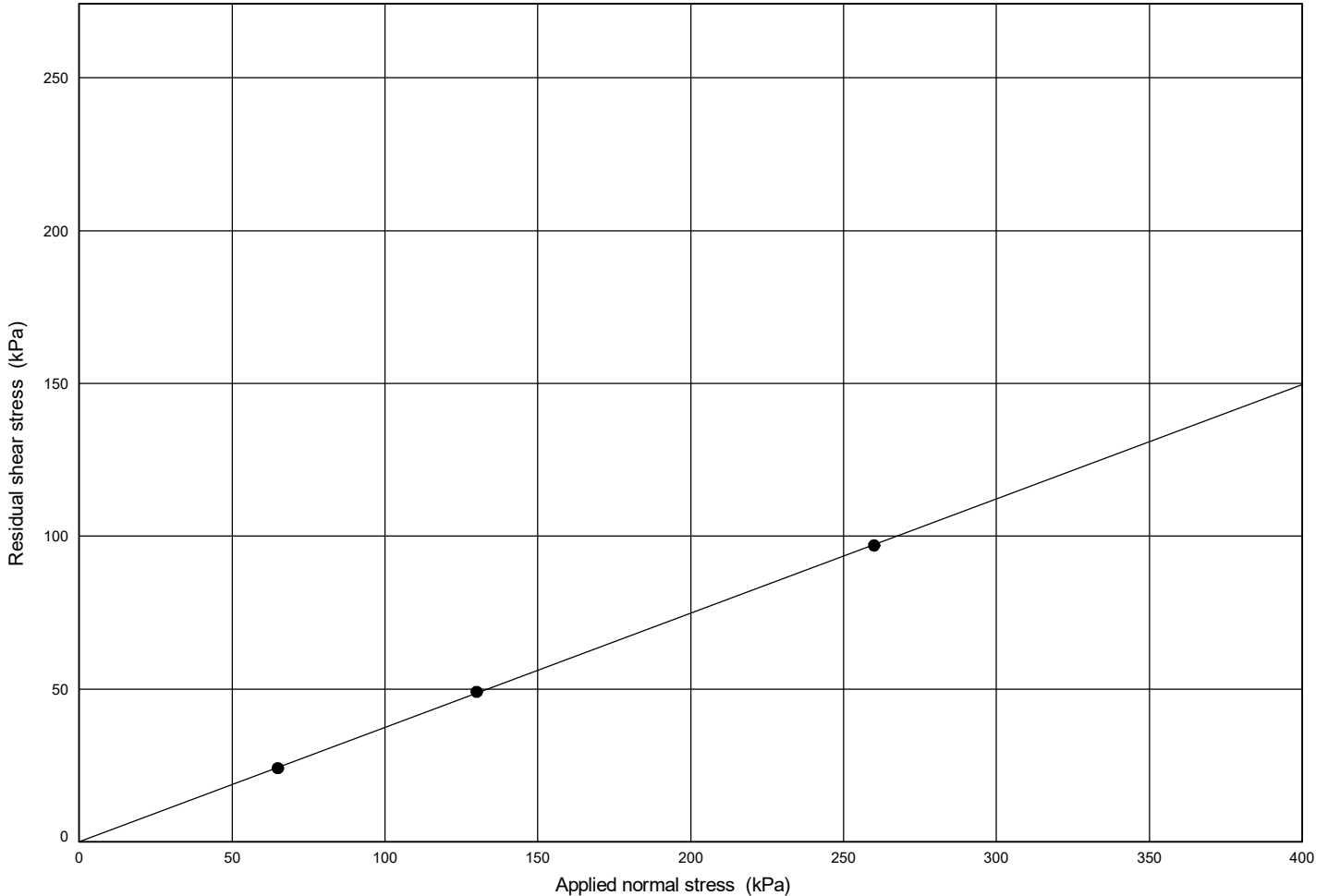
SAMPLE DEPTH (m)

6.00

DESCRIPTION Greyish brown silty CLAY

SPECIMEN DEPTH (m)

6.50



Geotechnical Engineering Ltd, Centurion House, Olympus Park, Quevedley, Gloucester, GL2 4NF. Tel. 01452 527743 35371-01 948.GPJ 20/04/2020 11:03:15

GENERAL DETAILS			SHEARING STAGES			
inner radius of specimen	(mm)	35	stage	normal stress (kPa)	residual shear stress (kPa)	cumulative angular displacement (degrees)
outer radius of specimen	(mm)	50	1	65	24.1	54
initial thickness of specimen	(mm)	5				
initial moisture content	(%)	25.0				
final moisture content	(%)	24.4				
rate of angular displacement	(mm/min)	0.048	2	130	49.1	108
SHEAR STRENGTH PARAMETERS			3	260	97.0	179
			residual angle of shearing resistance $\phi'_r$ (deg)	20.5		
residual cohesion intercept $c'_r$	(kPa)	0				
remarks:					CONTRACT	CHECKED
					<b>35371/01</b>	<b>WJ</b>

# UNDRAINED TRIAXIAL COMPRESSION

BS.1377 : PART 7 : 1990 : 8



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)

borehole /trial pit no.	sample		specimen depth (m)	code	moisture content		dimensions		density		cell pressure (kPa)	rate of strain (%/min)	deviator stress (kPa)	failure strain (%)	failure mode	shear strength* (kPa)	description and remarks	
	no./type	depth (m)			initial (%)	final (%)	length (mm)	diameter (mm)	bulk (Mg/m3)	dry (Mg/m3)								
CP202	24Cs	6.90	6.95	UU100	26.5	24.1	206	104	1.98	1.56	140	2.0	228	13.6	I	114	Brown mottled orange and grey slightly gravelly slightly sandy CLAY	
general remarks:				code:		failure mode:		membrane type/thickness:									CONTRACT	CHECKED
* shear strength taken as half deviator stress at failure for each stage membrane correction applied sample taken vertically (unless otherwise specified) strain rate 2%/min (unless otherwise specified)				UU - unconsolidated undrained M - multi stage S - set of three R - remoulded		B - barrel (plastic failure) S - shear (brittle failure) I - intermediate O - other (see remarks)		latex membrane used (unless otherwise specified) 38 - 0.2mm 70 - 0.4mm 100 - 0.4mm									35371/01	TB

1731 - UUTXL TP201 01.90 BLK3 BLK Test 01 - 30584-351404.XLSM

## UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION

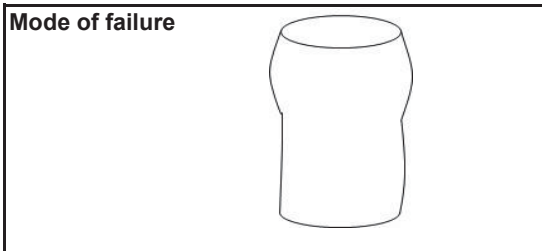
Location	TP201
Sample Ref	BLK3
Depth (m)	1.90-2.10
Sample Type	BLK

**Description:**  
Soft grey mottled dark grey and brown silty CLAY with 2-3 mm pockets of organic matter.

**Specimen Details**


Specimen conditions		Undisturbed
Length	(mm)	138.5
Diameter	(mm)	69.9
Moisture content	(%)	61.1
Bulk density	(Mg/m <sup>3</sup> )	1.54
Dry density	(Mg/m <sup>3</sup> )	0.96
<b>Test Details</b>		
Latex membrane thickness	(mm)	0.3
Specimen height prior to shearing	(mm)	134.8
Membrane correction	(kPa)	0.8
Mean rate of shear	(%/min)	1.4
Cell pressure	(kPa)	75
Strain at failure	(%)	7.6
Maximum deviator stress	(kPa)	47
Shear Stress Cu	(kPa)	23

**Mode of failure**



Orientation of the sample	Vertical
Distance from top of tube mm	

Version 1.80 - 20/08/2019

Processed by JS  
Checked and Approved by  
  
J Sturges - Operations Manager  
24/02/2020

Project Number:  
**GEO / 30584**


Project Name:  
**A417 MISSING LINK  
35371-01**



## Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: CP104  
Sample No.: UT7  
Depth (m): 3.00-3.45

Description:  
Firm greenish grey slightly silty CLAY.

<b>SPECIMEN DETAILS</b>			
Depth within original sample	20 mm from top		
Orientation within original sample	Vertical		
<b>TEST DETAILS</b>			
Specimen Type and Preparation	U (Undisturbed)		
Cell Preparation	Checks performed in accordance with Clause 3.5		
Specimen Number	<b>Specimen No. 1</b>	<b>Specimen No. 2</b>	<b>Specimen No. 3</b>
Initial Diameter <i>mm</i>	37.89	37.90	37.84
Initial Length <i>mm</i>	75.78	75.81	75.79
Initial Water Content <i>%</i>	21.7	21.6	21.0
Initial Wet Density <i>Mg/m<sup>3</sup></i>	2.05	2.04	2.06
Drainage Conditions	One end and radial boundary		
<b>SATURATION STAGE</b>	Method: Clause 5.2	Method: Clause 5.2	Method: Clause 5.2 & 5.3
Final Cell Pressure <i>kPa</i>	450	550	650
Final Pore Pressure <i>kPa</i>	432	523	612
Final Pore Pressure Parameter B	0.98	0.95	0.95
Duration <i>day(s)</i>	2	2	2
<b>CONSOLIDATION STAGE</b>			
Cell Pressure <i>kPa</i>	450	550	650
Back Pressure <i>kPa</i>	400	400	400
Effective Pressure <i>kPa</i>	50	150	250
Final Pore Pressure <i>kPa</i>	401	400	400
Final Pore Pressure Dissipation <i>%</i>	97	100	100
Duration <i>day(s)</i>	1	1	1
<b>SHEARING STAGE</b>			
Cell Pressure <i>kPa</i>	450	550	650
Rate of Axial Displacement <i>mm/min</i>	0.015	0.015	0.015
Initial Pore Pressure <i>kPa</i>	401	400	400
Initial Effective Stress <i>kPa</i>	49	150	250
<b>CONDITIONS AT FAILURE</b> <i>criteria</i>	Maximum deviator stress		
Pore Pressure <i>kPa</i>	357	376	393
Minor Effective Principal Stress <i>kPa</i>	93	174	257
Deviator Stress <i>kPa</i>	233	360	543
Major Effective Principal Stress <i>kPa</i>	326	534	800
Effective Principal Stress Ratio	3.52	3.06	3.11
Pore Pressure Parameter A	-0.19	-0.07	-0.01
Axial Strain <i>%</i>	20.0	19.9	19.8
Membrane & filter correction applied to Deviator Stress <i>kPa</i>	16	16	16
Duration <i>day(s)</i>	1	1	1
Final Water Content <i>%</i>	22.8	21.8	21.2
Final Wet Density <i>Mg/m<sup>3</sup></i>	2.08	2.11	2.15
<b>EFFECTIVE STRESS PARAMETERS</b>			
Cohesion <i>kPa</i>	14		
Angle of Shear Resistance <i>degrees</i>	29		
<b>FAILURE SKETCH</b>			

Checked and Approved by



P Heritage - Project Manager  
20/02/2020

Project Number:

GEO / 30584

Project Name:

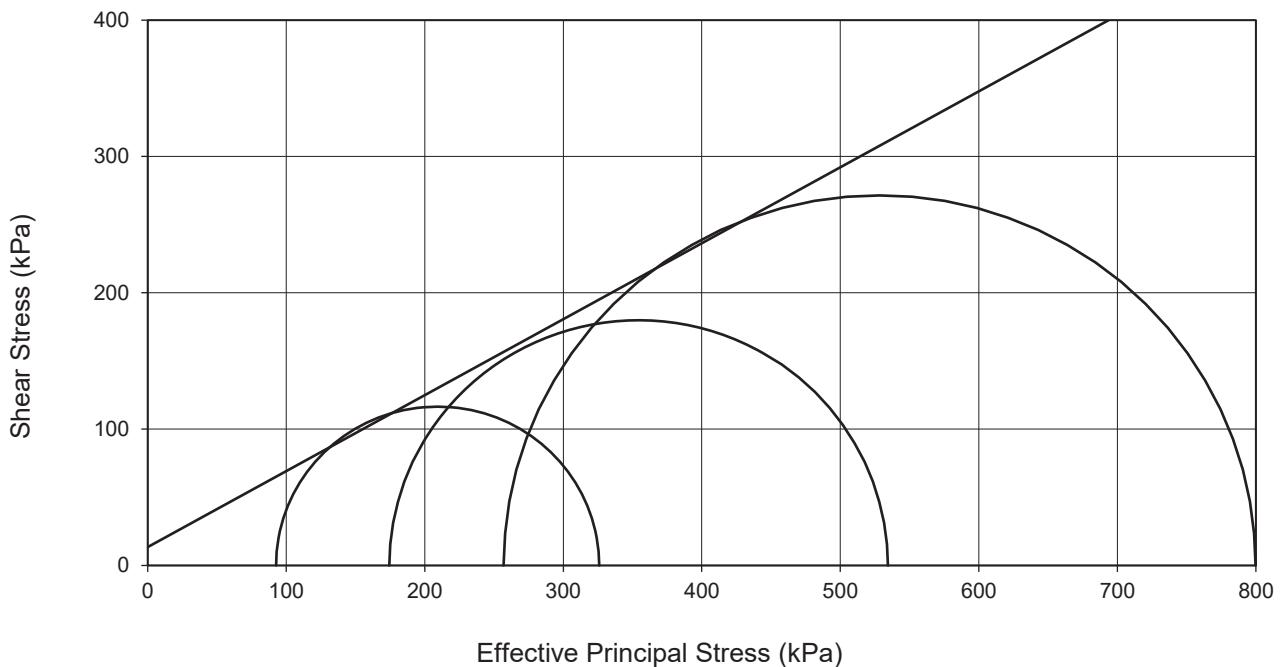
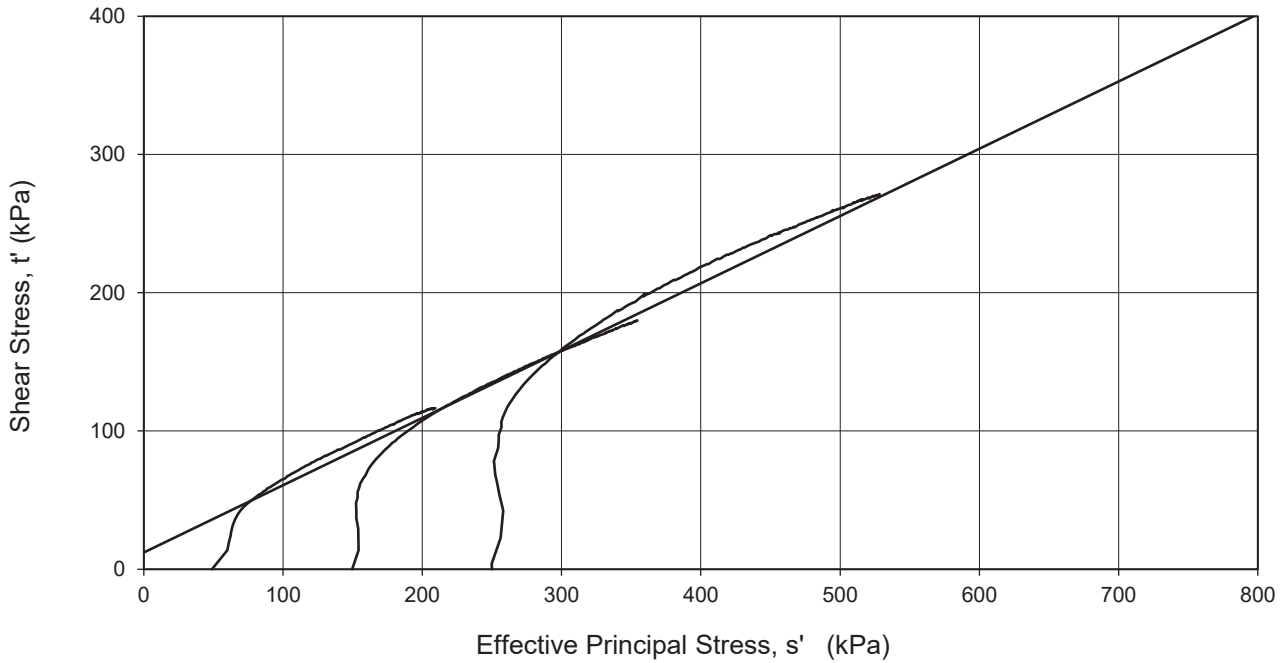
**A417 MISSING LINK  
35371-01**



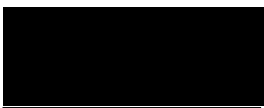

## Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: CP104  
 Sample No.: UT7  
 Depth (m): 3.00-3.45

Description:  
 Firm greenish grey slightly silty CLAY.



Checked and Approved by



P Heritage - Project Manager  
 20/02/2020

Project Number:

**GEO / 30584**

Project Name:

**A417 MISSING LINK  
 35371-01**

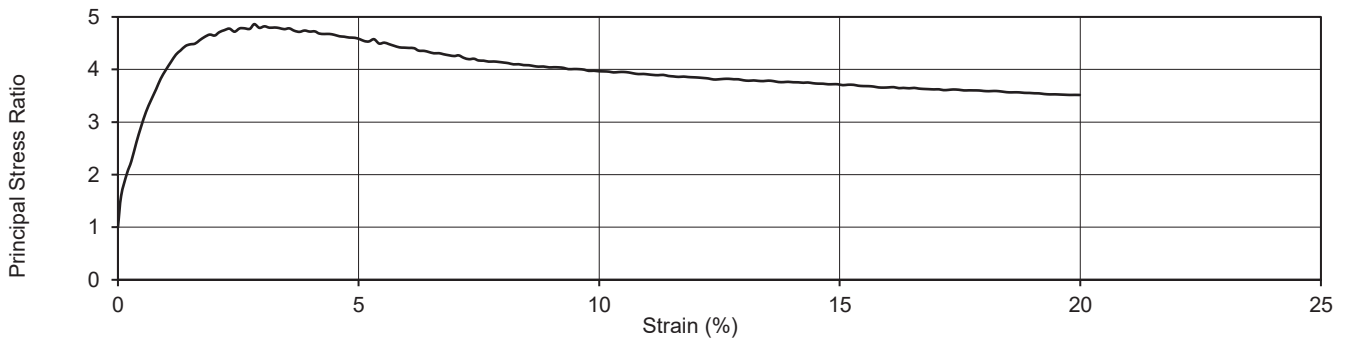
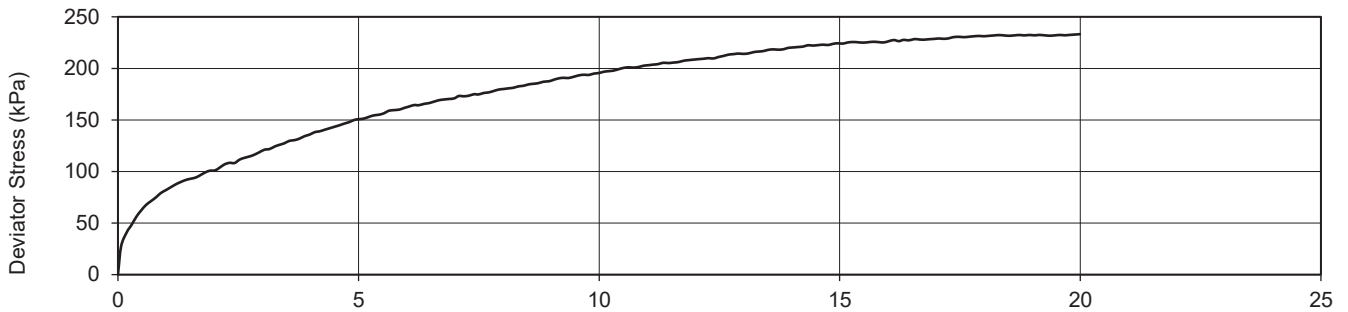
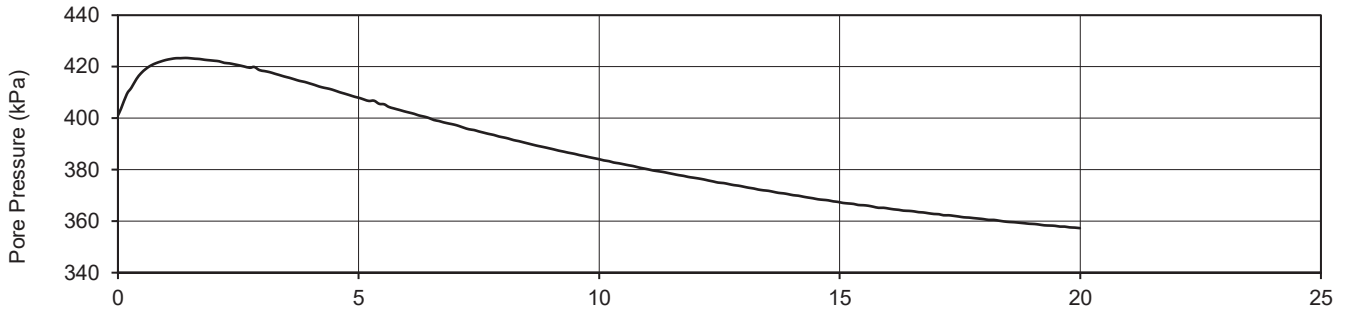
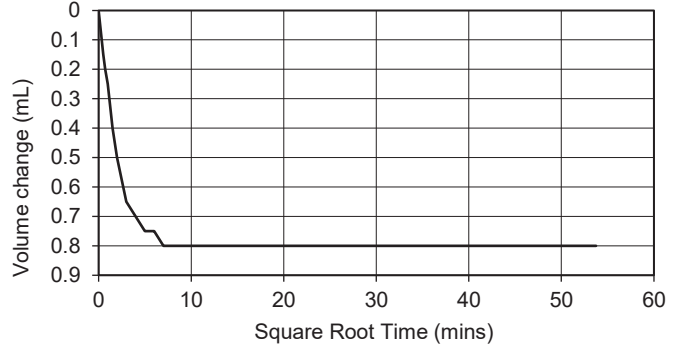
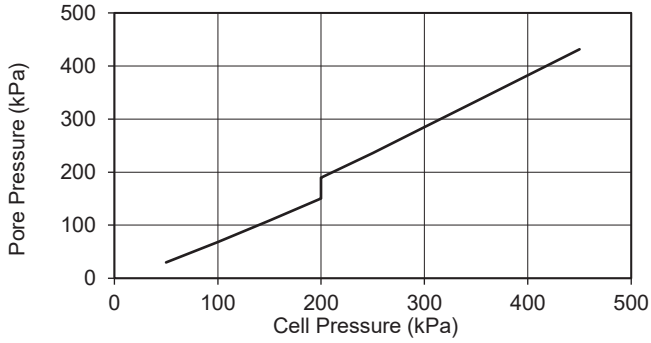
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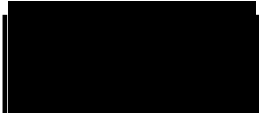
# Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: CP104  
 Sample No.: UT7  
 Depth (m): 3.00-3.45

**Specimen 1**



Checked and Approved by



P Heritage - Project Manager  
20/02/2020

Project Number:

**GEO / 30584**

Project Name:

**A417 MISSING LINK  
35371-01**

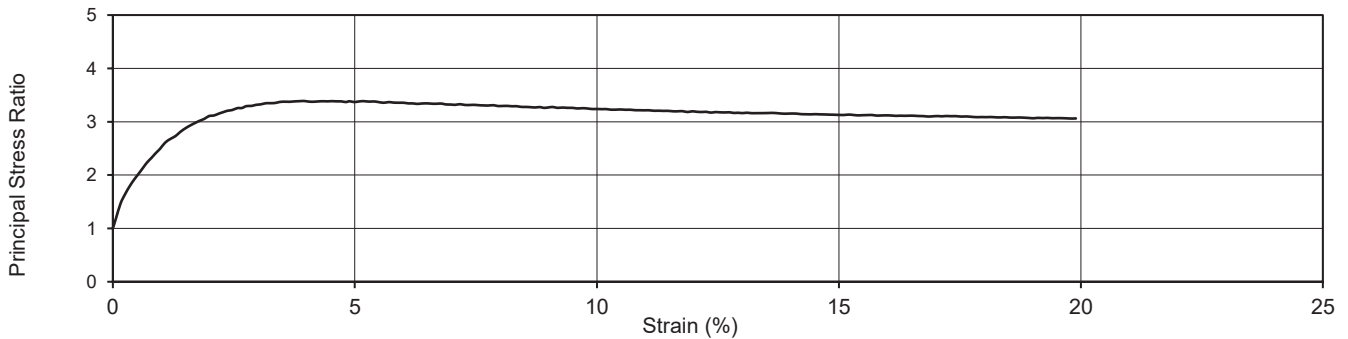
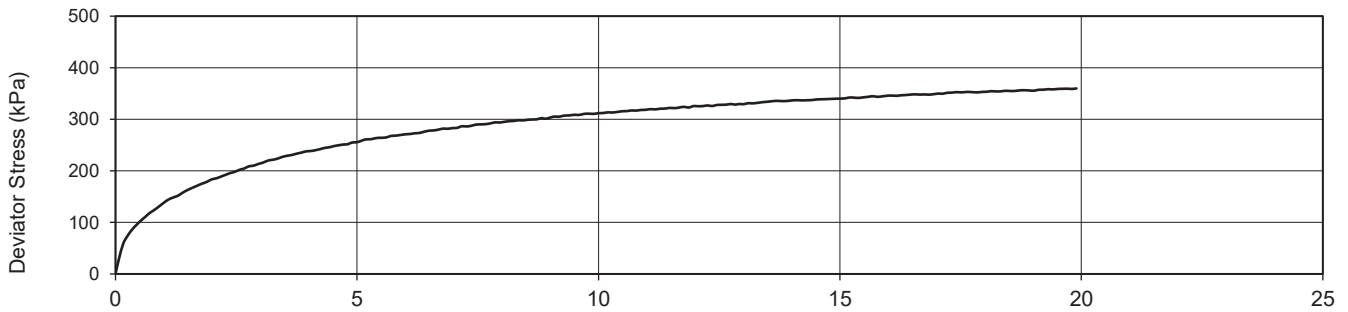
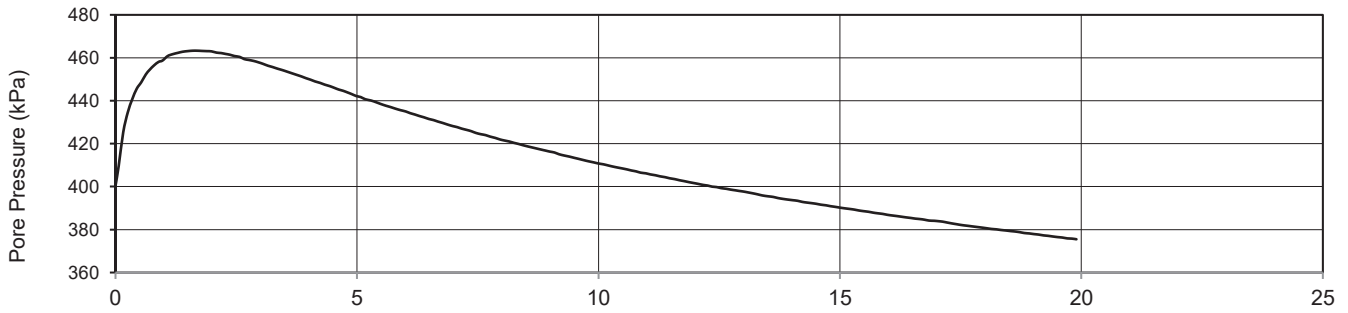
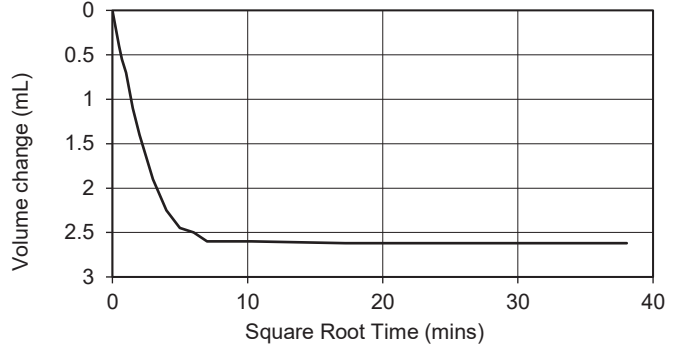
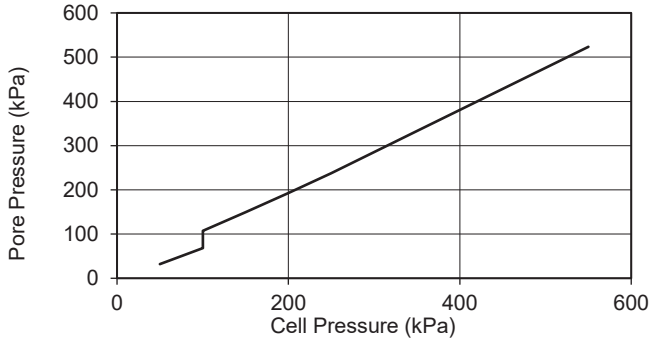
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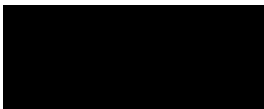
# Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: CP104  
 Sample No.: UT7  
 Depth (m): 3.00-3.45

**Specimen 2**



Checked and Approved by



P Heritage - Project Manager  
20/02/2020

Project Number:

**GEO / 30584**

Project Name:

**A417 MISSING LINK  
35371-01B**

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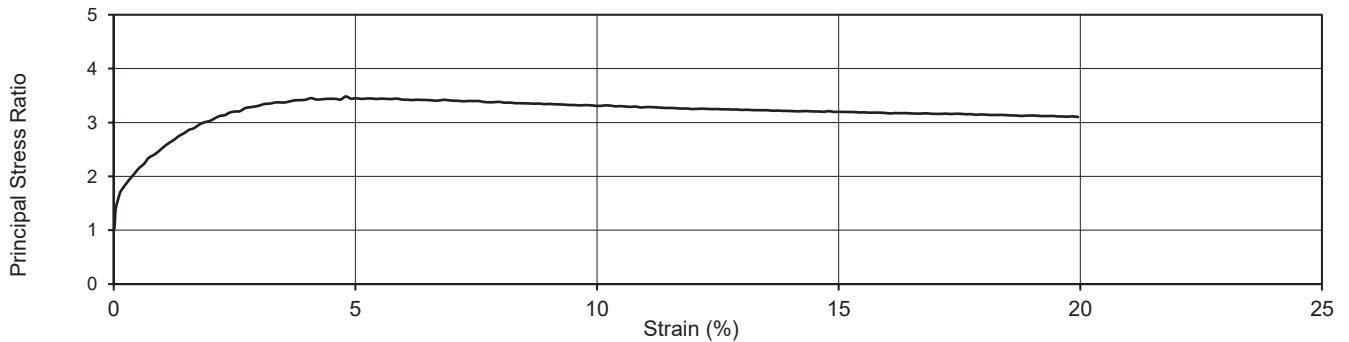
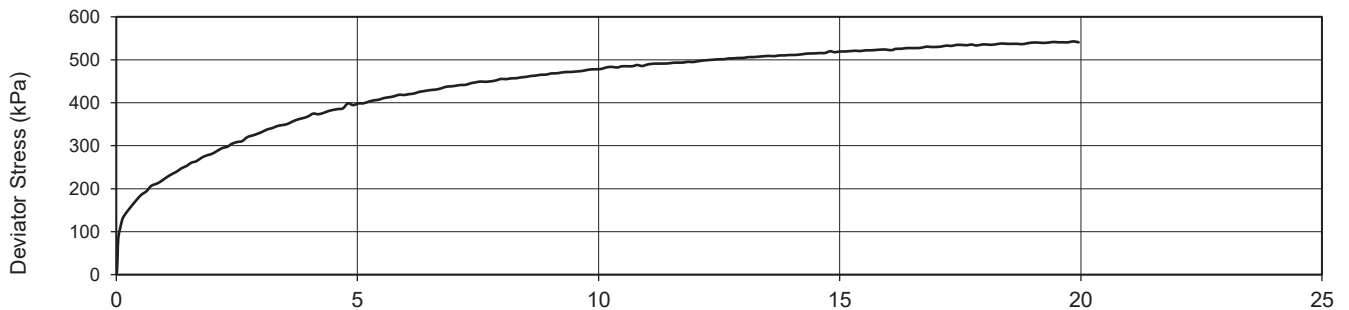
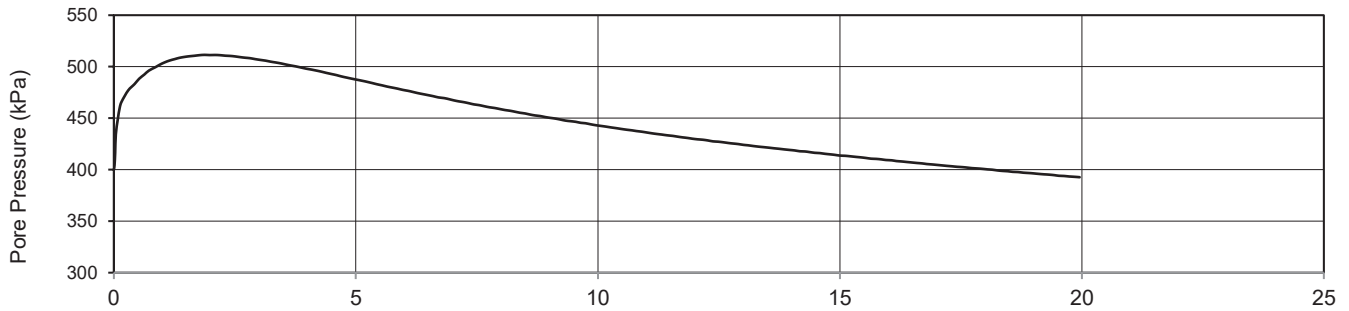
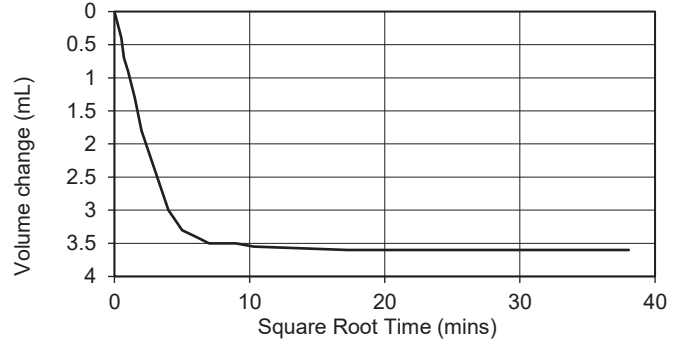
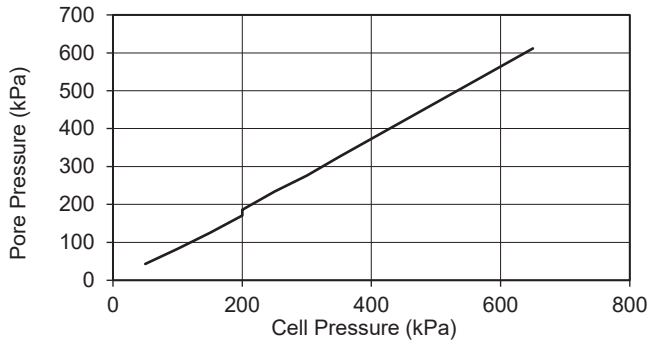




# Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: CP104  
 Sample No.: UT7  
 Depth (m): 3.00-3.45

**Specimen 3**



Checked and Approved by



P Heritage - Project Manager  
20/02/2020

Project Number:

**GEO / 30584**

Project Name:

**A417 MISSING LINK  
35371-01**




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## Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: TP201  
Sample No.: BLK3  
Depth (m): 1.90-2.10

Description:  
Very soft grey oxidised to brown silty organic CLAY with black decomposed organic matter.

<b>SPECIMEN DETAILS</b>	Depth within original sample 20 mm from top Orientation within original sample Vertical		
<b>TEST DETAILS</b>	Specimen Type and Preparation BLK (Undisturbed) Cell Preparation Checks performed in accordance with Clause 3.5		
Specimen Number	<b>Specimen No. 1</b>	<b>Specimen No. 2</b>	<b>Specimen No. 3</b>
Initial Diameter <span style="float: right;"><i>mm</i></span>	37.41	37.55	37.74
Initial Length <span style="float: right;"><i>mm</i></span>	76.69	77.26	76.36
Initial Water Content <span style="float: right;"><i>%</i></span>	61.3	61.5	59.8
Initial Wet Density <span style="float: right;"><i>Mg/m<sup>3</sup></i></span>	1.64	1.64	1.65
Drainage Conditions	One end and radial boundary		
<b>SATURATION STAGE</b>	Method: Clause 5.3	Method: Clause 5.3	Method: Clause 5.3
Final Cell Pressure <span style="float: right;"><i>kPa</i></span>	350	400	500
Final Pore Pressure <span style="float: right;"><i>kPa</i></span>	340	396	491
Final Pore Pressure Parameter B	0.97	0.99	0.99
Duration <span style="float: right;"><i>day(s)</i></span>	2	2	2
<b>CONSOLIDATION STAGE</b>			
Cell Pressure <span style="float: right;"><i>kPa</i></span>	350	400	500
Back Pressure <span style="float: right;"><i>kPa</i></span>	300	300	300
Effective Pressure <span style="float: right;"><i>kPa</i></span>	50	100	200
Final Pore Pressure <span style="float: right;"><i>kPa</i></span>	300	303	300
Final Pore Pressure Dissipation <span style="float: right;"><i>%</i></span>	100	97	100
Duration <span style="float: right;"><i>day(s)</i></span>	1	1	1
<b>SHEARING STAGE</b>			
Cell Pressure <span style="float: right;"><i>kPa</i></span>	350	400	500
Rate of Axial Displacement <span style="float: right;"><i>mm/min</i></span>	0.012	0.012	0.012
Initial Pore Pressure <span style="float: right;"><i>kPa</i></span>	300	303	300
Initial Effective Stress <span style="float: right;"><i>kPa</i></span>	50	97	200
<b>CONDITIONS AT FAILURE</b> <span style="float: right;"><i>criteria</i></span>	Maximum deviator stress		
Pore Pressure <span style="float: right;"><i>kPa</i></span>	326	373	439
Minor Effective Principal Stress <span style="float: right;"><i>kPa</i></span>	24	27	61
Deviator Stress <span style="float: right;"><i>kPa</i></span>	76	94	168
Major Effective Principal Stress <span style="float: right;"><i>kPa</i></span>	100	121	229
Effective Principal Stress Ratio	4.11	4.51	3.76
Pore Pressure Parameter A	0.34	0.75	0.82
Axial Strain <span style="float: right;"><i>%</i></span>	16.4	13.6	14.6
Membrane & filter correction applied to Deviator Stress <span style="float: right;"><i>kPa</i></span>	16	15	16
Duration <span style="float: right;"><i>day(s)</i></span>	1	1	1
Final Water Content <span style="float: right;"><i>%</i></span>	53.3	49.9	44.1
Final Wet Density <span style="float: right;"><i>Mg/m<sup>3</sup></i></span>	1.64	1.70	1.78
<b>EFFECTIVE STRESS PARAMETERS</b>			
Cohesion <span style="float: right;"><i>kPa</i></span>	6.0		
Angle of Shear Resistance <span style="float: right;"><i>degrees</i></span>	33		
<b>FAILURE SKETCH</b>			

Checked and Approved by



P Heritage - Project Manager  
20/02/2020

Project Number:

GEO / 30584

Project Name:

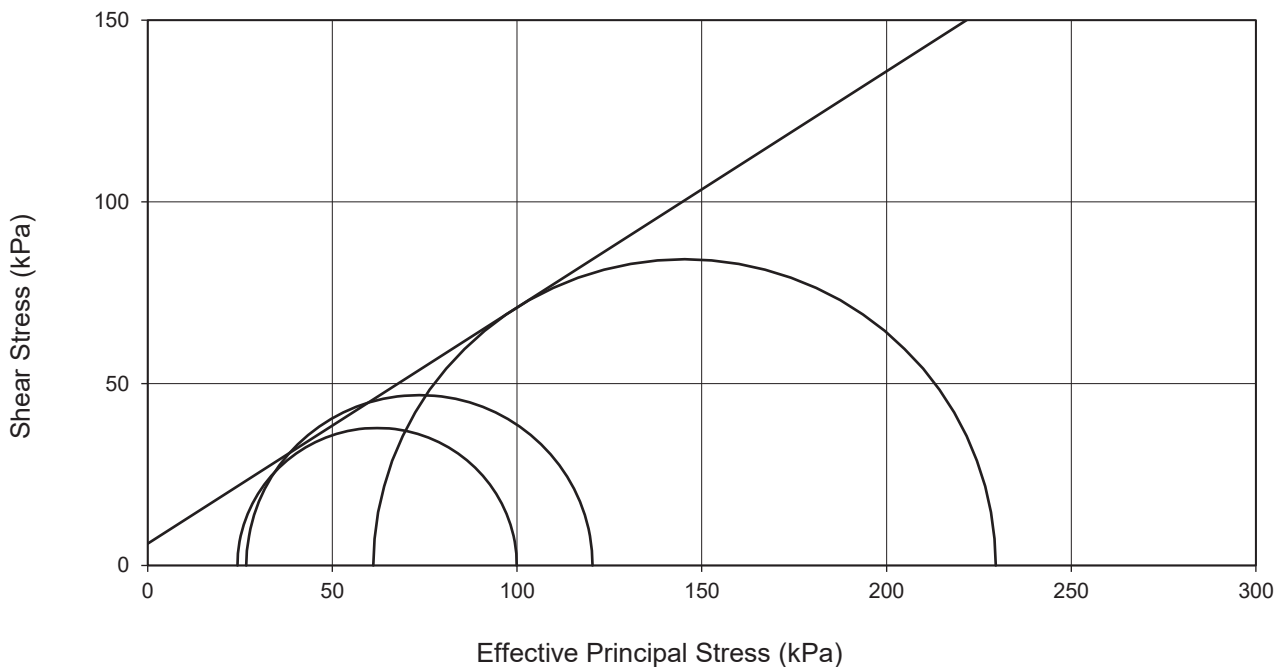
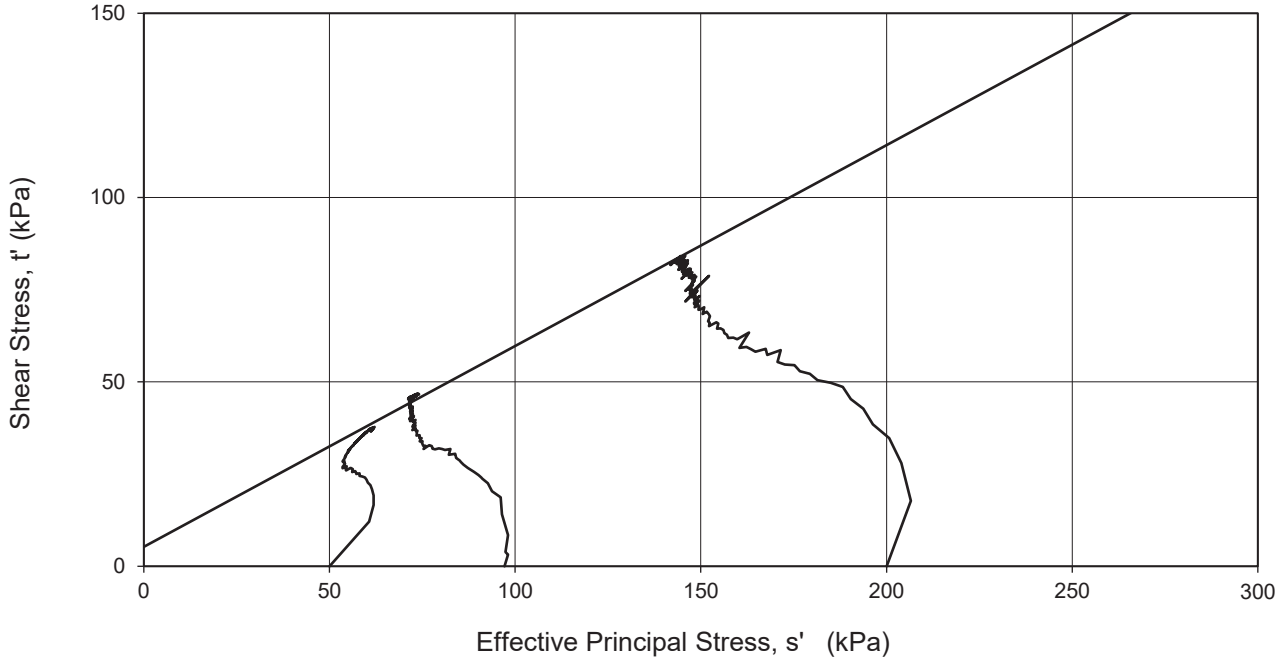
**A417 MISSING LINK  
35371-01**



# Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: TP201  
Sample No.: BLK3  
Depth (m): 1.90-2.10

Description:  
Very soft grey oxidised to brown silty organic CLAY with black decomposed organic matter.



Checked and Approved by



P Heritage - Project Manager  
20/02/2020

Project Number:

**GEO / 30584**

Project Name:

**A417 MISSING LINK  
35371-01**

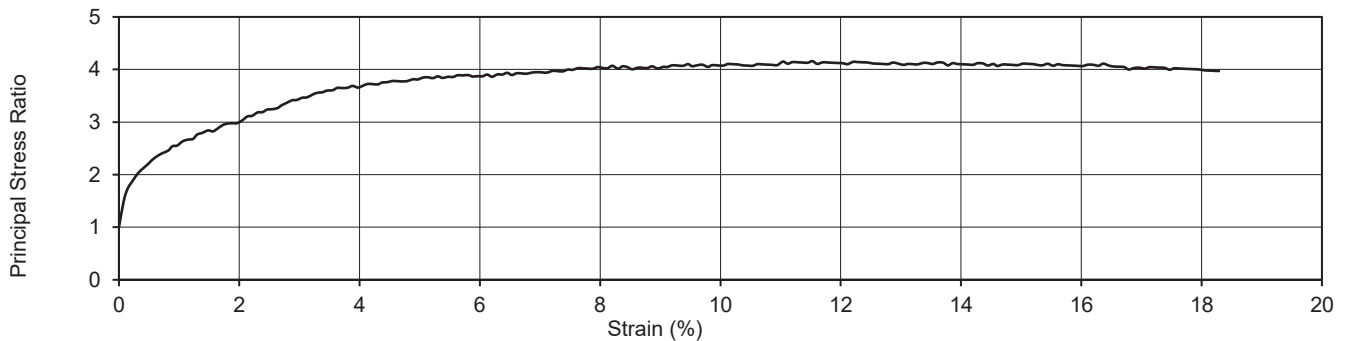
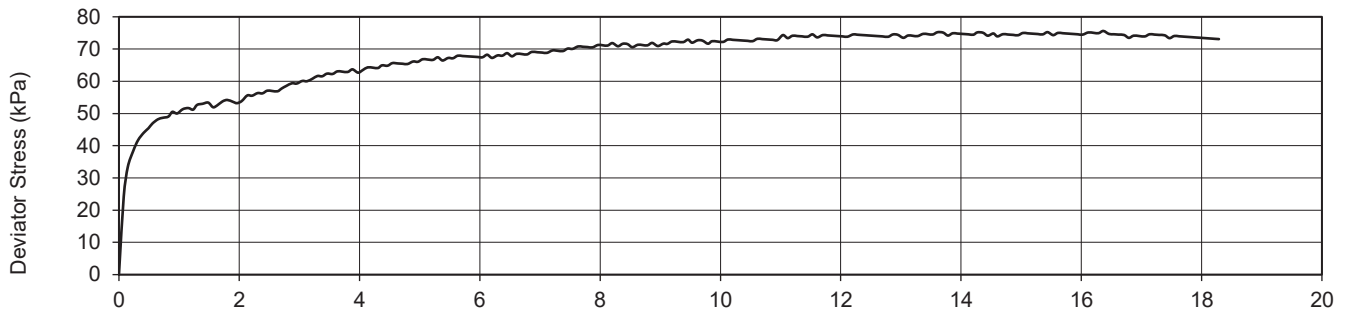
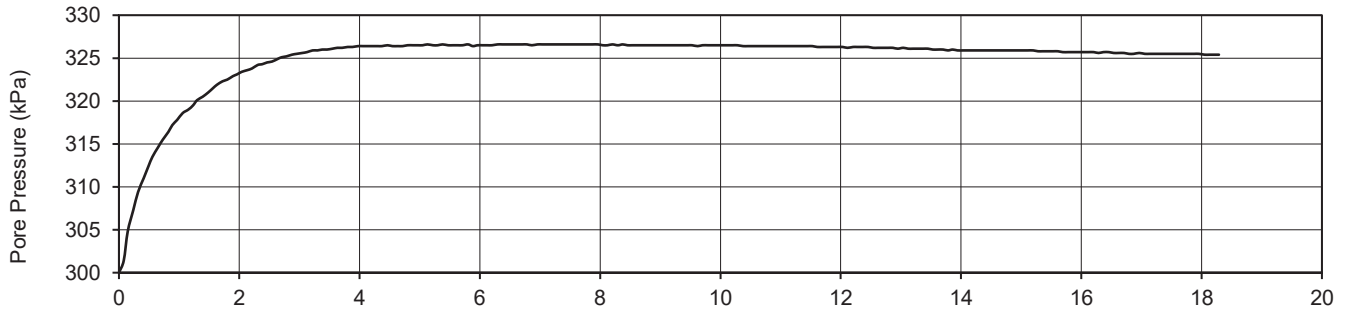
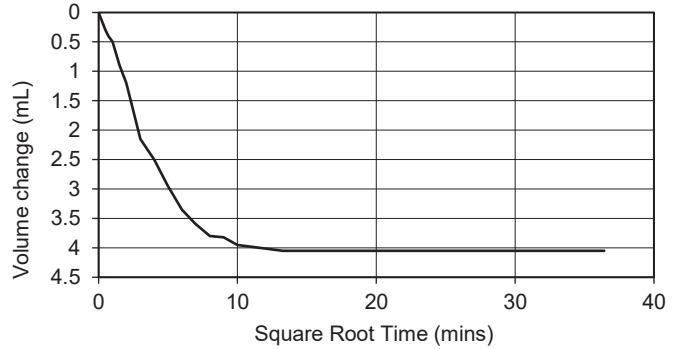
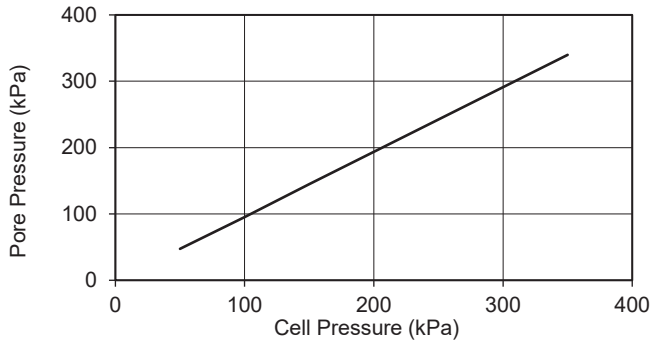
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# Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: TP201  
 Sample No.: BLK3  
 Depth (m): 1.90-2.10

**Specimen 1**



Checked and Approved by



P Heritage - Project Manager  
20/02/2020

Project Number:

**GEO / 30584**

Project Name:

**A417 MISSING LINK  
35371-01**

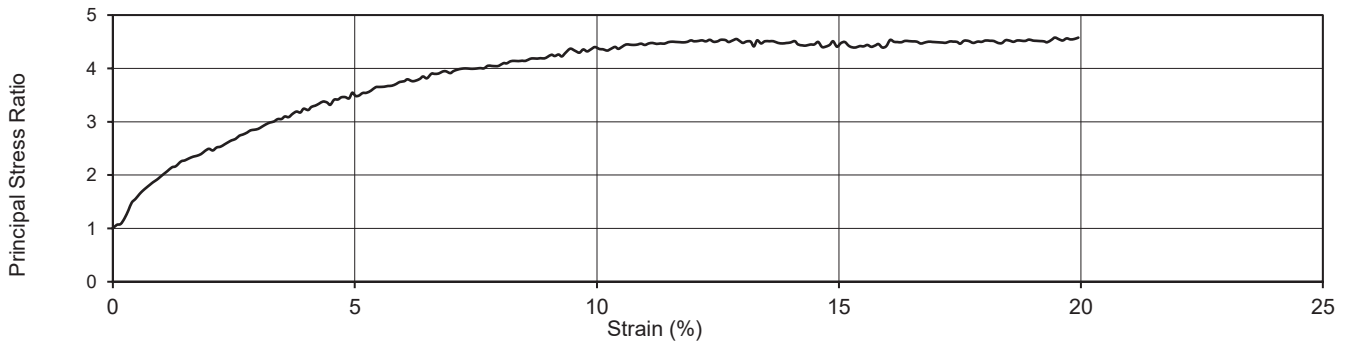
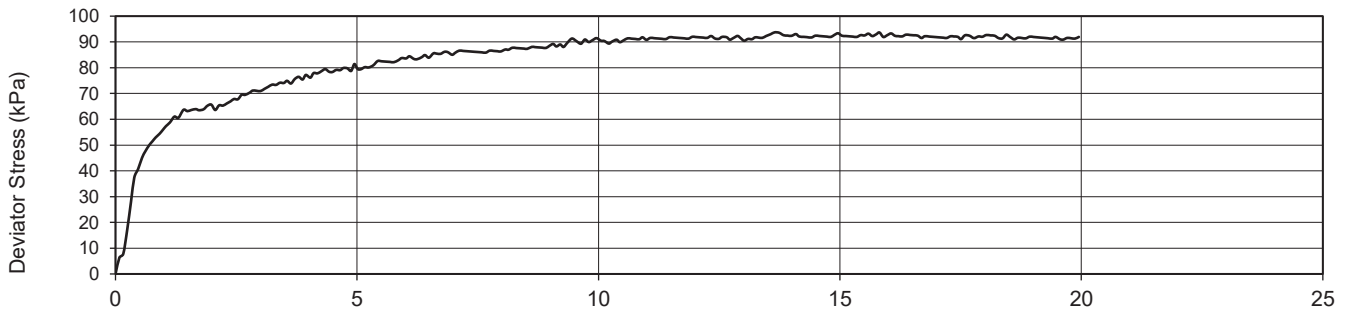
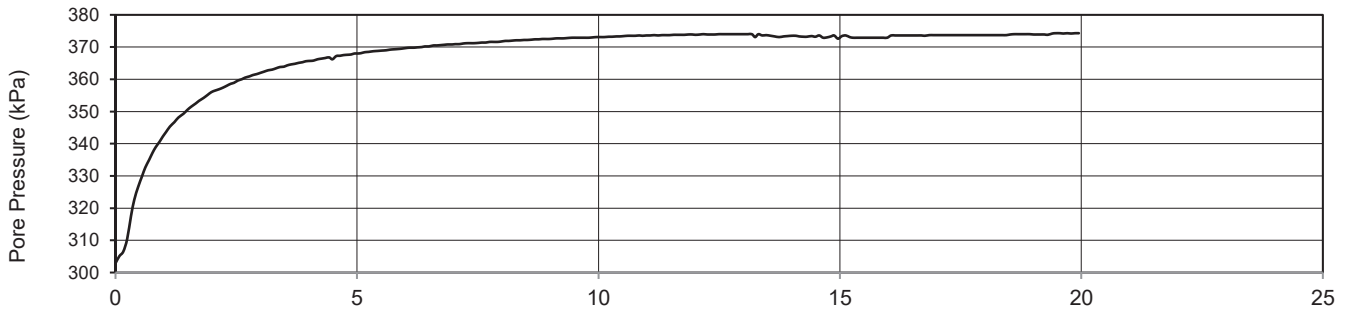
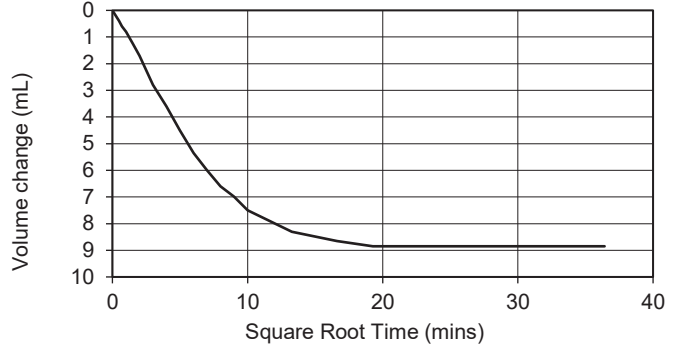
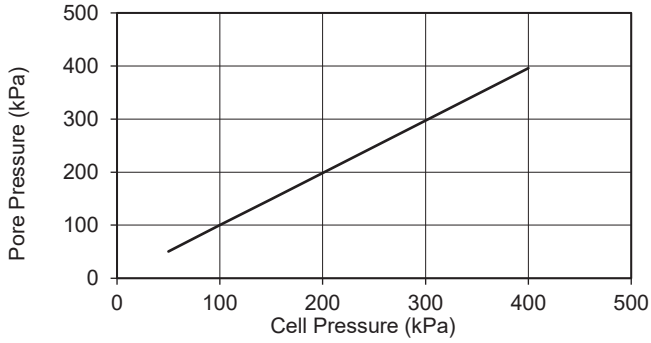
**GEOLABS**®



# Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: TP201  
 Sample No.: BLK3  
 Depth (m): 1.90-2.10

**Specimen 2**



Checked and Approved by



P Heritage - Project Manager  
20/02/2020

Project Number:

**GEO / 30584**

Project Name:

**A417 MISSING LINK  
35371-01**

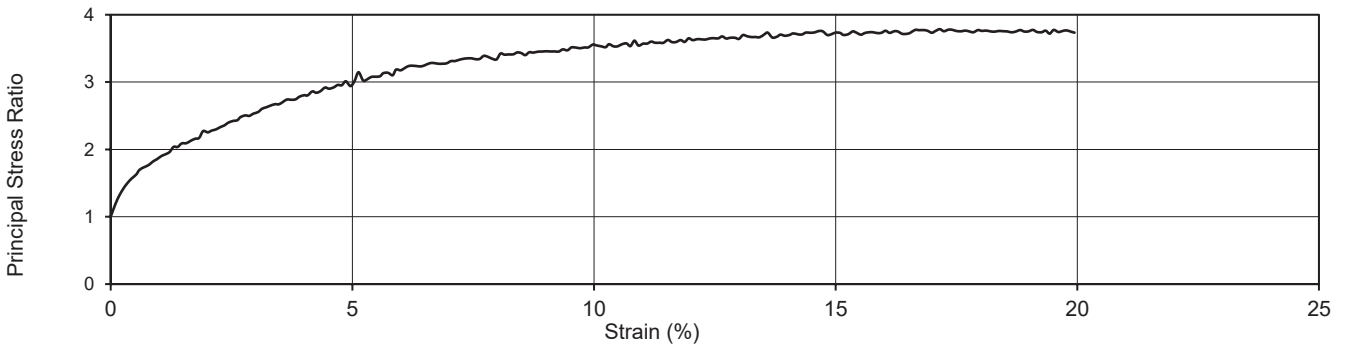
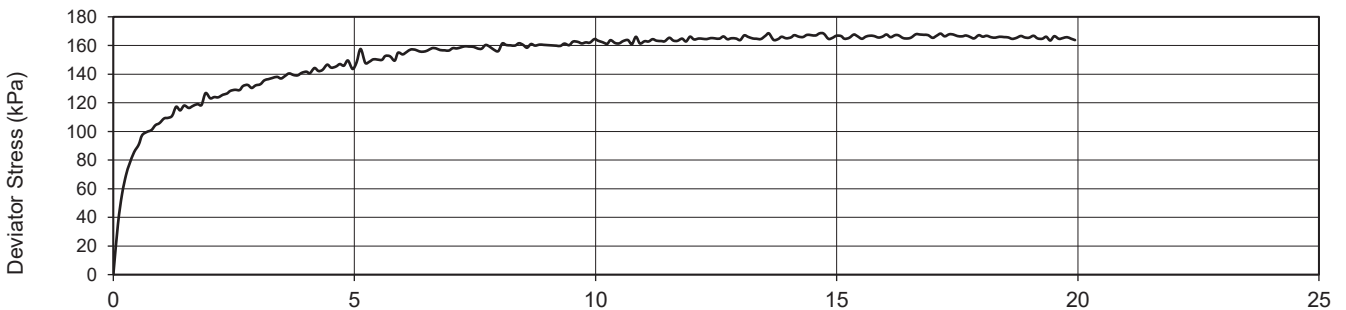
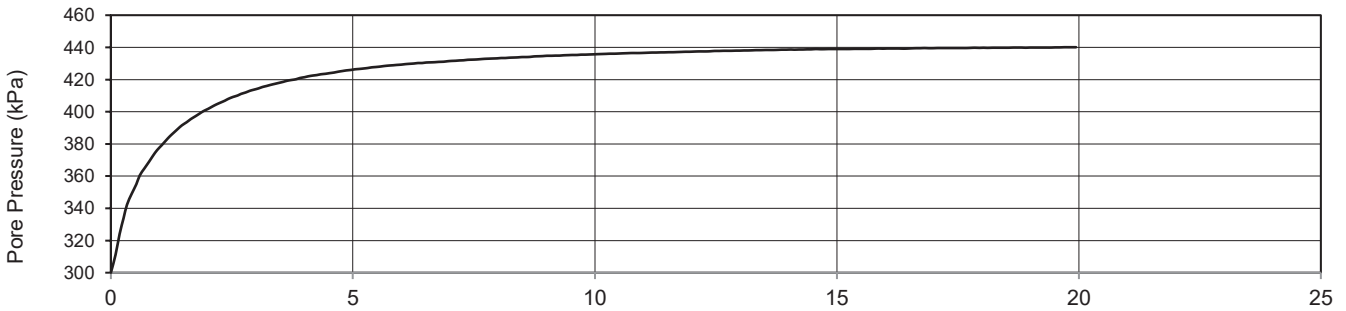
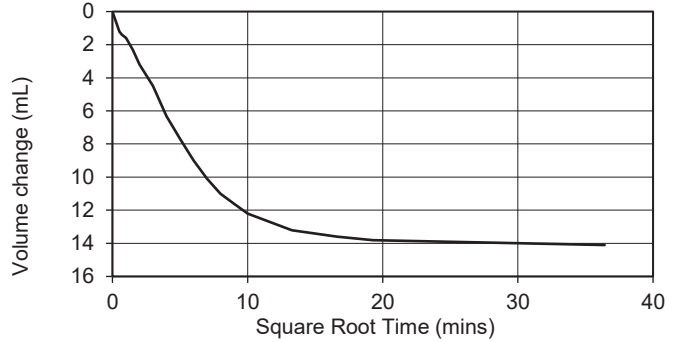
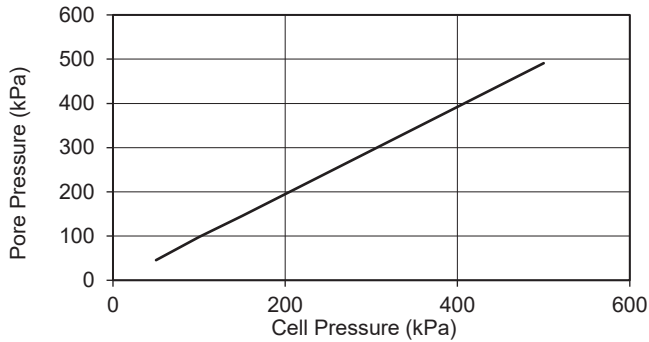
**GEOLABS**®



# Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: TP201  
 Sample No.: BLK3  
 Depth (m): 1.90-2.10

**Specimen 3**



Checked and Approved by



P Heritage - Project Manager  
20/02/2020

Project Number:

**GEO / 30584**

Project Name:

**A417 MISSING LINK  
35371-01B**

**GEOLABS**®



**UNIAXIAL COMPRESSIVE STRENGTH OF ROCK**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)

borehole /trial pit no.	sample		specimen depth (m)	diameter D (mm)	height H (mm)	H/D	moisture content (%)	bulk density (Mg/m3)	loading rate (kN/min)	time to failure (min:sec)	UCS (MPa)	description, codes and remarks
	no./type	depth (m)										
CP102	27Cs	9.50	9.50	116.3	259.5	2.23	22.8	2.04	1	02:42	0.22	Brown mottled black MUDSTONE, N, AxCa. H/D ratio falls outside ISRM specification
CP102	33Cs	12.40	12.40	114.9	289.1	2.52	18.3	2.15	1	02:08	0.20	Grey MUDSTONE, N, AxSh
CP102	39Cs	19.60	19.60	113.7	291.6	2.56	14.1	2.21	1	09:51	0.96	Grey MUDSTONE, N, AxCa
CP200	33Cs	11.60	11.60	114.6	338.3	2.95	19.4	2.15	1	01:54	0.18	Grey MUDSTONE, N, AxCa
CP200	37Cs	14.10	14.10	116.3	294.2	2.53	17.4	2.16	1	01:50	0.17	Grey MUDSTONE, N, AxCa
CP202	30Cs	12.70	12.70	114.3	273.4	2.39	14.2	2.26	2	10:45	2.09	Grey MUDSTONE, N, AxCa. H/D ratio falls outside ISRM specification
CP202	34Cs	17.85	17.85	113.2	276.6	2.44	13.4	2.26	2	07:23	1.46	Grey MUDSTONE, N, AxCa. H/D ratio falls outside of ISRM specification
CP204	46Cs	21.65	21.65	116.0	274.7	2.37	12.8	2.27	2	09:52	1.87	Grey MUDSTONE, N, AxCa. H/D ratio falls outside ISRM specification

## general remarks

sample obtained from vertically drilled core (unless specified), test machine - VJT6000

coding:	moisture condition	sample storage	failure mode
	N - natural moisture content	U - not wrapped	Ax - axial cleavage
	F - fully saturated	F - wrapped in cling film/foil	Ca - cataclasis
	S - soaked	W - waxed	Sh - shear
	P - air/partially dried	G - contained in sealed Geoline	Ex - explosive
			Ot - other

CONTRACT  
**35371/01**

CHECKED  
**TB**

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)	L (mm)						
CP102	9.50	A	X	N	115		40		0.19	76.53	0.03	1.21	0.04	Brown mottled black MUDSTONE
CP102	9.50	D	Y	N		40	115		0.14	115.00	0.01	1.45	0.02	Brown mottled black MUDSTONE
CP102	12.40	A	X	N	115		30		0.16	66.28	0.04	1.14	0.04	Grey MUDSTONE
CP102	12.40	D	Y	N		40	115		0.09	115.00	0.01	1.45	0.01	Grey MUDSTONE
CP102	14.20	A	X	P	120		45		0.56	82.92	0.08	1.26	0.10	Grey MUDSTONE
CP102	14.20	D	Y	P		40	120		0.43	120.00	0.03	1.48	0.04	Grey MUDSTONE
CP102	15.10	A	X	P	120		50		0.76	87.40	0.10	1.29	0.13	Grey MUDSTONE
CP102	15.10	D	Y	P		50	120		0.54	120.00	0.04	1.48	0.06	Grey MUDSTONE
CP102	16.85	A	X	P	120		90		0.94	117.26	0.07	1.47	0.10	Grey MUDSTONE
CP102	16.85	D	Y	P		80	120		0.63	120.00	0.04	1.48	0.06	Grey MUDSTONE
CP102	18.25	A	X	P	120		60		1.07	95.75	0.12	1.34	0.16	Grey MUDSTONE
CP102	18.25	D	Y	P		60	120		0.84	120.00	0.06	1.48	0.09	Grey MUDSTONE
CP102	19.40	A	X	P	120		45		0.76	82.92	0.11	1.26	0.14	Grey MUDSTONE
CP102	19.40	D	Y	P		50	120		0.69	120.00	0.05	1.48	0.07	Grey MUDSTONE
CP102	19.90	A	X	N	115		30		0.41	66.28	0.09	1.14	0.11	Grey MUDSTONE
CP102	19.90	D	Y	N		30	115		0.26	115.00	0.02	1.45	0.03	Grey MUDSTONE
CP200	12.00	A	X	P	120		100		31.50	123.61	2.06	1.50	3.10	Grey LIMESTONE
CP200	12.00	D	Y	P		40	120		30.26	120.00	2.10	1.48	3.12	Grey LIMESTONE
CP200	11.95	A	X	N	115		40		0.10	76.53	0.02	1.21	0.02	Grey MUDSTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35371/01</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		



**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)	L (mm)						
CP200	11.95	D	Y	N		40	115	0.06	115.00	0.00	1.45	0.01	Grey MUDSTONE	
CP200	14.00	A	X	P	120		60	0.41	95.75	0.04	1.34	0.06	Grey MUDSTONE	
CP200	14.00	D	Y	P		60	120	0.29	120.00	0.02	1.48	0.03	Grey MUDSTONE	
CP200	14.40	A	X	N	115		50	0.13	85.56	0.02	1.27	0.02	Grey MUDSTONE	
CP200	14.40	D	Y	N		50	115	0.11	115.00	0.01	1.45	0.01	Grey MUDSTONE	
CP202	9.10	A	X	P	120		40	0.31	78.18	0.05	1.22	0.06	Grey MUDSTONE	
CP202	9.10	D	Y	P		45	120	0.43	120.00	0.03	1.48	0.04	Grey MUDSTONE	
CP202	10.00	A	X	P	120		40	1.11	78.18	0.18	1.22	0.22	Grey MUDSTONE	
CP202	10.00	D	Y	P		35	120	0.29	120.00	0.02	1.48	0.03	Grey MUDSTONE	
CP202	11.50	A	X	P	120		60	0.86	95.75	0.09	1.34	0.13	Grey MUDSTONE	
CP202	11.50	D	Y	P		70	120	0.66	120.00	0.05	1.48	0.07	Grey MUDSTONE	
CP202	13.00	A	X	P	120		45	0.93	82.92	0.14	1.26	0.17	Grey MUDSTONE	
CP202	13.00	D	Y	P		50	120	0.76	120.00	0.05	1.48	0.08	Grey MUDSTONE	
CP202	12.70	A	X	N	115		40	0.58	76.53	0.10	1.21	0.12	Grey MUDSTONE	
CP202	12.70	D	Y	N		40	115	0.39	115.00	0.03	1.45	0.04	Grey MUDSTONE	
CP202	14.50	A	X	P	120		50	0.71	87.40	0.09	1.29	0.12	Grey MUDSTONE	
CP202	14.50	D	Y	P		50	120	0.49	120.00	0.03	1.48	0.05	Grey MUDSTONE	
CP202	16.00	A	X	P	120		70	0.79	103.42	0.07	1.39	0.10	Grey MUDSTONE	
CP202	16.00	D	Y	P		70	120	0.16	120.00	0.01	1.48	0.02	Grey MUDSTONE	
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02														
test type		test orientation relative to discontinuities				moisture condition				CONTRACT		CHECKED		
A - axial		X - perpendicular		U - unknown		N - natural moisture content				35371/01		TB		
D - diametral		Y - parallel		P - partially air dried										
I - irregular lump		Z - oblique		S - soaked										

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)	L (mm)						
CP202	17.50	A	X	P	120		60		1.35	95.75	0.15	1.34	0.20	Grey MUDSTONE
CP202	17.50	D	Y	P		60	120		1.09	120.00	0.08	1.48	0.11	Grey MUDSTONE
CP202	17.85	A	X	N	115		40		0.70	76.53	0.12	1.21	0.14	Grey MUDSTONE
CP202	17.85	D	Y	N		40	115		0.46	115.00	0.03	1.45	0.05	Grey MUDSTONE
CP202	19.00	A	X	P	120		50		0.96	87.40	0.13	1.29	0.16	Grey MUDSTONE
CP202	19.00	D	Y	P		60	120		0.78	120.00	0.05	1.48	0.08	Grey MUDSTONE
CP204	11.50	I	U	P	95	160	60		4.98	85.19	0.69	1.27	0.87	Grey and brown LIMESTONE
CP204	12.50	I	U	P	50	70	50		0.26	56.42	0.08	1.06	0.09	Brown and grey MUDSTONE
CP204	16.50	A	X	P	120		50		0.86	87.40	0.11	1.29	0.14	Grey MUDSTONE
CP204	16.50	D	Y	P		60	120		0.80	120.00	0.06	1.48	0.08	Grey MUDSTONE
CP204	17.65	A	X	P	120		90		24.19	117.26	1.76	1.47	2.58	Grey LIMESTONE
CP204	17.65	D	Y	P		90	120		28.61	120.00	1.99	1.48	2.95	Grey LIMESTONE
CP204	18.15	A	X	N	115		90		6.24	114.80	0.47	1.45	0.69	Grey LIMESTONE
CP204	18.15	D	Y	N		90	115		4.76	115.00	0.36	1.45	0.52	Grey LIMESTONE
CP204	22.00	A	X	P	120		55		1.21	91.67	0.14	1.31	0.19	Grey MUDSTONE
CP204	22.00	D	Y	P		60	120		1.48	120.00	0.10	1.48	0.15	Grey MUDSTONE
CP204	21.65	A	X	N	115		40		1.40	76.53	0.24	1.21	0.29	Grey MUDSTONE
CP204	21.65	D	Y	N		40	115		1.01	115.00	0.08	1.45	0.11	Grey MUDSTONE
CP204	24.50	A	X	P	120		80		3.14	110.56	0.26	1.43	0.37	Grey MUDSTONE
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02														
test type		test orientation relative to discontinuities				moisture condition				CONTRACT		CHECKED		
A - axial		X - perpendicular		U - unknown		N - natural moisture content				35371/01		TB		
D - diametral		Y - parallel		P - partially air dried										
I - irregular lump		Z - oblique		S - soaked										

# POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (948)

borehole /trial pit no.	sample depth (m)	test type	test orientation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)							
CP204	24.50	D	Y	P		80	120	1.91	120.00	0.13	1.48	0.20	Grey MUDSTONE	

general remarks  
 tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
 test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	<b>CONTRACT</b> <b>35371/01</b>	<b>CHECKED</b> <b>TB</b>
A - axial	X - perpendicular U - unknown	N - natural moisture content		
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		



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GEOTECHNICAL ENGINEERING LIMITED

For the attention of David Owen/Ed Crimp

Version No. 1

Page No. 1 of 32

Date of Issue 09/04/2020

### TEST REPORT

PROJECT/SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-PHASE 2A (1059)	Samples received	20/01/2020
GEL REPORT NUMBER	35371-02	Schedule received	20/01/2020
Test report refers to	All Schedules	Testing commenced	22/01/2020
		Status	Final

### SUMMARY OF RESULTS ATTACHED

TEST METHOD & DESCRIPTION	QUANTITY	ACCREDITED TEST
BS EN ISO 17892-1: 2014:5. Water Content	17	YES
BS1377: Part 2: 1990:4.2-4.4&5.2-5.4, Liquid & Plastic Limits	17	YES
BS EN ISO 17892-1: 2014:5. Water Content (Subcontracted)	3	YES
BS EN ISO 17892-12:2018 Liquid & Plastic Limits (Subcontracted)	3	YES
BS EN ISO 17892-4: 2016: 5.2, Particle Size Distribution - Wet Sieve	7	YES
BS EN ISO 17892-4: 2016: 5.4, Particle Size Distribution - Pipette	7	YES
BS1377: Part 4: 1990:3, Dry Density/Moisture Content Relationship	2	YES
BS1377: Part 7: 1990:6, Residual Strength by Ring Shear	1	NO
BS1377: Part 7: 1990:8&9, Undrained Triaxial Compression	3	YES
BS1377: Part 8: 1990: Effective Stress Testing (Subcontracted)	2	YES
ISRM: 2007: Point Load Strength Test	2	YES
BRE SD1 Suite (Subcontracted)	1	YES/NO
BRE SD1 Reduced Suite: pH, Sulphate - water and acid soluble, sulphur (Subcontracted)	1	YES

Remarks This report may not be partially reproduced without written permission from this laboratory.  The results reported relate to samples received in the laboratory	Approved Signatories: <b>T Best (Deputy Laboratory Manager)</b> E Crimp (Senior Engineer) J Hanson (Director) N Parry (Director)
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Doc TR01 Rev No. 22 Revision date 02/01/20 DC:JH

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VAT Number: 682 5857 89

Payments: Geotechnical Engineering Limited  
Sort code: 16-22-11 Bank account: 11125135

**LIQUID AND PLASTIC LIMITS**

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1059)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
CP213	5L	1.20	1.70	16	BXE	4	60	25	35	Yellowish brown mottled grey slightly gravelly slightly sandy silty CLAY
CP213	39C	13.50	14.20	10.1	BXE	1	56	24	32	Grey slightly gravelly slightly sandy silty CLAY
CP213	44D	16.50	16.50	18.9	BXE	50	36	17	19	Yellowish brown slightly sandy gravelly silty CLAY
CP213	56Cs	21.70	21.70	13.1	BXE	0	44	24	20	Grey slightly sandy silty CLAY
CP214	9UT	3.00	3.05	22.1	BXE	0	43	20	23	Yellowish brown mottled orange slightly sandy silty CLAY
CP214	18UT	6.00	6.10	43.5	BXE	1	46	21	25	Grey slightly gravelly slightly sandy silty CLAY
CP214	40Cs	15.05	15.10	12.7	BXE	3	36	18	18	Light brown slightly gravelly slightly sandy silty CLAY
CP214	49Cs	19.80	19.85	16.9	BXE	4	54	25	29	Brown mottled orange and grey slightly gravelly slightly sandy silty CLAY
CP214	54Cs	24.15	24.20	14.5	BXE	0	39	25	14	Grey slightly sandy clayey SILT
CP215	7UT	2.20	2.20	24.7	BXE	1	48	23	25	Grey mottled orangish brown slightly sandy silty CLAY
CP215	15UT	4.20	4.25	23.8	BXE	3	47	23	24	Orangish brown mottled grey slightly gravelly slightly sandy silty CLAY
CP215	26UT	7.20	7.40	23.2	BXE	1	56	24	32	Dark grey slightly sandy silty CLAY
CP215	37Cs	9.70	9.90	20.8	BXE	1	50	21	29	Dark grey slightly sandy slightly gravelly silty CLAY
CP215	42Cs	11.50	11.55	30.3	BXE	8	53	22	31	Grey mottled brown slightly gravelly slightly sandy silty CLAY
CP215	47Cs	13.80	13.80	27.3	BXE	3	60	31	29	Brown slightly gravelly slightly sandy clayey SILT
CP215	52Cs	16.35	16.40	13.4	BXE	8	32	18	14	Light brown mottled orange slightly gravelly slightly sandy silty CLAY
CP215	56Cs	19.35	19.40	19.4	BXE	0	50	23	27	Greyish brown mottled orange slightly sandy silty CLAY

## general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

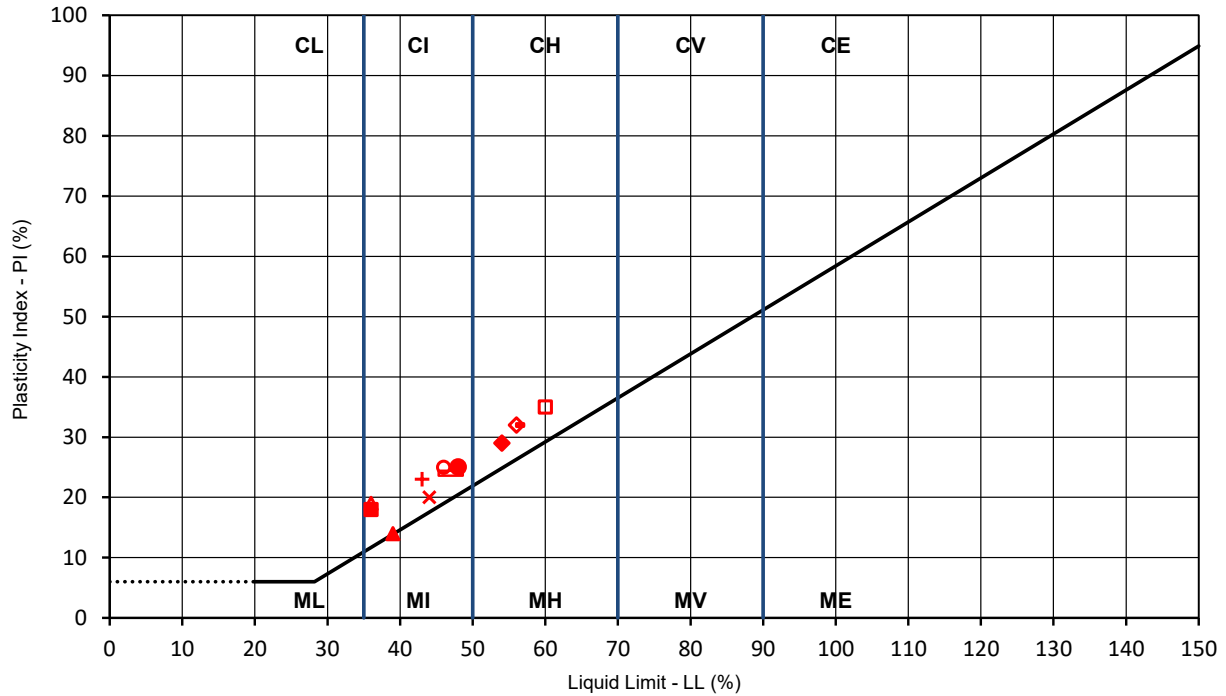
specimen preparation	test method	CONTRACT	CHECKED
A - as received	X - cone penetrometer (test 4.3)	<b>35371/02</b>	<b>TB</b>
B - washed on 0.425mm sieve	Y - cone penetrometer (test 4.4)		
C - air dried	Z - casagrande apparatus (test 4.5)		
D - oven dried (60oC)			
E - oven dried (105oC)			
F - not known			

Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A  
 (1059)



BH/TP No.	depth (m)	LL	PL	PI	remarks	
□	CP213	1.70	60	25	35	
◇	CP213	14.20	56	24	32	
△	CP213	16.50	36	17	19	
×	CP213	21.70	44	24	20	
+	CP214	3.05	43	20	23	
○	CP214	6.10	46	21	25	
■	CP214	15.10	36	18	18	
◆	CP214	19.85	54	25	29	
▲	CP214	24.20	39	25	14	
●	CP215	2.20	48	23	25	
▣	CP215	4.25	47	23	24	
▪	CP215	7.40	56	24	32	

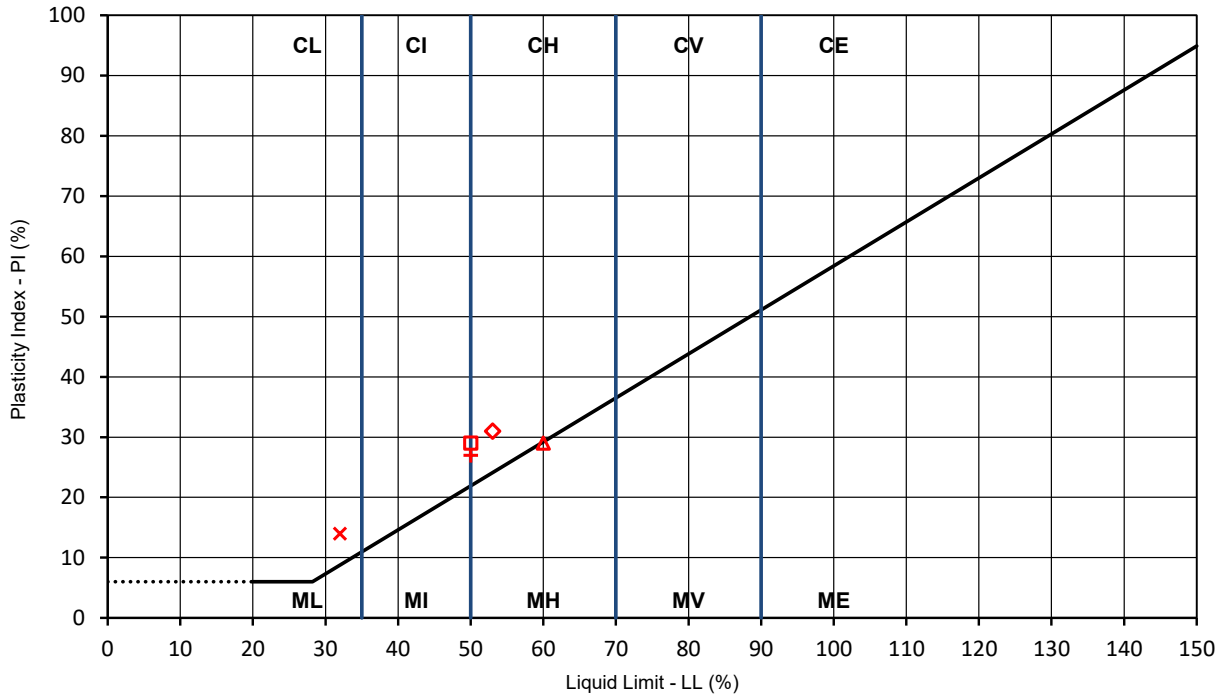
CONTRACT	CHECKED
<b>35371/02</b>	<b>TB</b>

Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A  
 (1059)





BH/TP No.	depth (m)	LL	PL	PI	remarks
□ CP215	9.90	50	21	29	
◇ CP215	11.55	53	22	31	
△ CP215	13.80	60	31	29	
× CP215	16.40	32	18	14	
+ CP215	19.40	50	23	27	

CONTRACT	CHECKED
<b>35371/02</b>	<b>TB</b>

# SUMMARY OF GEOTECHNICAL TESTING

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression			Chemical Tests			Other tests and comments	
Location	Depth (m)	Sample Ref	Type	Description	WC (%)	LL (%)	PL (%)	PI (%)	<425 µm (%)	Bulk Mg/m³	Dry Mg/m³	Condition	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 (g/L)		W/S Mg (mg/L)
CP213	8.00-8.45	UT22	U	Firm to stiff brown mottled dark grey fine sandy silty CLAY with rare fine gravel.	21.1	37	23	14	98										Effective Stress
CP214	1.20-1.75	UT3	U	Firm yellowish brown and brown slightly gravelly slightly sandy silty CLAY. Gravel is fine to medium.	43.1	77	30	47	85										
CP214	10.80-11.10	Cs31	C	Stiff to very stiff dark grey and dark brown silty CLAY with rare fine sand.	22.6	45	22	23	100										Effective Stress

Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed)

Checked and Approved by  J Sturges - Operations Manager 26/02/2020	Project Number:  <b>GEO / 30585</b>  Project Name:  <b>A417 MISSING LINK</b> <b>35371-02</b>	
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**SUMMARY OF LIQUID AND PLASTIC LIMIT TESTS**

Location	Depth m	Sample Ref	Sample Type	Description	Water Content BS EN ISO 17892-1 : 2014 %	Liquid Limit %	Plastic Limit %	Plasticity Index %	Percentage Passing 425µm %	Atterberg Classification	Test Type	Sample Condition
CP213	8.00-8.45	UT22	U	Firm to stiff brown mottled dark grey fine sandy silty CLAY with rare fine gravel.	21.1	37	23	14	98	CI	2	1
CP214	1.20-1.75	UT3	U	Firm yellowish brown and brown slightly gravelly slightly sandy silty CLAY. Gravel is fine to medium.	43.1	77	30	47	85	CV	2	1
CP214	10.80-11.10	Cs31	C	Stiff to very stiff dark grey and dark brown silty CLAY with rare fine sand.	22.6	45	22	23	100	CI	2	1

<p><b>Test Type:</b>          1 - 1 point 80g / 30° fall cone method.          2 - 4 point 80g / 30° fall cone method.          3 - Non plastic determination.</p>	<p><b>Sample condition:</b>          1 - As Received          2 - Air Dried          3 - Washed &amp; Air Dried</p>
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Checked and Approved by:



J Sturges - Operations Manager  
26/02/2020

Project Number: **GEO / 30585**

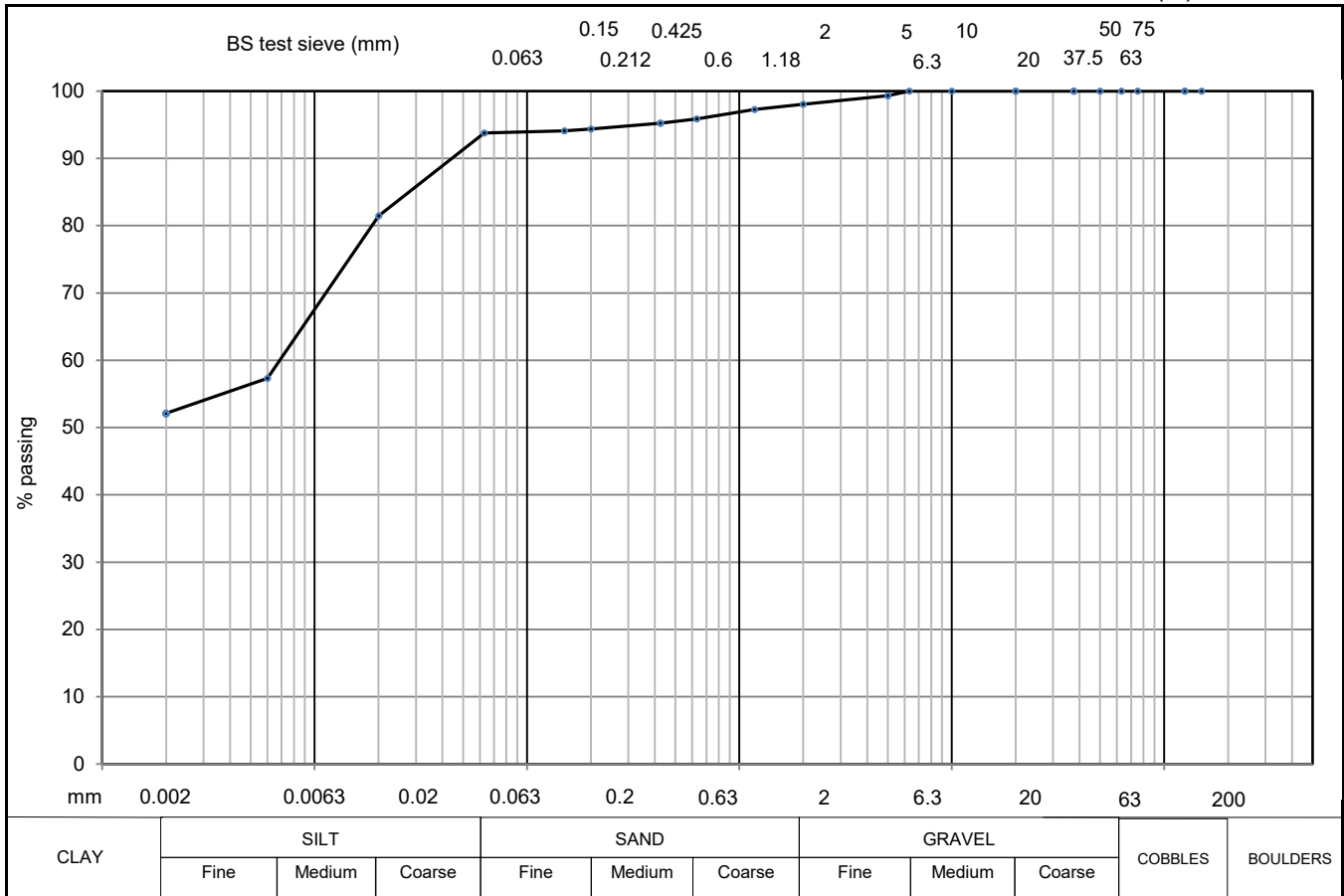
Project Name: **A417 MISSING LINK  
35371-02**



Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP213
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1059)	SAMPLE No./TYPE	5L
DESCRIPTION	Yellowish brown mottled grey slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	1.20
		SPECIMEN TOP (m)	1.70
		SPECIMEN BASE (m)	2.00



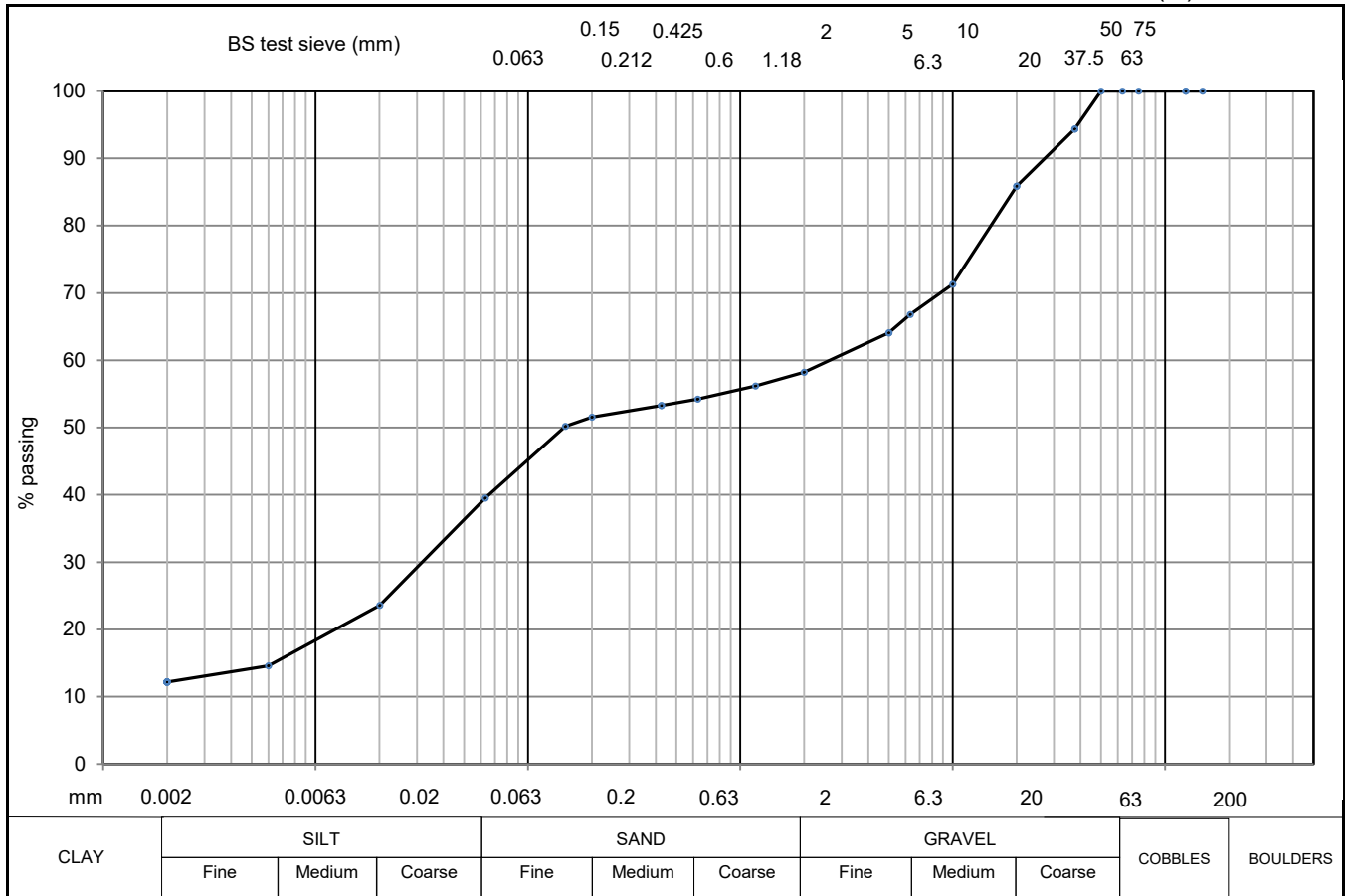
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	52						
SILT	42	150		5	99	20	81
SILT & CLAY	94						
SAND	4	75		2	98	6	57
GRAVEL	2						
COBBLE & BOULDER	0	63		1.18	97	2	52
test method(s)	5.2 & 5.4	50		0.63	96		
test method		37.5		0.425	95		
5.2 - sieving		20		0.2	94		
5.3 - sedimentation by hydrometer		10		0.15	94		
5.4 - sedimentation by pipette		6.3	100	0.063	94		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	CONTRACT <b>35371/02</b>	CHECKED <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP213
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1059)	SAMPLE No./TYPE	18L
DESCRIPTION	Yellowish and orangish brown slightly sandy gravelly silty CLAY	SAMPLE DEPTH (m)	6.00
		SPECIMEN TOP (m)	6.50
		SPECIMEN BASE (m)	7.00



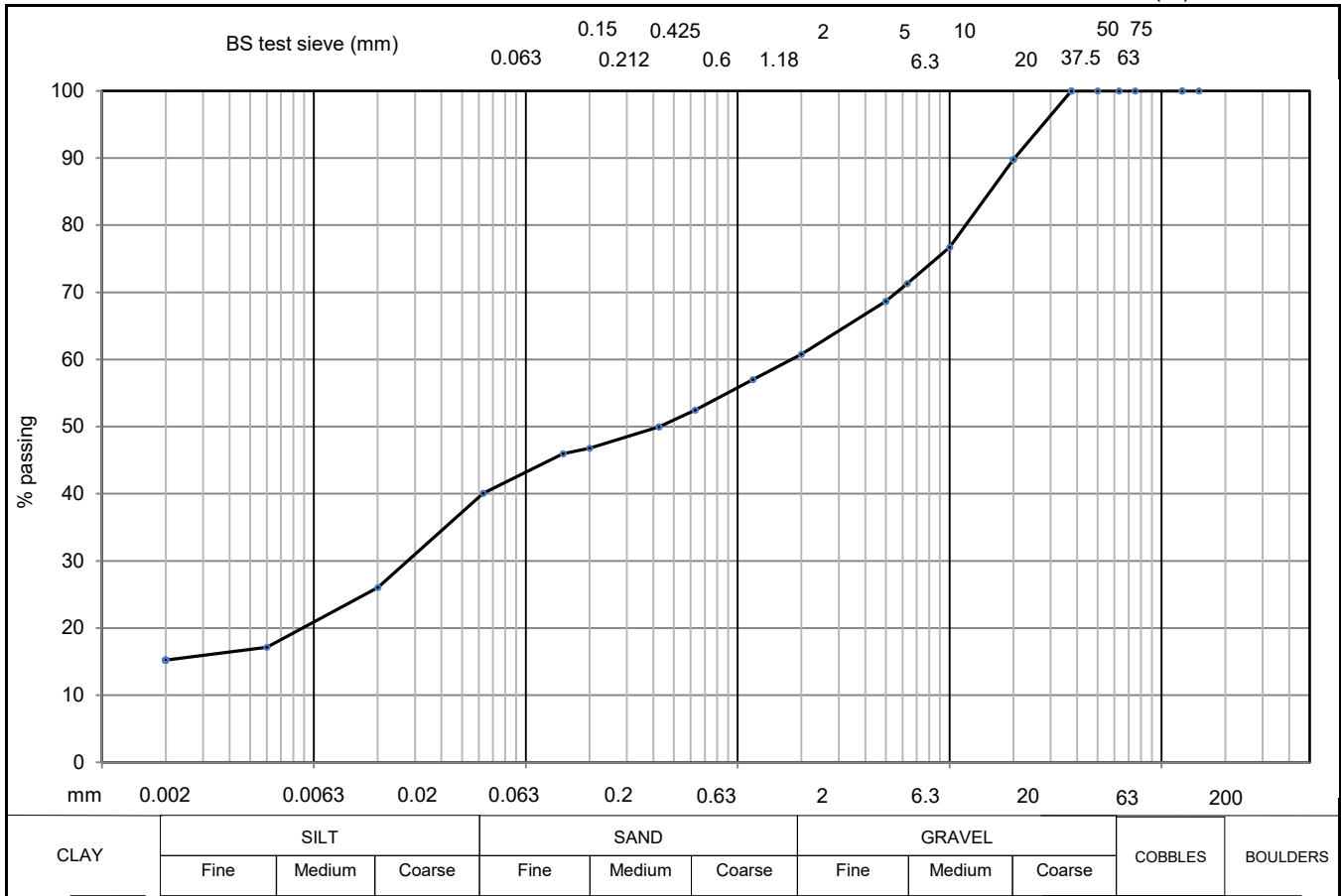
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	12						
SILT	27	150		5	64	20	24
SILT & CLAY	40						
SAND	19	75		2	58	6	15
GRAVEL	42						
COBBLE & BOULDER	0	63		1.18	56	2	12
test method(s)	5.2 & 5.4	50	100	0.63	54		
test method		37.5	94	0.425	53		
5.2 - sieving		20	86	0.2	52		
5.3 - sedimentation by hydrometer		10	71	0.15	50		
5.4 - sedimentation by pipette		6.3	67	0.063	40		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35371/02</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP213
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1059)	SAMPLE No./TYPE	45L
DESCRIPTION	Yellowish brown mottled orange slightly sandy gravelly silty CLAY	SAMPLE DEPTH (m)	16.50
		SPECIMEN TOP (m)	16.70
		SPECIMEN BASE (m)	17.40



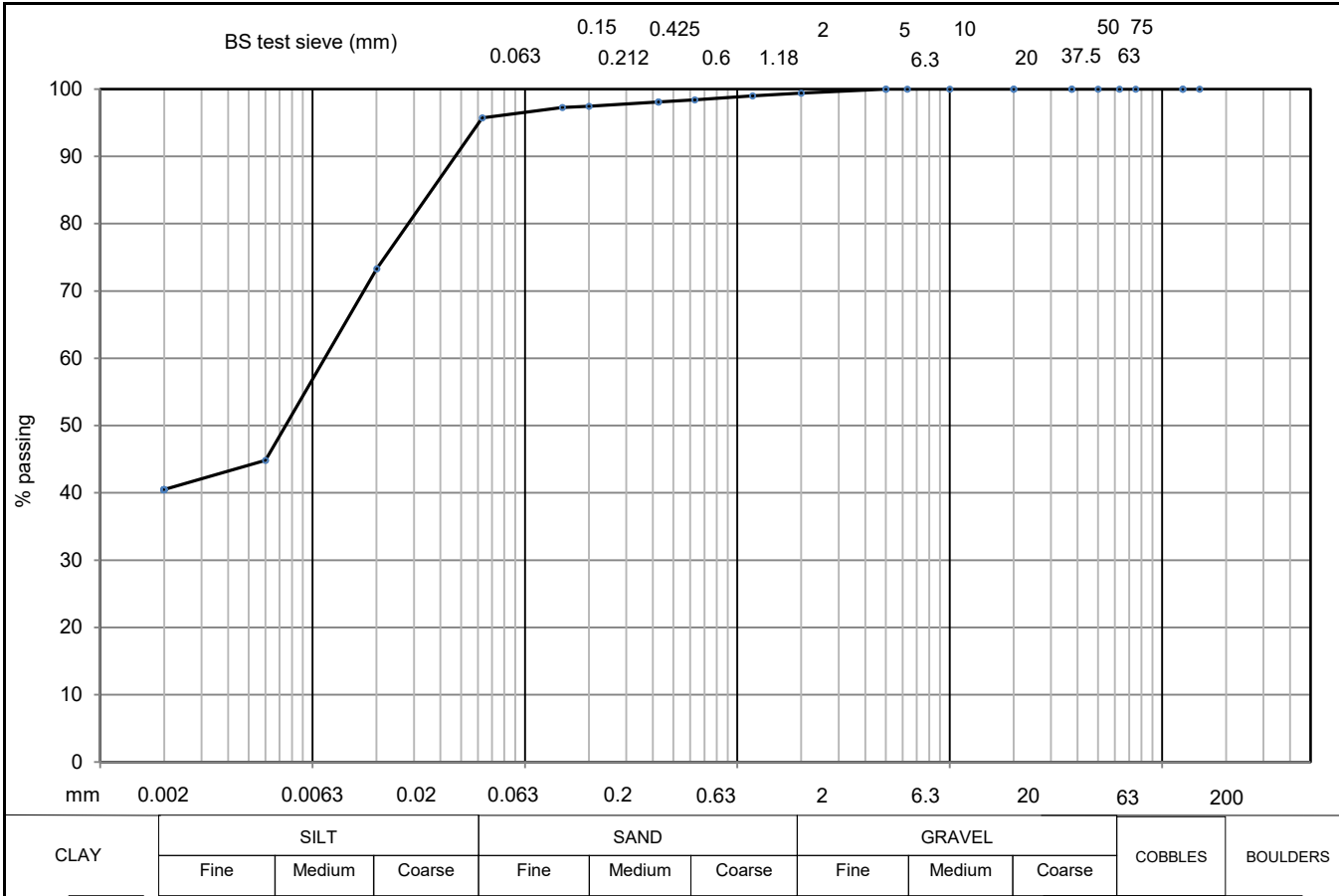
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	15						
SILT	25	150		5	69	20	26
SILT & CLAY	40						
SAND	21	75		2	61	6	17
GRAVEL	39						
COBBLE & BOULDER	0	63		1.18	57	2	15
test method(s)	5.2 & 5.4	50		0.63	52		
test method		37.5	100	0.425	50		
5.2 - sieving		20	90	0.2	47		
5.3 - sedimentation by hydrometer		10	77	0.15	46		
5.4 - sedimentation by pipette		6.3	71	0.063	40		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35371/02</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP214
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1059)	SAMPLE No./TYPE	10L
DESCRIPTION	Greyish brown mottled orange slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	3.00
		SPECIMEN TOP (m)	3.55
		SPECIMEN BASE (m)	4.00



CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		

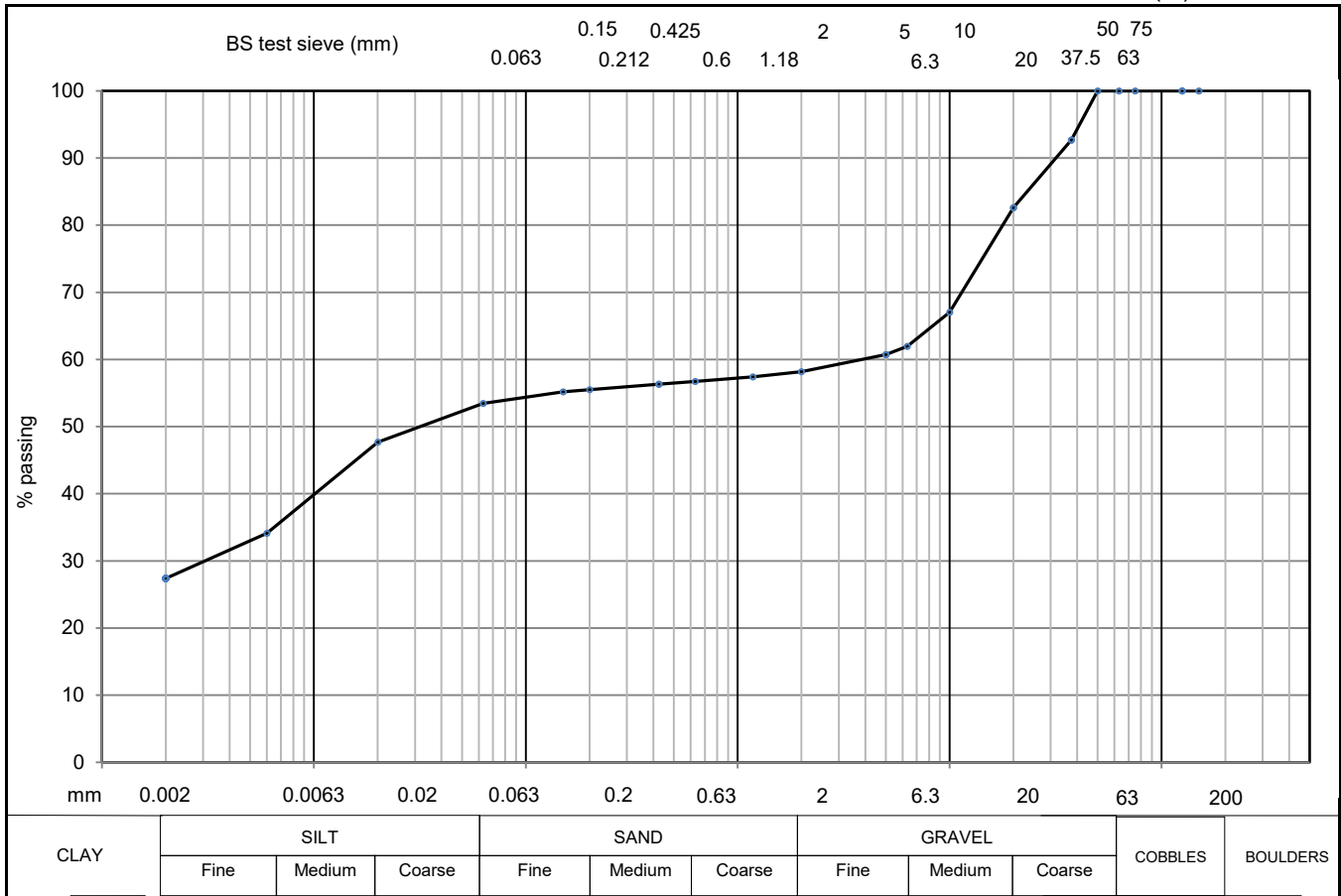
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	41						
SILT	55	150		5	100	20	73
SILT & CLAY	96						
SAND	4	75		2	99	6	45
GRAVEL	1						
COBBLE & BOULDER	0	63		1.18	99	2	40
test method(s)	5.2 & 5.4	50		0.63	98		
test method		37.5		0.425	98		
5.2 - sieving		20		0.2	97		
5.3 - sedimentation by hydrometer		10		0.15	97		
5.4 - sedimentation by pipette		6.3		0.063	96		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35371/02</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP214
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1059)	SAMPLE No./TYPE	30C
DESCRIPTION	Yellowish brown mottled grey slightly sandy gravelly silty CLAY	SAMPLE DEPTH (m)	10.00
		SPECIMEN TOP (m)	10.00
		SPECIMEN BASE (m)	10.50



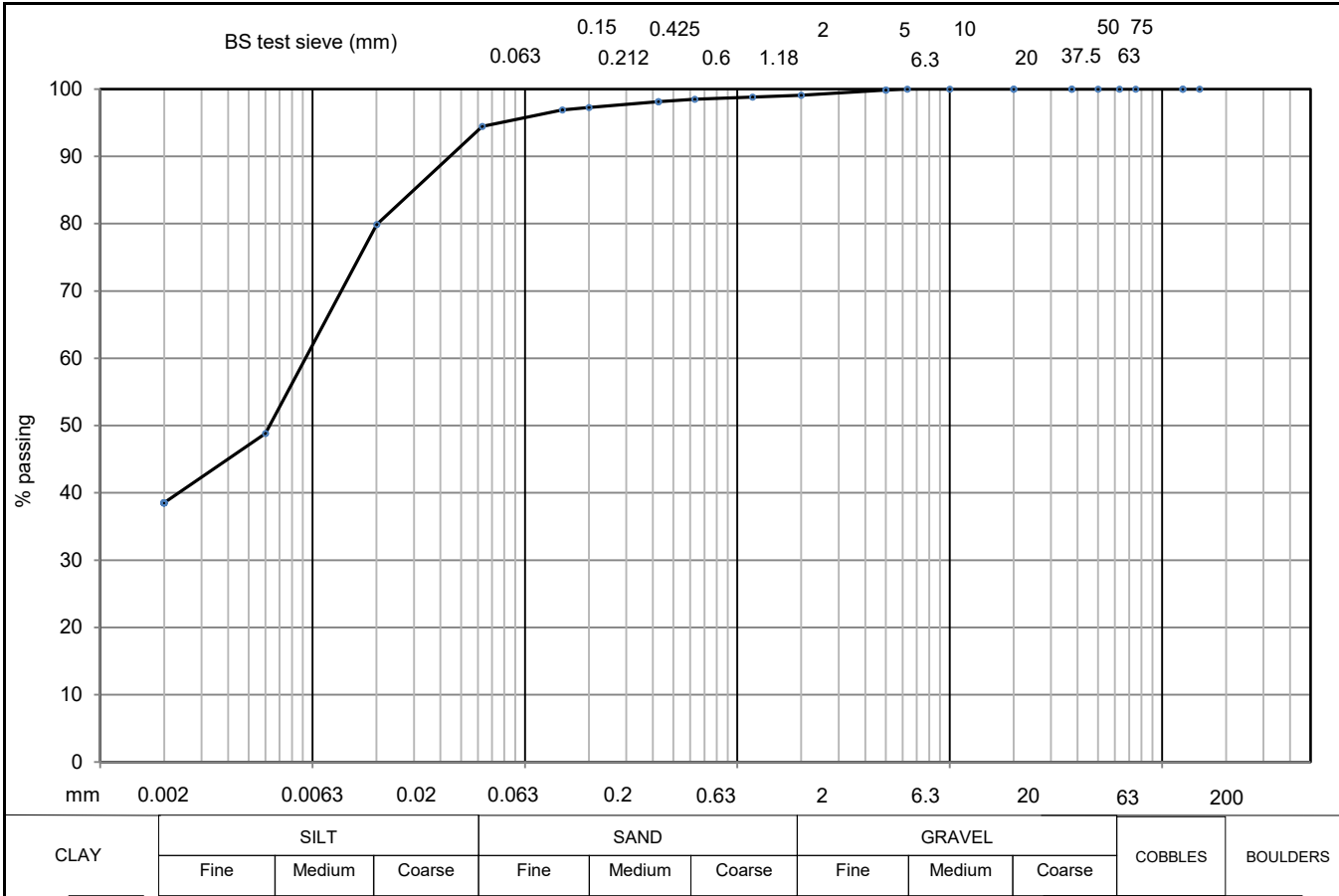
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	27						
SILT	26	150		5	61	20	48
SILT & CLAY	53						
SAND	5	75		2	58	6	34
GRAVEL	42						
COBBLE & BOULDER	0	63		1.18	57	2	27
test method(s)	5.2 & 5.4	50	100	0.63	57		
test method		37.5	93	0.425	56		
5.2 - sieving		20	83	0.2	55		
5.3 - sedimentation by hydrometer		10	67	0.15	55		
5.4 - sedimentation by pipette		6.3	62	0.063	53		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35371/02</b>	<b>TB</b>

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**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP215
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1059)	SAMPLE No./TYPE	18L
DESCRIPTION	Greyish brown mottled orange slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	4.20
		SPECIMEN TOP (m)	4.90
		SPECIMEN BASE (m)	5.20



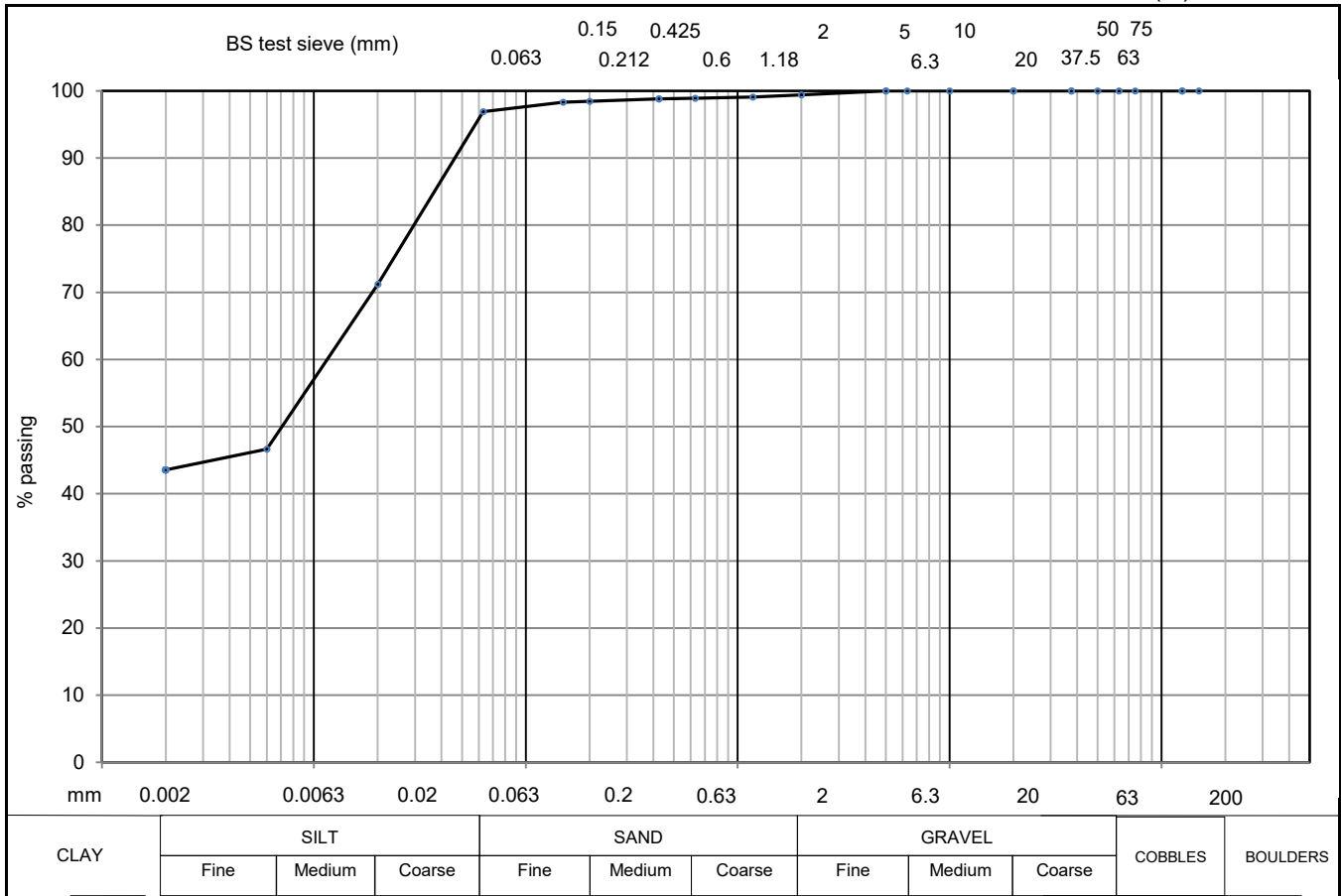
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	39						
SILT	56	150		5	100	20	80
SILT & CLAY	94						
SAND	5	75		2	99	6	49
GRAVEL	1						
COBBLE & BOULDER	0	63		1.18	99	2	39
test method(s)	5.2 & 5.4	50		0.63	98		
test method		37.5		0.425	98		
5.2 - sieving		20		0.2	97		
5.3 - sedimentation by hydrometer		10		0.15	97		
5.4 - sedimentation by pipette		6.3	100	0.063	94		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35371/02</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP215
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1059)	SAMPLE No./TYPE	35C
DESCRIPTION	Yellowish brown mottled orange slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	9.10
		SPECIMEN TOP (m)	9.10
		SPECIMEN BASE (m)	9.25



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	44						
SILT	53	150		5	100	20	71
SILT & CLAY	97						
SAND	2	75		2	99	6	47
GRAVEL	1						
COBBLE & BOULDER	0	63		1.18	99	2	44
test method(s)	5.2 & 5.4	50		0.63	99		
test method		37.5		0.425	99		
5.2 - sieving		20		0.2	98		
5.3 - sedimentation by hydrometer		10		0.15	98		
5.4 - sedimentation by pipette		6.3		0.063	97		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35371/02</b>	<b>TB</b>

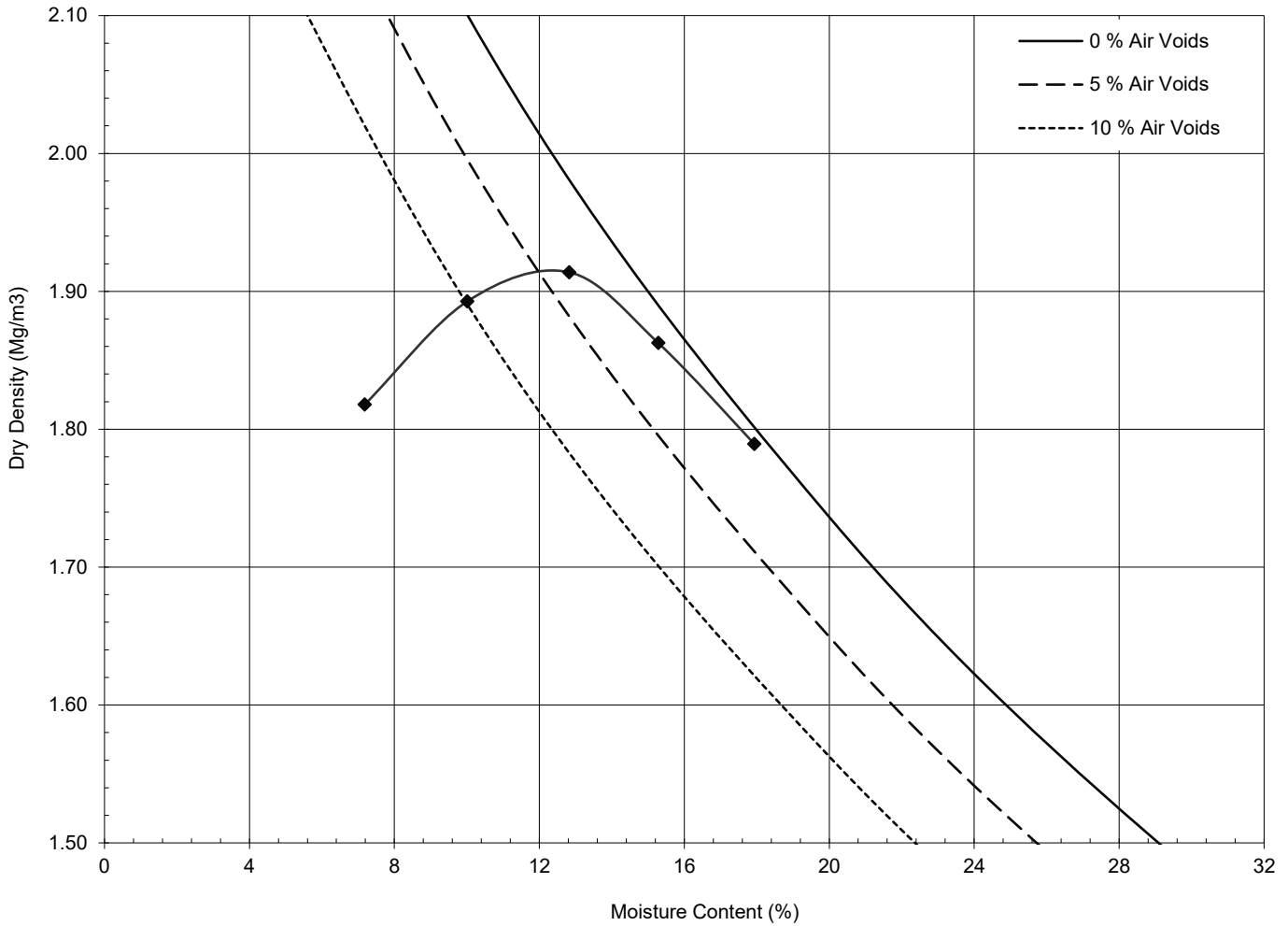


# DRY DENSITY/MOISTURE CONTENT RELATIONSHIP



BS. 1377 : Part 4 : 1990 : 3

CLIENT	OSBORNE	BH/TP No.	CP214
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1059)	SAMPLE No./TYPE	7L
DESCRIPTION	Yellowish brown slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	2.00
		SPECIMEN DEPTH (m)	2.00



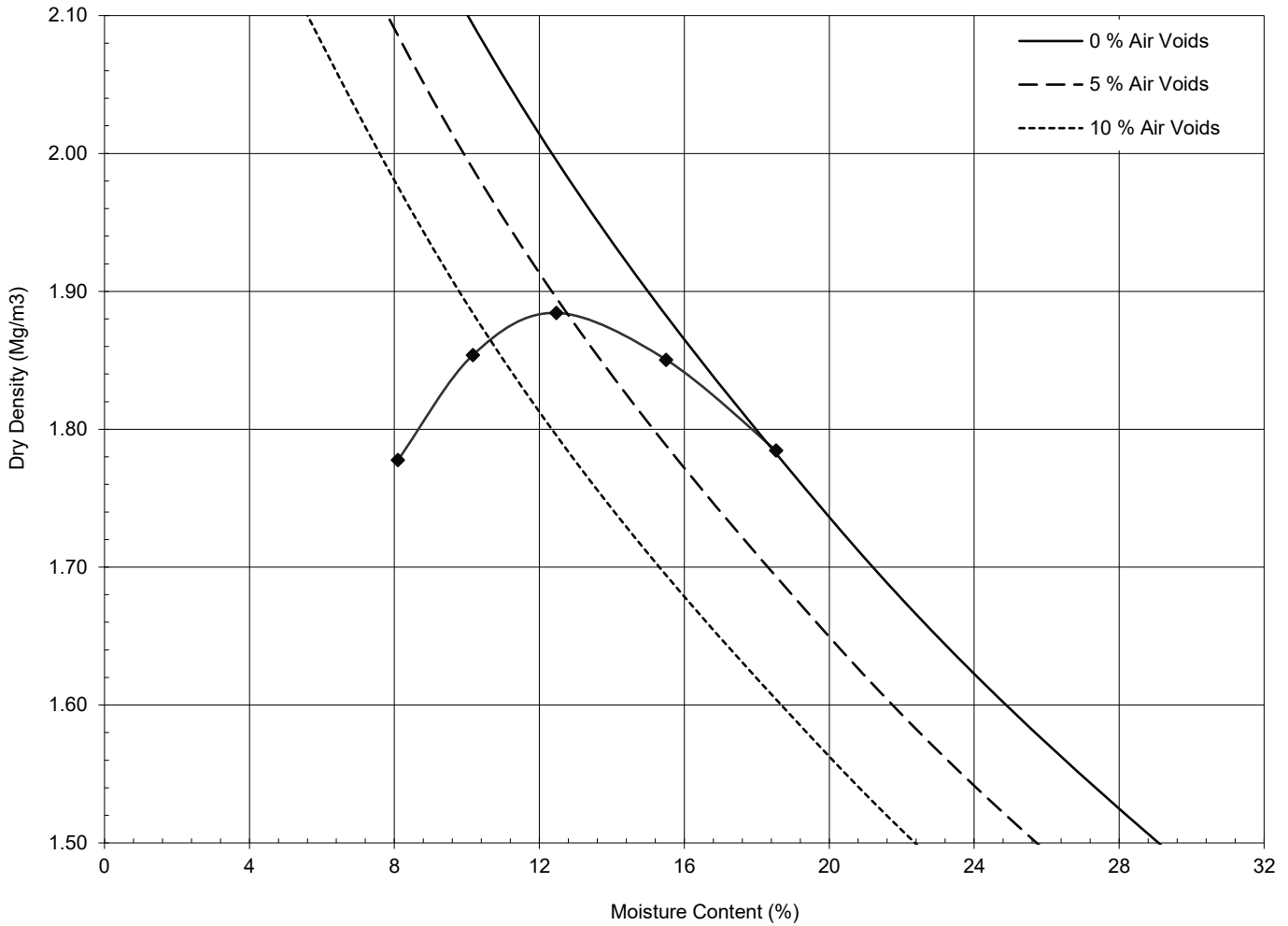
test method	3.5.4.1 4.5kg dynamic compaction - 1L mould				
preparation procedure	3.2.4.1 (grading zone 1)				
sample preparation	C R				
proportion retained on 37.5mm sieve	%	0	initial moisture content	%	8
proportion retained on 20mm sieve	%	0	maximum dry density	(Mg/m <sup>3</sup> )	1.92
particle density	(Mg/m <sup>3</sup> )	#2.66	optimum moisture content	%	12
remarks	# denotes particle density has been assigned an assumed value C denotes sample has been chopped to pass 20mm sieve S denotes sample has been shredded to pass 20mm sieve R denotes sample material has been recycled between/for points				
				CONTRACT	CHECKED
				<b>35371/02</b>	<b>TB</b>

# DRY DENSITY/MOISTURE CONTENT RELATIONSHIP



BS. 1377 : Part 4 : 1990 : 3

CLIENT	OSBORNE	BH/TP No.	CP215
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1059)	SAMPLE No./TYPE	13L
DESCRIPTION	Greyish brown slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	3.20
		SPECIMEN DEPTH (m)	3.20



test method	3.5.4.1 4.5kg dynamic compaction - 1L mould				
preparation procedure	3.2.4.1 (grading zone 1)				
sample preparation	C R				
proportion retained on 37.5mm sieve	%	0	initial moisture content	%	19
proportion retained on 20mm sieve	%	0	maximum dry density	(Mg/m <sup>3</sup> )	1.88
particle density	(Mg/m <sup>3</sup> )	#2.66	optimum moisture content	%	12
remarks	# denotes particle density has been assigned an assumed value C denotes sample has been chopped to pass 20mm sieve S denotes sample has been shredded to pass 20mm sieve R denotes sample material has been recycled between/for points				
				CONTRACT	CHECKED
				<b>35371/02</b>	<b>TB</b>

# RESIDUAL STRENGTH BY RING SHEAR



BS.1377 : Part 7 : 1990 : 6

CLIENT OSBORNE

BH/TP No.

CP215

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1059)

SAMPLE No./TYPE

7UT

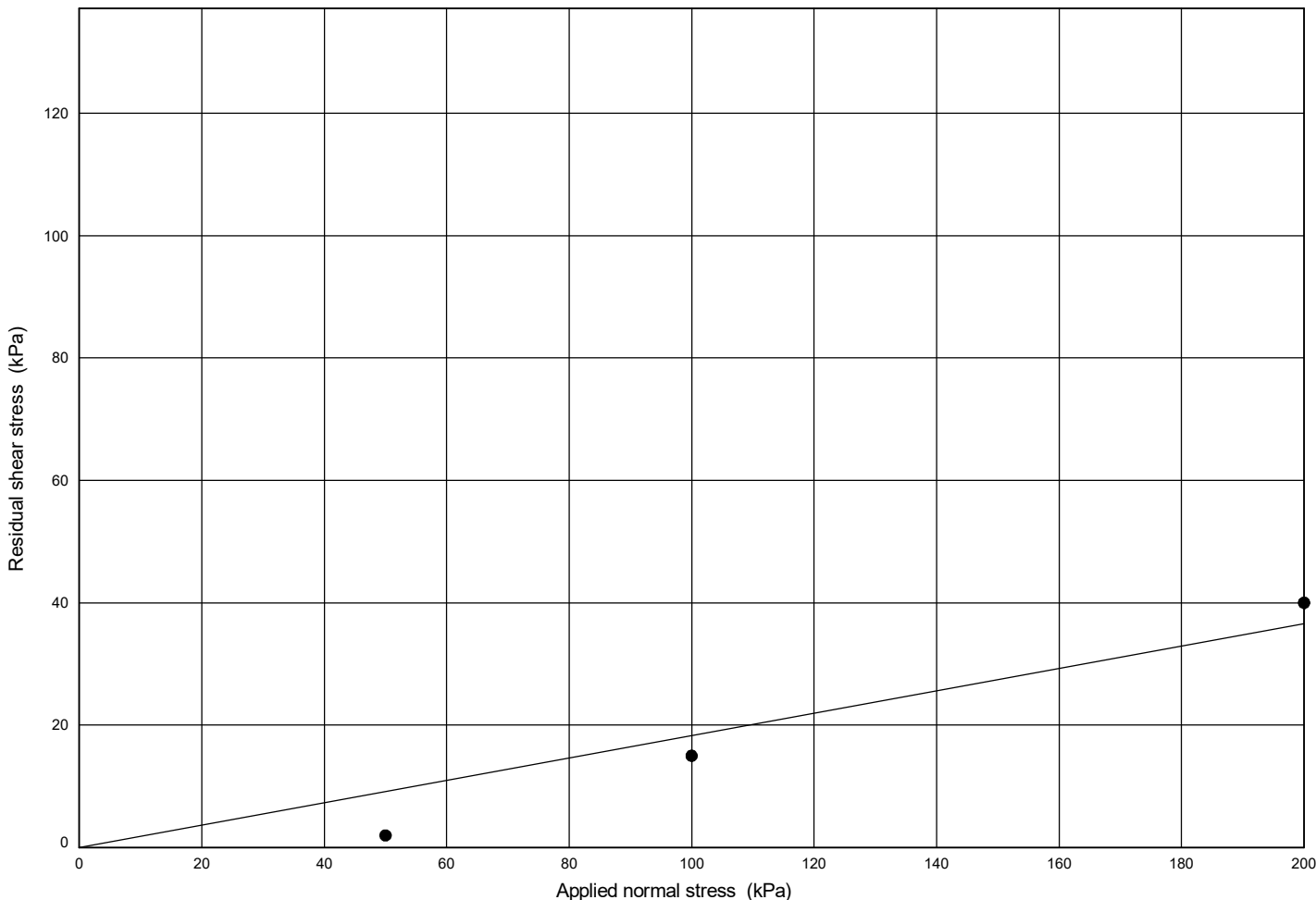
SAMPLE DEPTH (m)

2.20

DESCRIPTION Yellowish brown slightly sandy silty CLAY

SPECIMEN DEPTH (m)

2.20



Geotechnical Engineering Ltd, Centurion House, Olympus Park, Quevedale, Gloucester, GL2 4NF. Tel: 01452 527743 35371-02 1059.GPJ 20/04/2020 12:11:27

GENERAL DETAILS			SHEARING STAGES			
inner radius of specimen	(mm)	35	stage	normal stress (kPa)	residual shear stress (kPa)	cumulative angular displacement (degrees)
outer radius of specimen	(mm)	50	1	50	2.0	58
initial thickness of specimen	(mm)	5				
initial moisture content	(%)	26.8				
final moisture content	(%)	19.7				
rate of angular displacement	(mm/min)	0.052	2	100	15.0	69
SHEAR STRENGTH PARAMETERS			3	200	40.0	73
residual angle of shearing resistance $\phi'_r$ (deg)		10.5				
residual cohesion intercept $c'_r$ (kPa)		0				
remarks:					CONTRACT	CHECKED
					<b>35371/02</b>	<b>TB</b>

# UNDRAINED TRIAXIAL COMPRESSION

BS.1377 : PART 7 : 1990 : 8



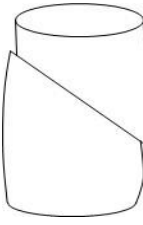
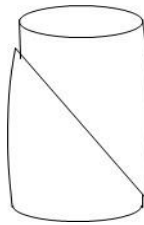
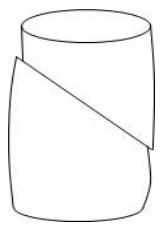
CLIENT OSBORNE




SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1059)

borehole /trial pit no.	sample		specimen depth (m)	code	moisture content		dimensions		density		cell pressure (kPa)	rate of strain (%/min)	deviator stress (kPa)	failure strain (%)	failure mode	shear strength* (kPa)	description and remarks
	no./type	depth (m)			initial (%)	final (%)	length (mm)	diameter (mm)	bulk (Mg/m3)	dry (Mg/m3)							
CP213	56Cs	21.70	21.70	UU70	13.1	15.1	180	90	2.17	1.92	400	2.0	1113	6.1	S	556	Dark grey clayey SILT
CP215	26UT	7.20	7.20	UU100	23	24.7	206	104	1.98	1.61	150	2.0	96	6.8	S	48	Grey slightly gravelly slightly sandy silty CLAY
CP215	37Cs	9.70	9.70	UU70	21	21.3	180	90	1.89	1.56	200	2.0	138	15.0	I	69	Dark grey slightly gravelly slightly sandy silty CLAY
<p>general remarks:</p> <p>* shear strength taken as half deviator stress at failure for each stage                      membrane correction applied                      sample taken vertically (unless otherwise specified)                      strain rate 2%/min (unless otherwise specified)</p> <p>code:                      UU - unconsolidated undrained                      M - multi stage                      S - set of three                      R - remoulded</p> <p>failure mode:                      B - barrel (plastic failure)                      S - shear (brittle failure)                      I - intermediate                      O - other (see remarks)</p> <p>membrane type/thickness:                      latex membrane used (unless otherwise specified)                      38 - 0.2mm                      70 - 0.4mm                      100 - 0.4mm</p>																	
															CONTRACT	CHECKED	
															<b>35371/02</b>	<b>TB</b>	

## Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: CP213 Sample No.: UT22 Depth (m): 8.00-8.45	Description: Brown clayey SILT.
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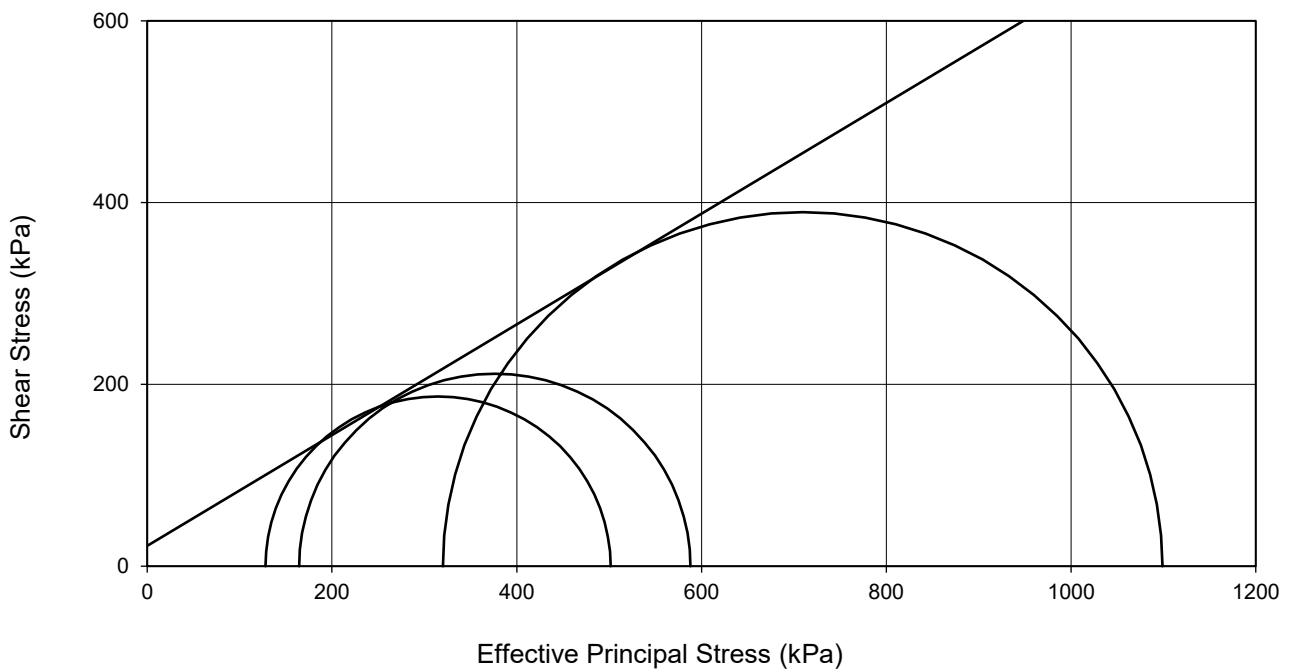
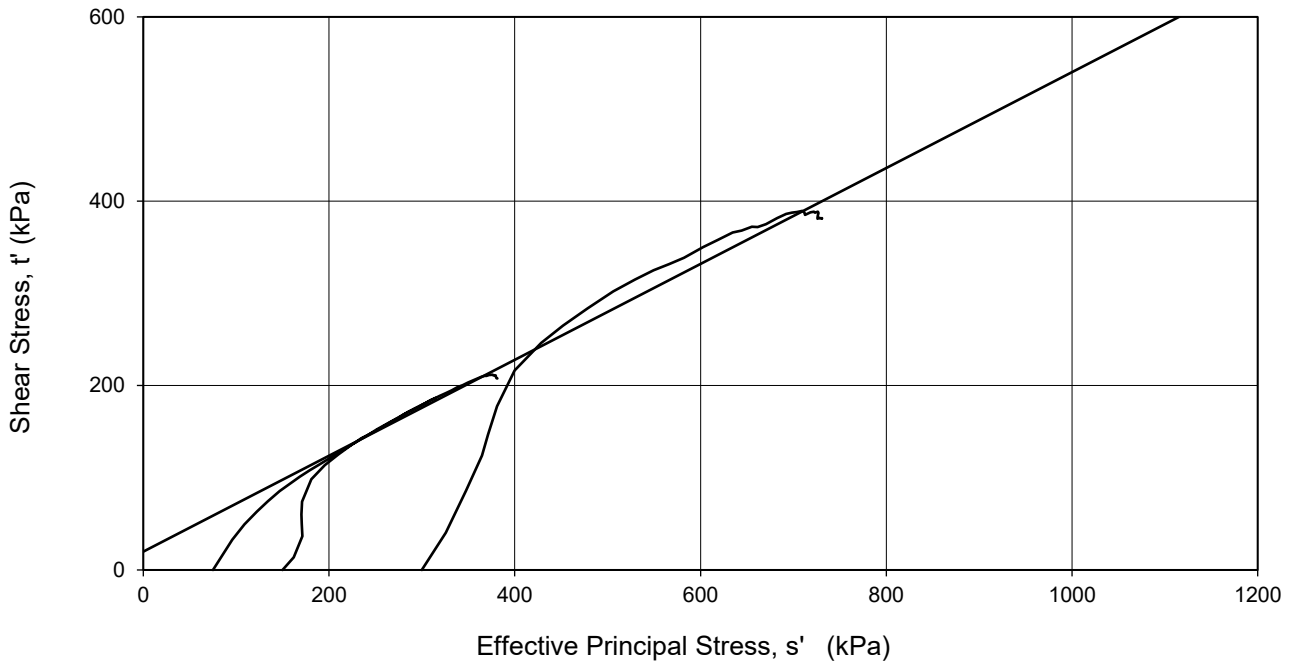
<b>SPECIMEN DETAILS</b>	20 mm from top		
Depth within original sample	Vertical		
<b>TEST DETAILS</b>	U (Undisturbed)		
Specimen Type and Preparation	Checks performed in accordance with Clause 3.5		
Cell Preparation			
Specimen Number	<b>Specimen No. 1</b>	<b>Specimen No. 2</b>	<b>Specimen No. 3</b>
Initial Diameter <i>mm</i>	38.50	37.75	37.85
Initial Length <i>mm</i>	74.83	75.17	75.18
Initial Water Content <i>%</i>	19.5	21.8	8.8
Initial Wet Density <i>Mg/m<sup>3</sup></i>	2.01	2.05	2.10
Drainage Conditions	One end and radial boundary		
<b>SATURATION STAGE</b>	Method: Clause 5.2	Method: Clause 5.3	Method: Clause 5.2
Final Cell Pressure <i>kPa</i>	375	450	600
Final Pore Pressure <i>kPa</i>	367	432	582
Final Pore Pressure Parameter B	0.97	0.95	0.99
Duration <i>day(s)</i>	3	3	3
<b>CONSOLIDATION STAGE</b>			
Cell Pressure <i>kPa</i>	375	450	600
Back Pressure <i>kPa</i>	300	300	300
Effective Pressure <i>kPa</i>	75	150	300
Final Pore Pressure <i>kPa</i>	300	300	300
Final Pore Pressure Dissipation <i>%</i>	100	100	100
Duration <i>day(s)</i>	1	1	1
<b>SHEARING STAGE</b>			
Cell Pressure <i>kPa</i>	375	450	600
Rate of Axial Displacement <i>mm/min</i>	0.015	0.015	0.015
Initial Pore Pressure <i>kPa</i>	300	300	300
Initial Effective Stress <i>kPa</i>	75	150	300
<b>CONDITIONS AT FAILURE</b>	Maximum deviator stress		
Pore Pressure <i>kPa</i>	247	286	280
Minor Effective Principal Stress <i>kPa</i>	128	164	320
Deviator Stress <i>kPa</i>	374	424	779
Major Effective Principal Stress <i>kPa</i>	502	588	1099
Effective Principal Stress Ratio	3.92	3.58	3.43
Pore Pressure Parameter A	-0.14	-0.03	-0.03
Axial Strain <i>%</i>	20.0	15.7	12.4
Membrane & filter correction applied to Deviator Stress <i>kPa</i>	16	15	14
Duration <i>day(s)</i>	1	1	1
Final Water Content <i>%</i>	19.5	19.7	18.4
Final Wet Density <i>Mg/m<sup>3</sup></i>	2.04	2.07	2.34
<b>EFFECTIVE STRESS PARAMETERS</b>			
Cohesion <i>kPa</i>	22		
Angle of Shear Resistance <i>degrees</i>	31.5		
<b>FAILURE SKETCH</b>			

Checked and Approved by  P Heritage - Project Manager 25/02/2020	Project Number: <h3 style="text-align: center;">GEO / 30585</h3> Project Name: <h2 style="text-align: center;">A417 MISSING LINK</h2> <h3 style="text-align: center;">35371-02</h3>	 
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## Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: CP213  
 Sample No.: UT22  
 Depth (m): 8.00-8.45

Description:  
 Brown clayey SILT.



Checked and Approved by



P Heritage - Project Manager  
 25/02/2020

Project Number:

**GEO / 30585**

Project Name:

**A417 MISSING LINK  
 35371-02**

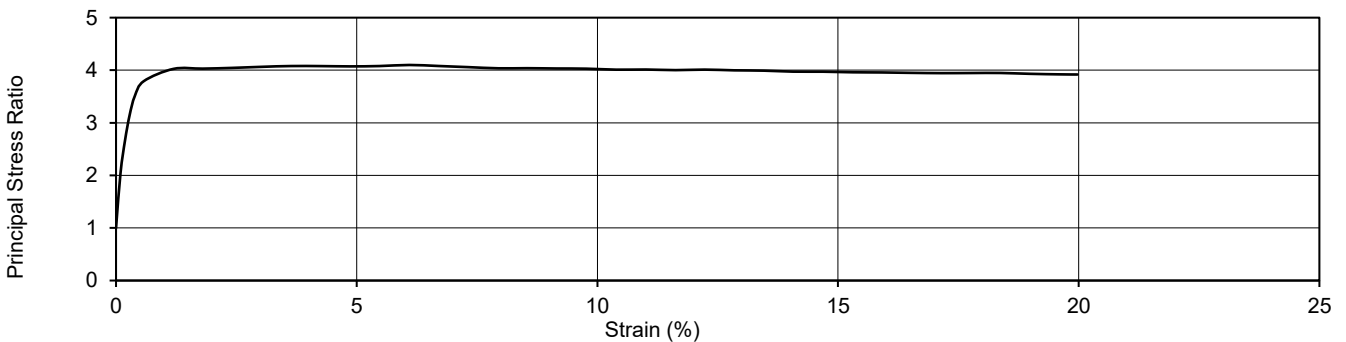
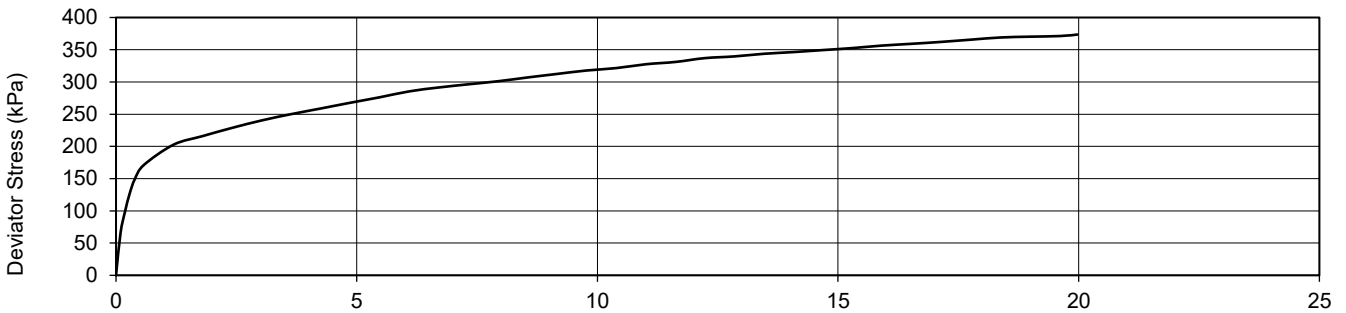
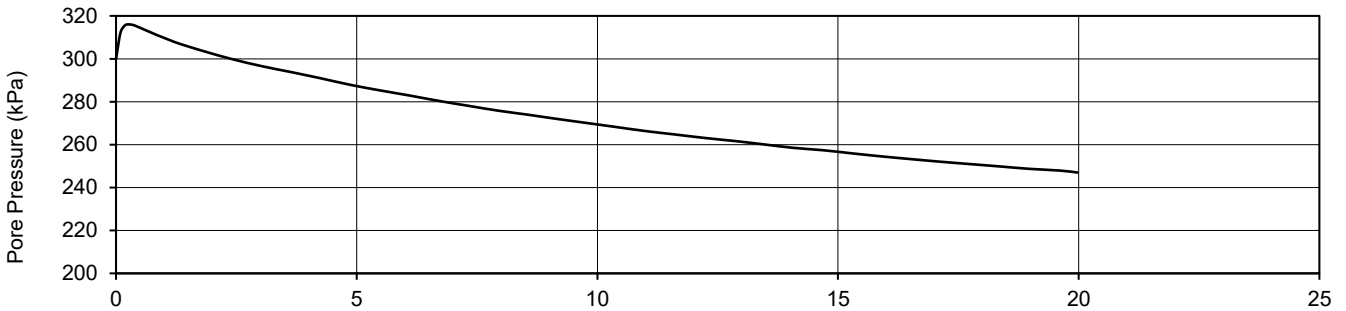
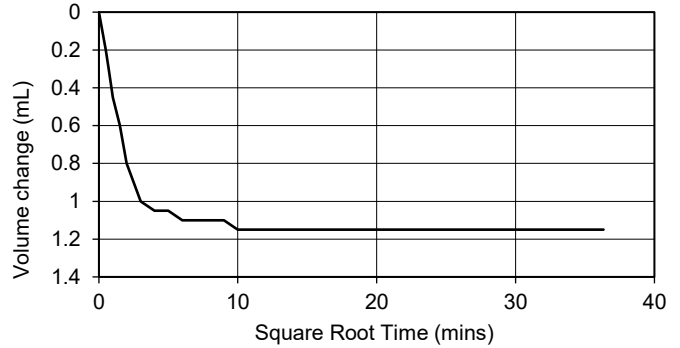
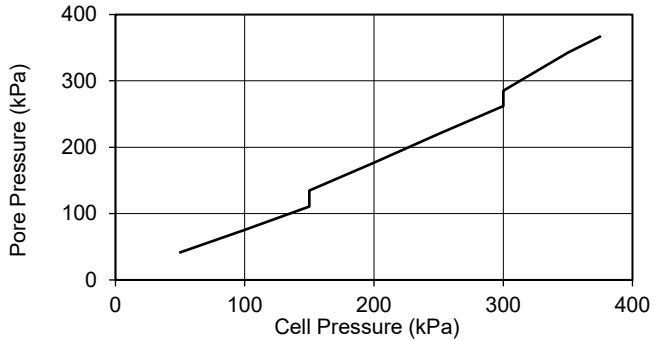
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# Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: CP213  
 Sample No.: UT22  
 Depth (m): 8.00-8.45

**Specimen 1**



Checked and Approved by



P Heritage - Project Manager  
25/02/2020

Project Number:

**GEO / 30585**

Project Name:

**A417 MISSING LINK  
35371-02**

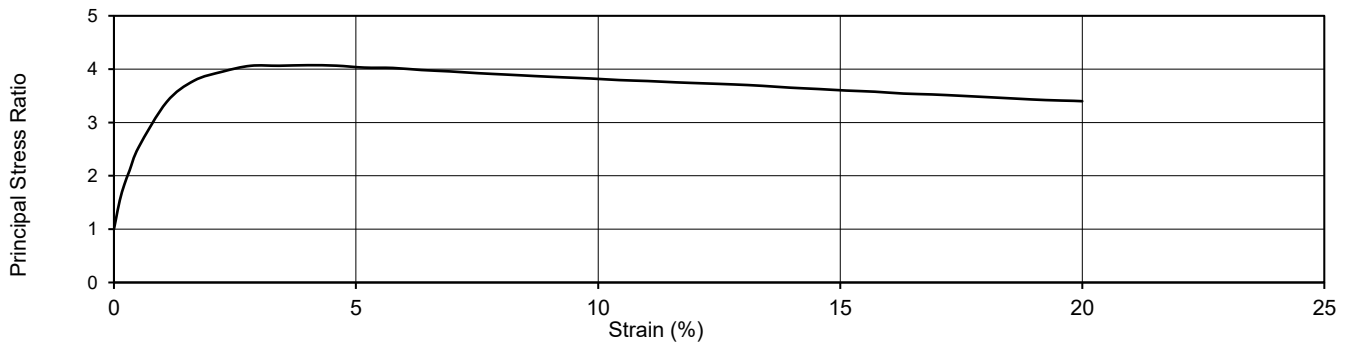
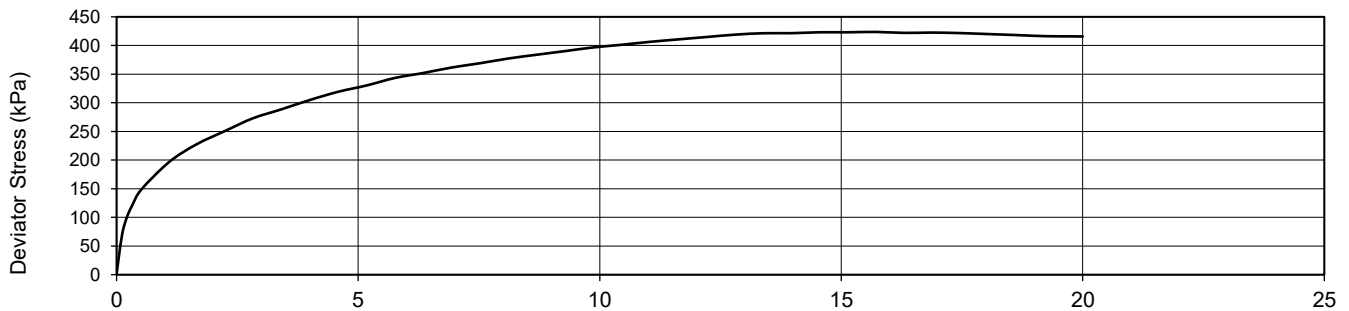
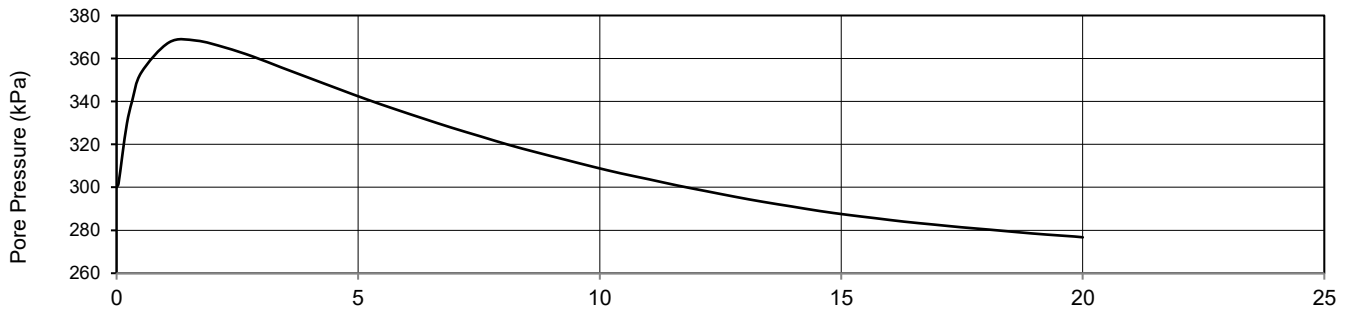
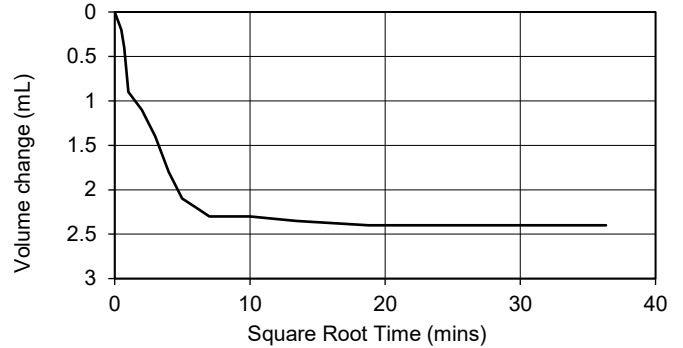
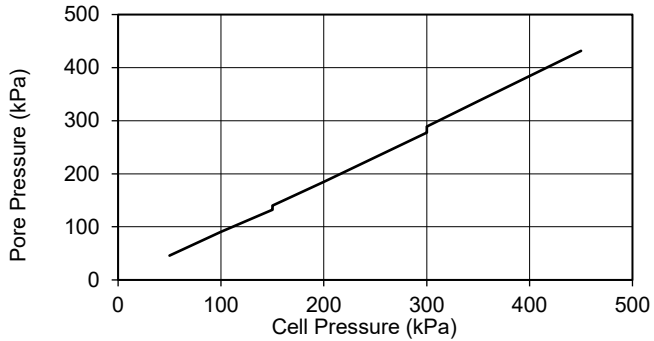
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## Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: CP213  
 Sample No.: UT22  
 Depth (m): 8.00-8.45

**Specimen 2**



Checked and Approved by



P Heritage - Project Manager  
25/02/2020

Project Number:

**GEO / 30585**

Project Name:

**A417 MISSING LINK  
35371-02**

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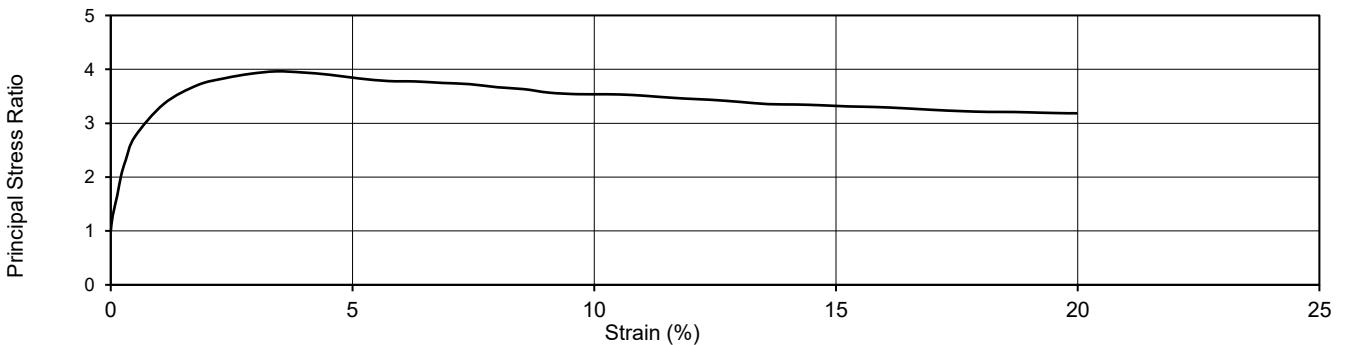
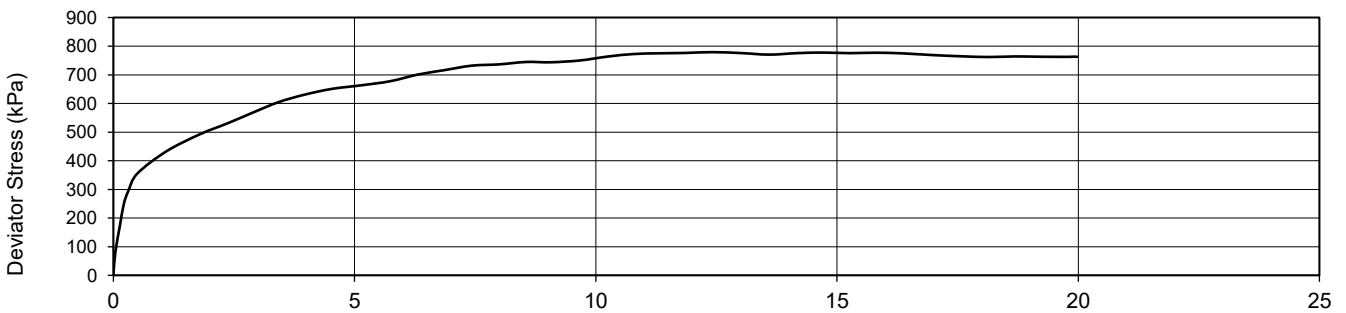
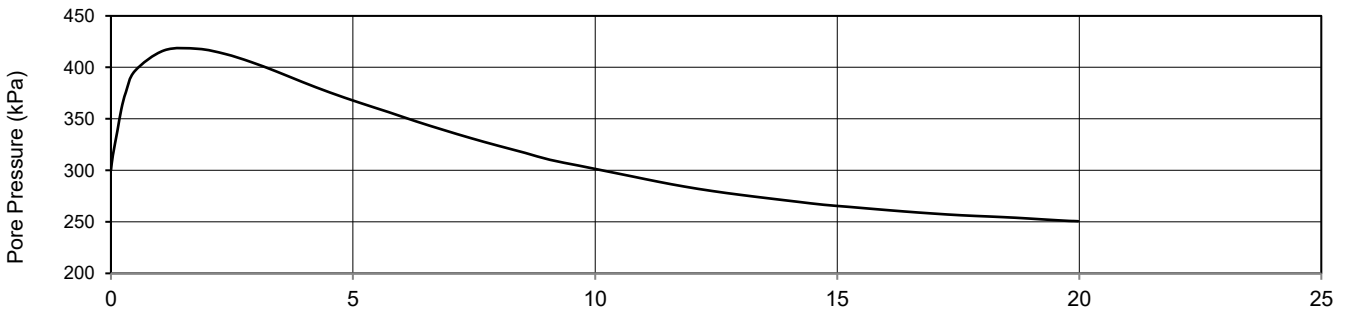
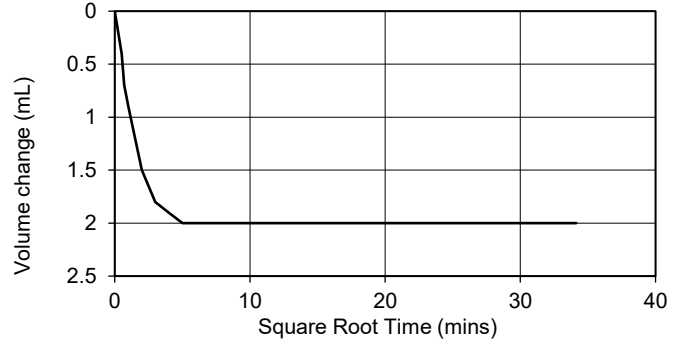
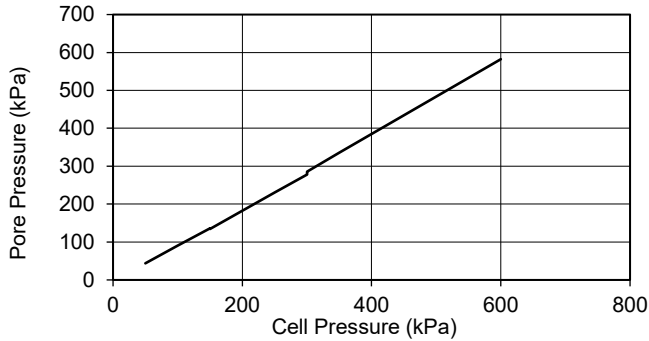




## Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: CP213  
 Sample No.: UT22  
 Depth (m): 8.00-8.45

**Specimen 3**



Checked and Approved by



P Heritage - Project Manager  
25/02/2020

Project Number:

**GEO / 30585**

Project Name:

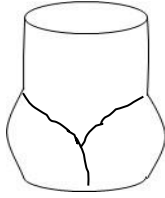
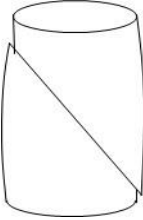
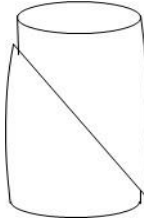
**A417 MISSING LINK  
35371-02**

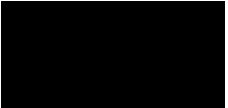

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## Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: CP214 Sample No.: Cs31 Depth (m): 10.80-11.10	Description: Brownish grey clayey SILT.
---	--

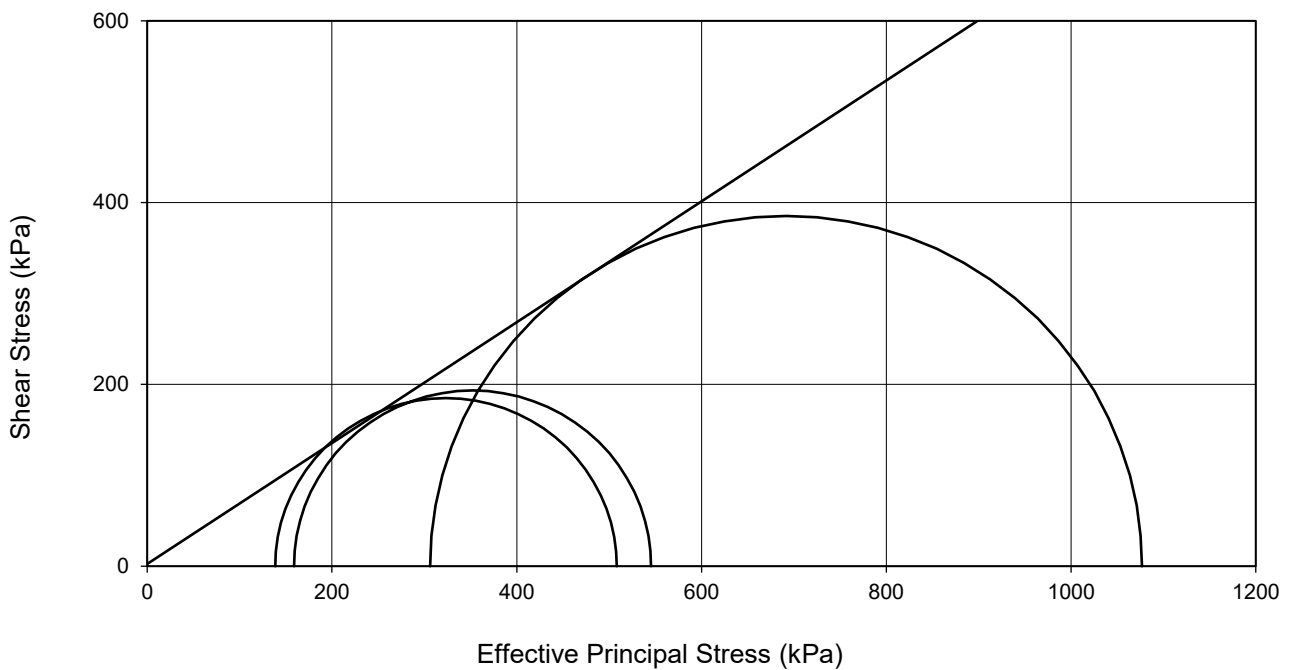
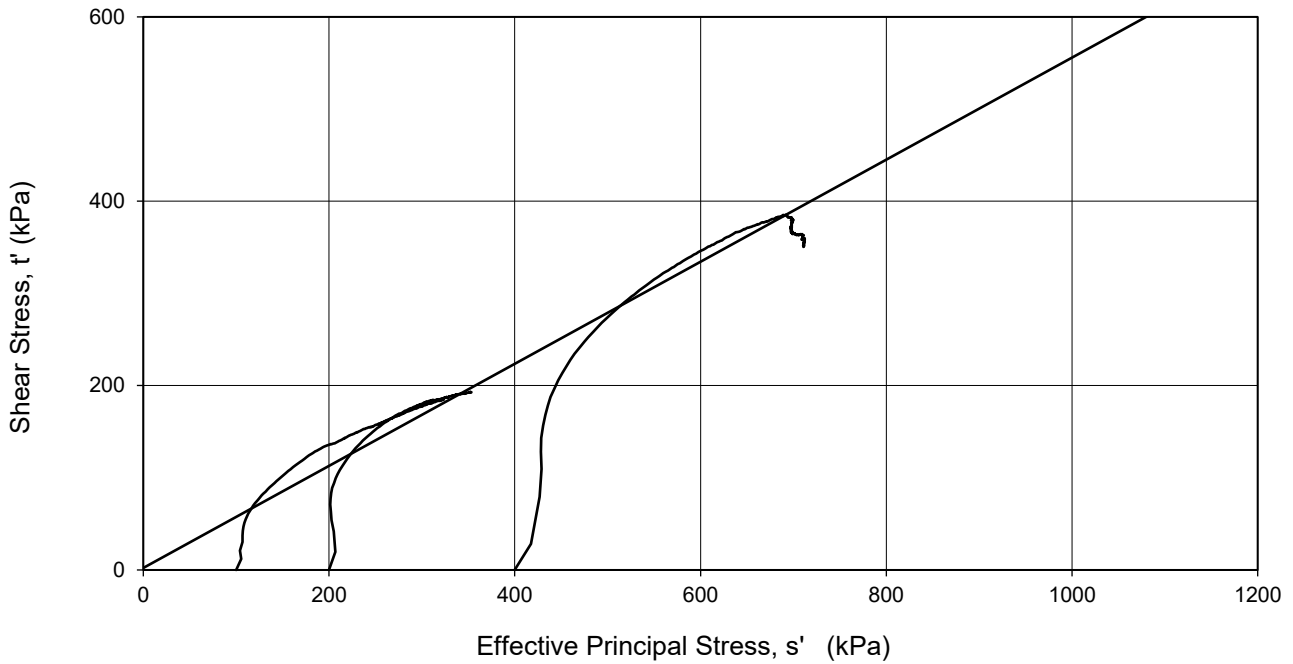
<b>SPECIMEN DETAILS</b>	20 mm from top		
Depth within original sample	Vertical		
Orientation within original sample			
<b>TEST DETAILS</b>	C (Undisturbed)		
Specimen Type and Preparation	Checks performed in accordance with Clause 3.5		
Cell Preparation			
Specimen Number	<b>Specimen No. 1</b>	<b>Specimen No. 2</b>	<b>Specimen No. 3</b>
Initial Diameter <i>mm</i>	38.22	38.09	37.41
Initial Length <i>mm</i>	76.52	76.76	76.77
Initial Water Content <i>%</i>	21.5	24.0	22.3
Initial Wet Density <i>Mg/m<sup>3</sup></i>	2.06	2.02	2.11
Drainage Conditions	One end and radial boundary		
<b>SATURATION STAGE</b>	Method: Clause 5.2	Method: Clause 5.2	Method: Clause 5.2
Final Cell Pressure <i>kPa</i>	400	500	700
Final Pore Pressure <i>kPa</i>	381	476	661
Final Pore Pressure Parameter B	0.95	0.96	0.95
Duration <i>day(s)</i>	2	2	2
<b>CONSOLIDATION STAGE</b>			
Cell Pressure <i>kPa</i>	400	500	700
Back Pressure <i>kPa</i>	300	300	300
Effective Pressure <i>kPa</i>	100	200	400
Final Pore Pressure <i>kPa</i>	300	300	300
Final Pore Pressure Dissipation <i>%</i>	100	100	100
Duration <i>day(s)</i>	1	1	1
<b>SHEARING STAGE</b>			
Cell Pressure <i>kPa</i>	400	500	700
Rate of Axial Displacement <i>mm/min</i>	0.015	0.015	0.015
Initial Pore Pressure <i>kPa</i>	300	300	300
Initial Effective Stress <i>kPa</i>	100	200	400
<b>CONDITIONS AT FAILURE</b>	Maximum deviator stress		
Pore Pressure <i>kPa</i>	261	341	394
Minor Effective Principal Stress <i>kPa</i>	139	159	306
Deviator Stress <i>kPa</i>	370	387	771
Major Effective Principal Stress <i>kPa</i>	509	546	1077
Effective Principal Stress Ratio	3.67	3.43	3.52
Pore Pressure Parameter A	-0.10	0.11	0.12
Axial Strain <i>%</i>	19.9	19.3	10.9
Membrane & filter correction applied to Deviator Stress <i>kPa</i>	16	16	14
Duration <i>day(s)</i>	1	1	1
Final Water Content <i>%</i>	22.5	22.8	21.6
Final Wet Density <i>Mg/m<sup>3</sup></i>	2.12	2.10	2.21
<b>EFFECTIVE STRESS PARAMETERS</b>			
Cohesion <i>kPa</i>	2.5		
Angle of Shear Resistance <i>degrees</i>	33.5		
<b>FAILURE SKETCH</b>			

Checked and Approved by	Project Number:	<b>GEO / 30585</b>
	Project Name:	<b>A417 MISSING LINK 35371-02</b>
P Heritage - Project Manager 25/02/2020		

## Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: CP214  
 Sample No.: Cs31  
 Depth (m): 10.80-11.10

Description:  
 Brownish grey clayey SILT.



Checked and Approved by



P Heritage - Project Manager  
 25/02/2020

Project Number:

**GEO / 30585**

Project Name:

**A417 MISSING LINK  
 35371-02**

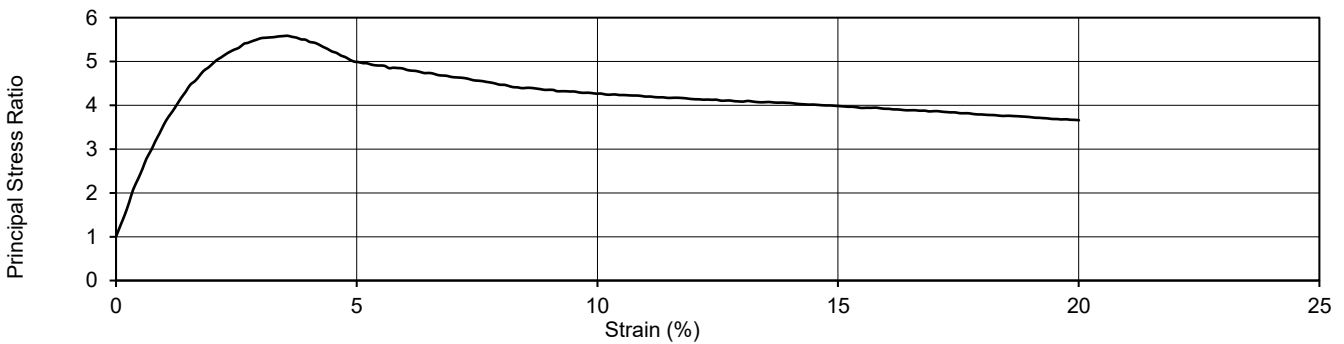
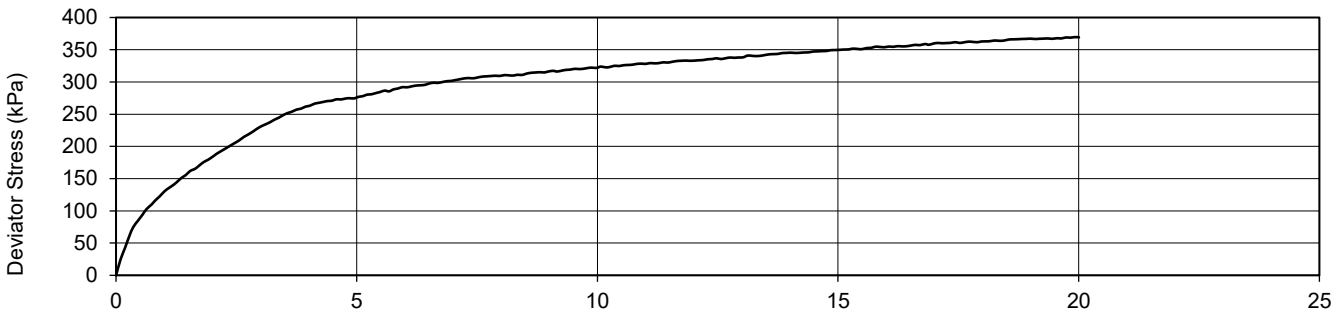
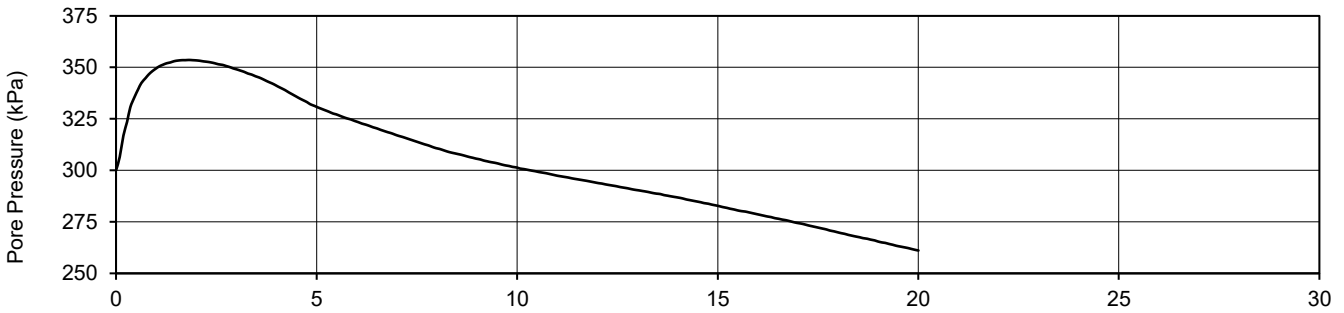
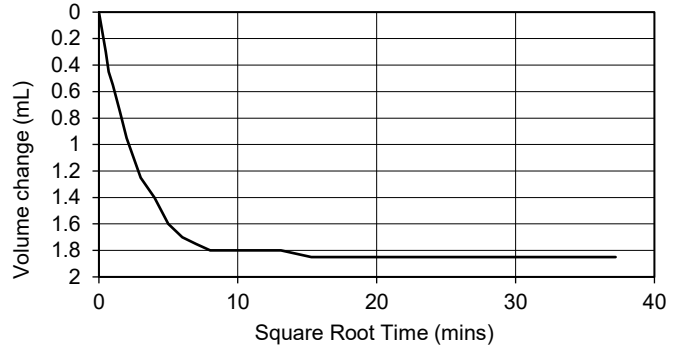
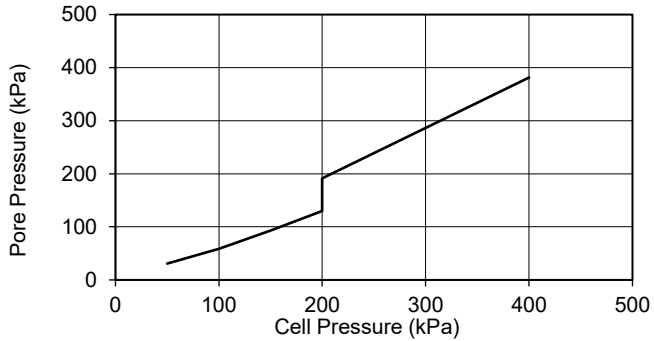
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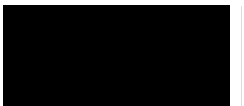
## Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: CP214  
 Sample No.: Cs31  
 Depth (m): 10.80-11.10

**Specimen 1**



Checked and Approved by



P Heritage - Project Manager  
25/02/2020

Project Number:

**GEO / 30585**

Project Name:

**A417 MISSING LINK  
35371-02**

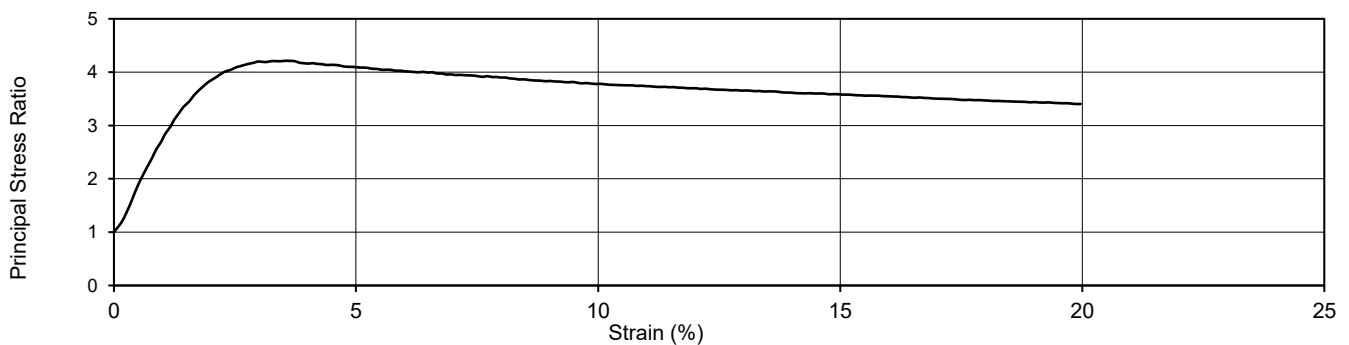
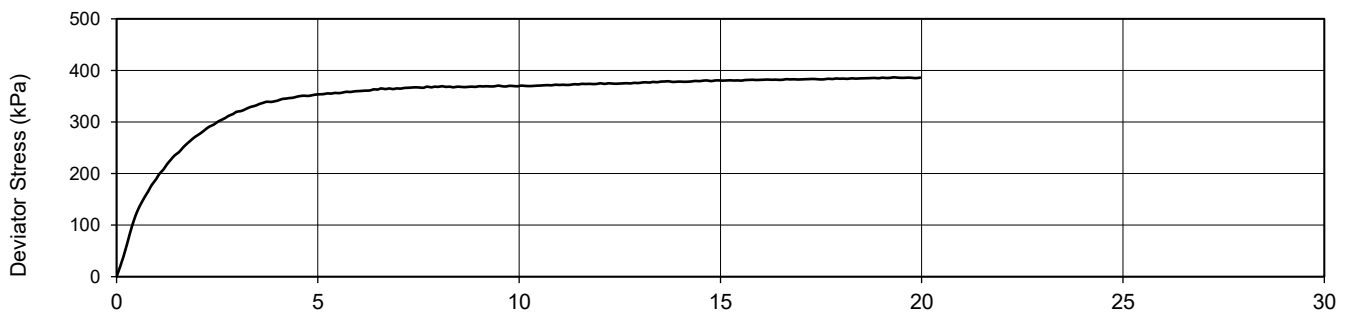
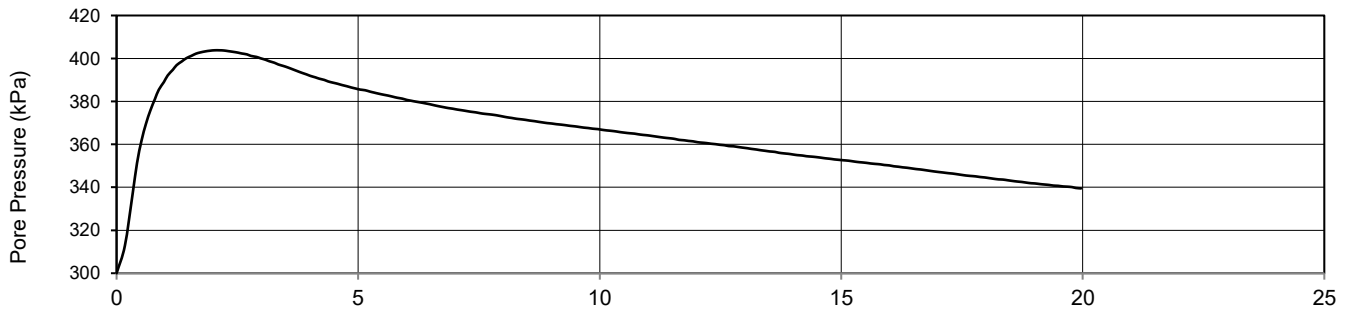
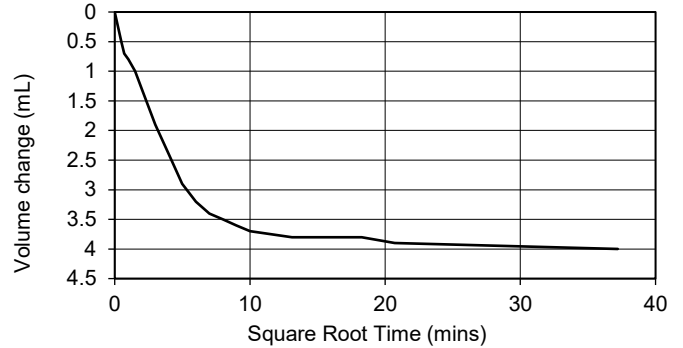
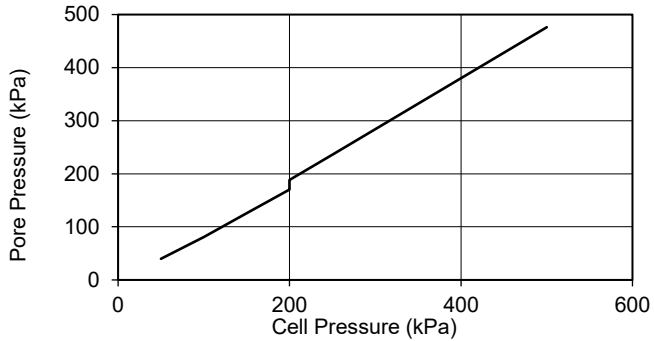
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## Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: CP214  
 Sample No.: Cs31  
 Depth (m): 10.80-11.10

**Specimen 2**



Checked and Approved by



P Heritage - Project Manager  
25/02/2020

Project Number:

**GEO / 30585**

Project Name:

**A417 MISSING LINK  
35371-02**

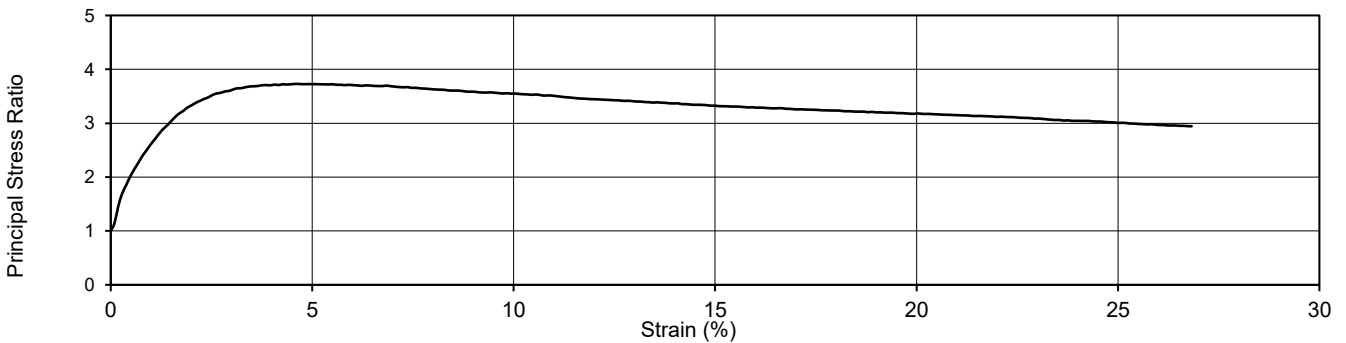
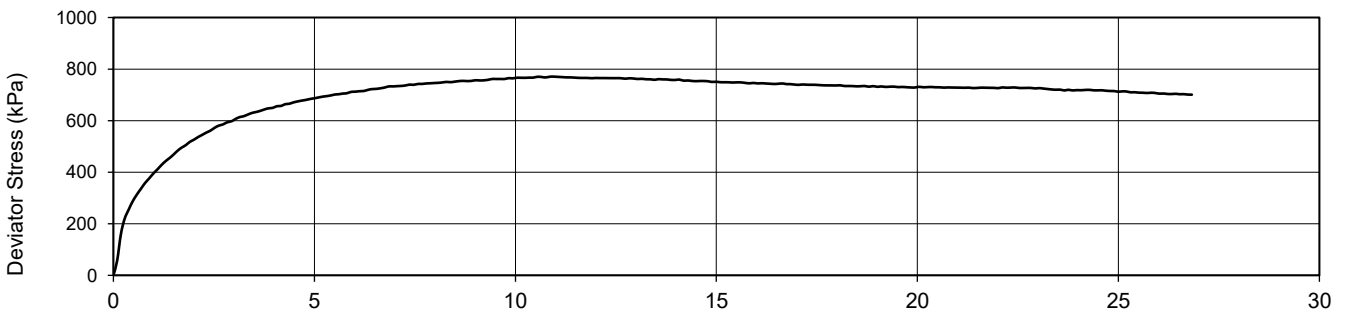
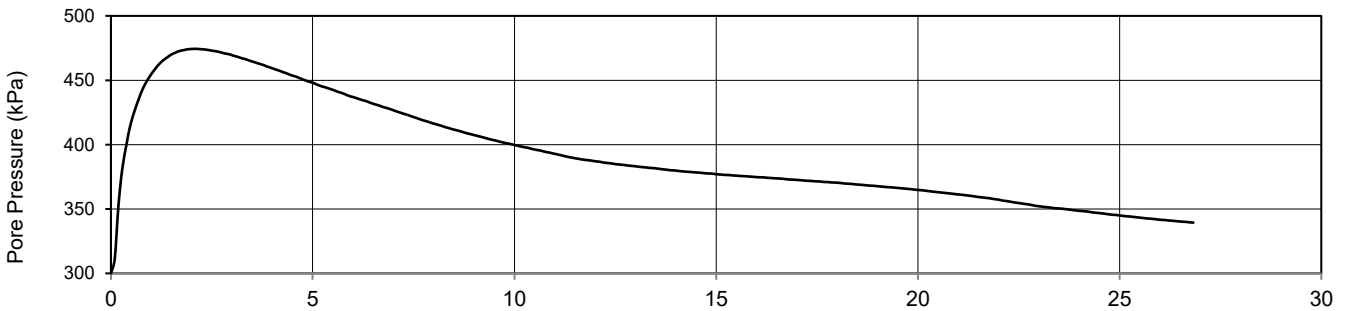
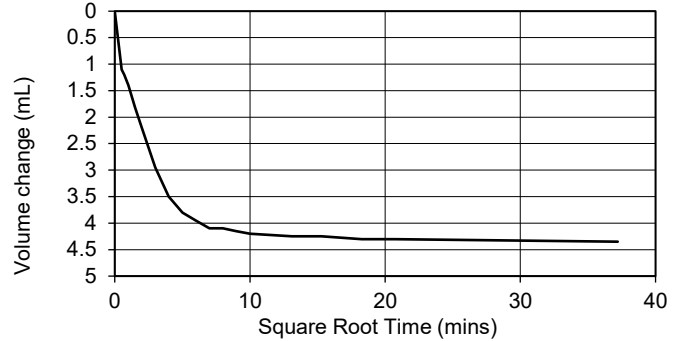
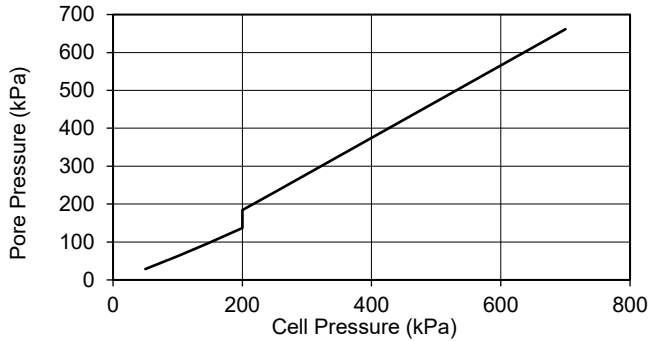
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## Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: CP214  
 Sample No.: Cs31  
 Depth (m): 10.80-11.10

**Specimen 3**



Checked and Approved by

  
 P Heritage - Project Manager  
 25/02/2020

Project Number:

**GEO / 30585**

Project Name:

**A417 MISSING LINK  
35371-02**

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# POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1059)

borehole /trial pit no.	sample depth (m)	test type	test orientation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)	L (mm)						
CP213	24.90	A	X	N	90		60		1.01	82.92	0.15	1.26	0.18	Grey mottled orange LIMESTONE
CP213	24.90	D	Y	N		60	90		5.21	90.00	0.64	1.30	0.84	Grey mottled orange LIMESTONE
CP214	15.35	A	X	P	105		40		1.02	73.13	0.19	1.19	0.23	Grey LIMESTONE
CP214	15.35	D	Y	P		40	105		0.82	105.00	0.07	1.40	0.10	Grey LIMESTONE

general remarks  
 tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
 test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	<b>CONTRACT</b> <b>35371/02</b>	<b>CHECKED</b> <b>TB</b>
A - axial	X - perpendicular U - unknown	N - natural moisture content		
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		



## Final Report

---

**Report No.:** 20-02332-1  
**Initial Date of Issue:** 29-Jan-2020  
**Client** Geotechnical Engineering Ltd  
**Client Address:** Centurion House  
Olympus Park  
Quedgeley  
Gloucester  
Gloucestershire  
GL2 4NF  
**Contact(s):** GEL  
Tom Best  
**Project** 35371/02 A417 Missing Link

<b>Quotation No.:</b>		<b>Date Received:</b>	24-Jan-2020
<b>Order No.:</b>	35371/02 LAB	<b>Date Instructed:</b>	24-Jan-2020
<b>No. of Samples:</b>	2		
<b>Turnaround (Wkdays):</b>	5	<b>Results Due:</b>	30-Jan-2020
<b>Date Approved:</b>	29-Jan-2020		

**Approved By:**

**Details:** Darrell Hall, Director

---



**Project: 35371/02 A417 Missing Link**

<b>Client: Geotechnical Engineering Ltd</b>		<b>Chemtest Job No.:</b>		20-02332	20-02332	
Quotation No.:		<b>Chemtest Sample ID.:</b>		958524	958525	
		Client Sample ID.:		30L	41C	
		Sample Location:		CP213	CP215	
		Sample Type:		SOIL	SOIL	
		Top Depth (m):		10.00	11.50	
		Bottom Depth (m):		11.50	13.00	
		Date Sampled:		22-Jan-2020	22-Jan-2020	
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>		
Moisture	N	2030	%	0.020	15	15
pH	U	2010		4.0	7.9	
pH (2.5:1)	N	2010		4.0		7.8
Magnesium (Water Soluble)	N	2120	g/l	0.010		0.015
Sulphate (2:1 Water Soluble) as SO <sub>4</sub>	U	2120	g/l	0.010	0.51	0.30
Total Sulphur	U	2175	%	0.010	0.90	0.56
Chloride (Water Soluble)	U	2220	g/l	0.010		< 0.010
Nitrate (Water Soluble)	N	2220	g/l	0.010		< 0.010
Sulphate (Acid Soluble)	U	2430	%	0.010	0.12	0.16

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measurement by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

## **Report Information**

### **Key**

---

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

---

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



2718

GEOTECHNICAL ENGINEERING LIMITED




For the attention of David Owen/Edward Crimp

Version No. 3  
Page No. 1 of 34  
Date of Issue 02/09/2020**TEST REPORT**

PROJECT/SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-PHASE 2A (992)	Samples received	20/01/2020
GEL REPORT NUMBER	35560-01	Schedule received	20/01/2020
Test report refers to	All Schedules	Testing commenced	22/01/2020
		Status	Final

**SUMMARY OF RESULTS ATTACHED**

TEST METHOD & DESCRIPTION	QUANTITY	ACCREDITED TEST
BS EN ISO 17892-1: 2014:5. Water Content	28	YES
BS1377: Part 2: 1990:4.2-4.4&5.2-5.4, Liquid & Plastic Limits	28	YES
BS EN ISO 17892-4: 2016: 5.2, Particle Size Distribution - Wet Sieve	7	YES
BS EN ISO 17892-4: 2016: 5.4, Particle Size Distribution - Pipette	7	YES
BS1377: Part 4: 1990:3, Dry Density/Moisture Content Relationship	2	YES
BS1377: Part 7: 1990:4.5, Determination of Shear Strength by Direct Shear	2	YES
BS1377: Part 7: 1990:8&9, Undrained Triaxial Compression	4	YES
BS1377: Part 8: 1990: Effective Stress Testing	1	YES
ISRM: 2007: Water Content of Rock	2	NO
ISRM: 2007: Point Load Strength Test	11	YES
BRE SD1 Reduced Suite: pH, Sulphate - water and acid soluble, sulphur (Subcontracted)	2	YES

Remarks This report may not be partially reproduced without written permission from this laboratory.  The results reported relate to samples received in the laboratory	Approved Signatories: <b>T Best (Deputy Laboratory Manager)</b> E Crimp (Senior Engineer) J Hanson (Director) N Parry (Director) 
--	--

Doc TR01 Rev No. 22 Revision date 02/01/20 DC:JH

**Geotechnical Engineering Ltd**Centurion House  
Olympus Park, Quedgeley  
Gloucester GL2 4NF[www.geoeng.co.uk](http://www.geoeng.co.uk)geotech@geoeng.co.uk  
TEL: 01452 527743  
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Sort code: 16-22-11 Bank account: 11125135

**LIQUID AND PLASTIC LIMITS**

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
CP210	9L	3.00	3.70	14.6	BXE	4	34	20	14	Yellowish brown slightly sandy silty CLAY
CP210	10L	4.00	4.27	12.8	BXE	19	35	19	16	Yellowish brown slightly sandy slightly gravelly silty CLAY
CP210	15UT	6.50	6.50	27.0	BXE	5	55	25	30	Yellowish brown slightly sandy silty CLAY
CP210	23Cs	11.70	11.70	19.8	BXE	1	44	25	19	Yellowish brown slightly sandy silty CLAY
CP210	28Cs	16.00	16.05	17.2	BYE	0	45	NP		Grey and brown slightly sandy SILT
CP210	34Cs	21.00	21.40	14.4	BXE	1	60	27	33	Dark grey slightly sandy silty CLAY
CP210	37Cs	23.90	23.95	13.3	BYE	1	40	NP		Grey slightly sandy SILT
CP211	15UT	5.00	5.05	26.6	BXE	5	39	22	17	Yellowish brown mottled orange slightly sandy silty CLAY
CP211	22Cs	10.30	10.48	24.8	AXE	0	54	25	29	Brown mottled grey and orange slightly sandy silty CLAY
CP211	25Cs	13.31	13.35	17.4	BXE	11	49	23	26	Light brown mottled orange slightly sandy silty CLAY
CP211	29Cs	17.75	17.80	18.0	AYE	2	41	NP		Grey and brown slightly sandy SILT
CP211	32Cs	20.15	20.20	15.2	BYE	1	44	NP		Grey slightly sandy SILT
CP211	48Cs	33.70	33.75	14.4	BYE	2	36	NP		Greyish brown sandy SILT
CP217	4D	1.25	1.25	13.2	BYE	54	34	20	14	Yellow and brown slightly sandy gravelly silty CLAY
CP217	15Cs	5.80	5.85	21.3	BXE	1	33	22	11	Light brown mottled grey slightly sandy silty CLAY
CP217	19UT	7.20	7.20	19.9	BXE	6	35	23	12	Brown mottled grey and orange slightly sandy clayey SILT
CP217	32Cs	10.90	10.95	17.0	BXE	2	40	19	21	Grey slightly sandy CLAY
CP217	34Cs	12.80	12.85	17.1	BXE	1	52	23	29	Brown slightly sandy silty CLAY
CP217	38Cs	17.05	17.10	17.4	BXE	16	47	23	24	Brown slightly gravelly slightly sandy silty CLAY

## general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

## specimen preparation

A - as received

B - washed on 0.425mm sieve

C - air dried

D - oven dried (60°C)

E - oven dried (105°C)

F - not known

## test method

X - cone penetrometer (test 4.3)

Y - cone penetrometer (test 4.4)

Z - casagrande apparatus (test 4.5)

CONTRACT

**35560/01**

CHECKED

**TB**

**LIQUID AND PLASTIC LIMITS**

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
CP217	41Cs	19.45	19.50	16.1	BXE	1	52	24	28	Brown slightly sandy silty CLAY
CP217	47Cs	25.60	25.65	16.3	BXE	5	50	25	25	Light brown mottled orange slightly sandy silty CLAY
CP217	53Cs	29.30	29.35	16.3	BXE	0	39	26	13	Grey slightly sandy clayey SILT
CP217	56Cs	32.95	33.00	12.0	BXE	1	44	NP		Grey slightly sandy SILT
DSRC205	12L	4.00	4.80	18.7	BXE	1	35	23	12	Yellowish brown slightly sandy clayey SILT
DSRC205	17UT	6.00	6.05	20.8	BXE	0	36	23	13	Greenish brown sandy clayey SILT
DSRC205	28Cs	9.25	9.30	18.5	BYE	1	35	NP		Grey slightly sandy SILT
DSRC205	37Cs	14.10	14.10	19.5	BXE	4	58	24	34	Greyish brown slightly sandy CLAY
DSRC205	49Cs	24.00	24.40	15.2	BXE	0	43	27	16	Grey slightly sandy silty CLAY

## general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

## specimen preparation

A - as received

B - washed on 0.425mm sieve

C - air dried

D - oven dried (60°C)

E - oven dried (105°C)

F - not known

## test method

X - cone penetrometer (test 4.3)

Y - cone penetrometer (test 4.4)

Z - casagrande apparatus (test 4.5)

CONTRACT

**35560/01**

CHECKED

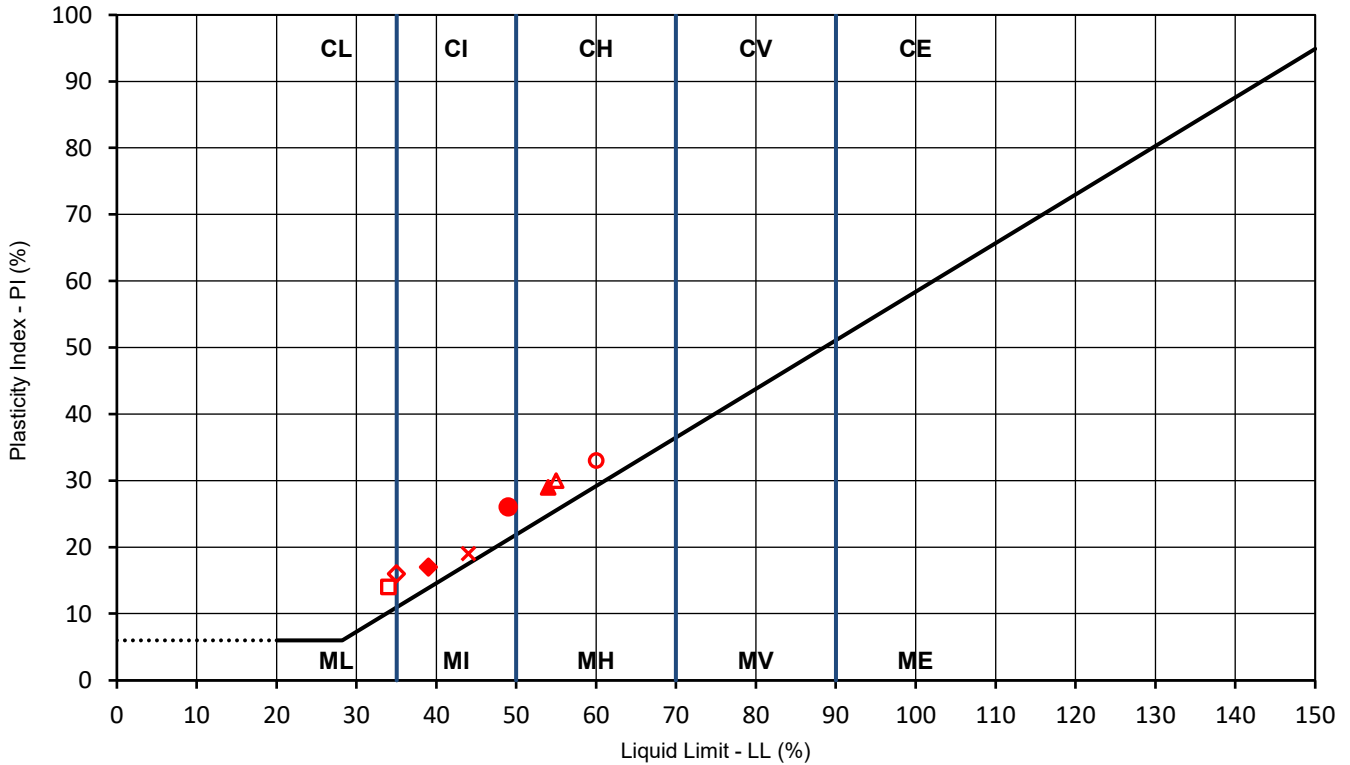
**TB**

Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	CP210	3.70	34	20	14	
◇	CP210	4.27	35	19	16	
△	CP210	6.50	55	25	30	
×	CP210	11.70	44	25	19	
	CP210	16.05	45	NP		
○	CP210	21.40	60	27	33	
	CP210	23.95	40	NP		
◆	CP211	5.05	39	22	17	
▲	CP211	10.48	54	25	29	
●	CP211	13.35	49	23	26	
	CP211	17.80	41	NP		
	CP211	20.20	44	NP		

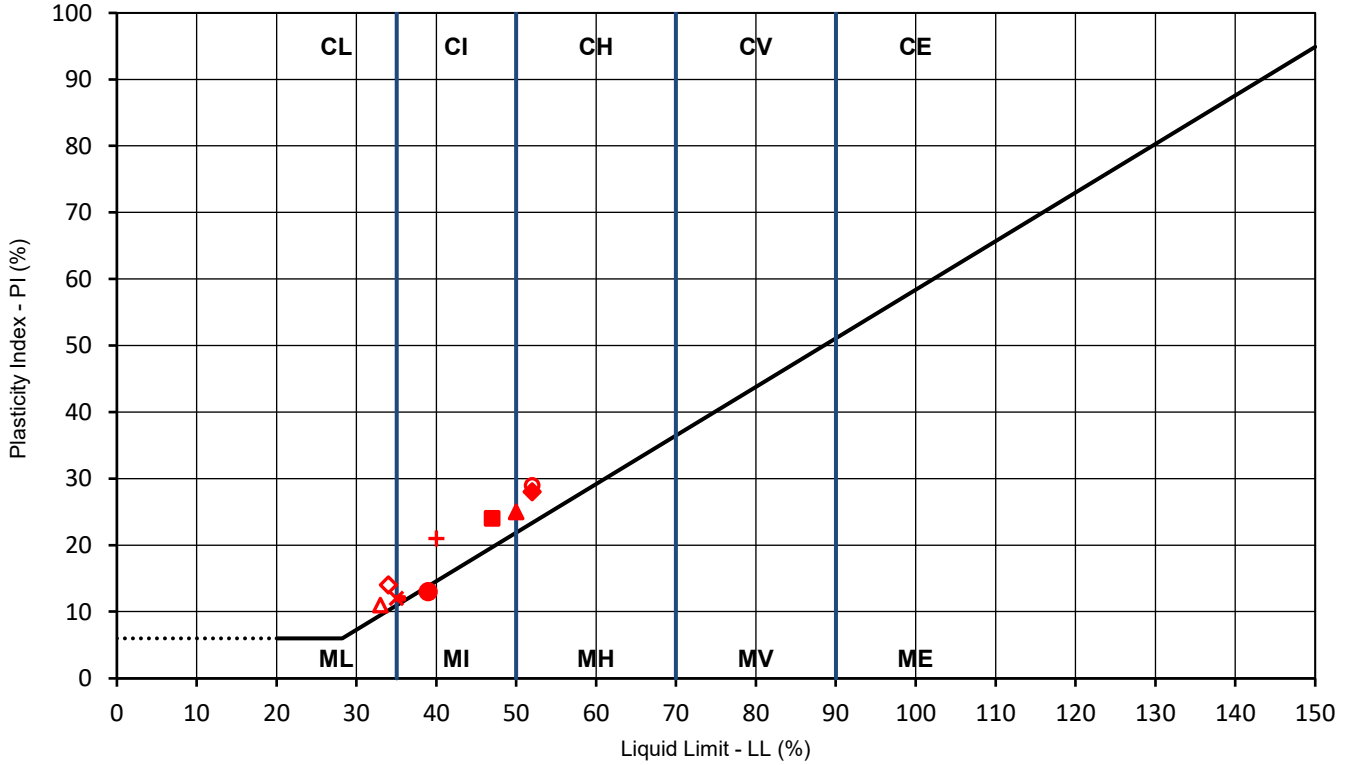
CONTRACT	CHECKED
<b>35560/01</b>	<b>TB</b>

Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)



BH/TP No.	depth (m)	LL	PL	PI	remarks
CP211	33.75	36	NP		
◇ CP217	1.25	34	20	14	
△ CP217	5.85	33	22	11	
× CP217	7.20	35	23	12	
+ CP217	10.95	40	19	21	
○ CP217	12.85	52	23	29	
■ CP217	17.10	47	23	24	
◆ CP217	19.50	52	24	28	
▲ CP217	25.65	50	25	25	
● CP217	29.35	39	26	13	
□ CP217	33.00	44	NP		
▪ DSRC205	4.80	35	23	12	

CONTRACT	CHECKED
<b>35560/01</b>	<b>TB</b>

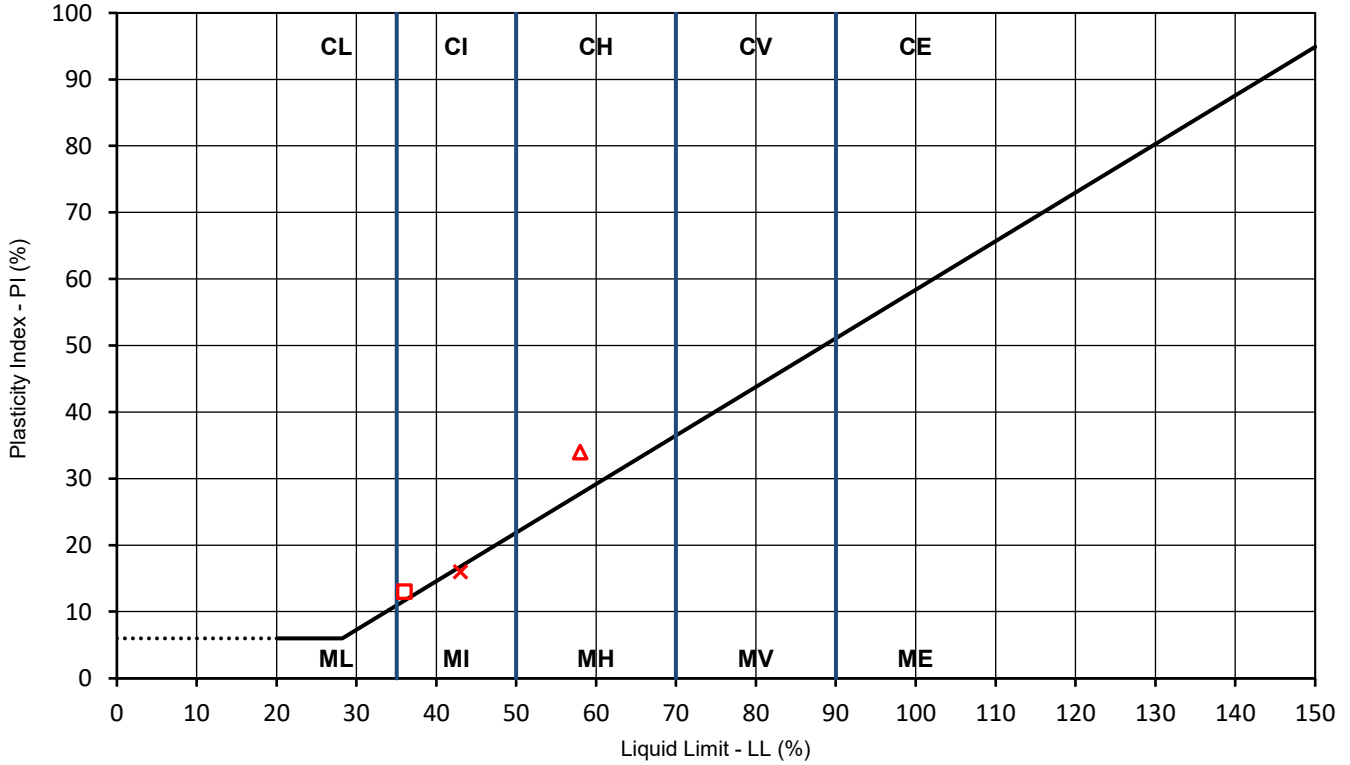


Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)



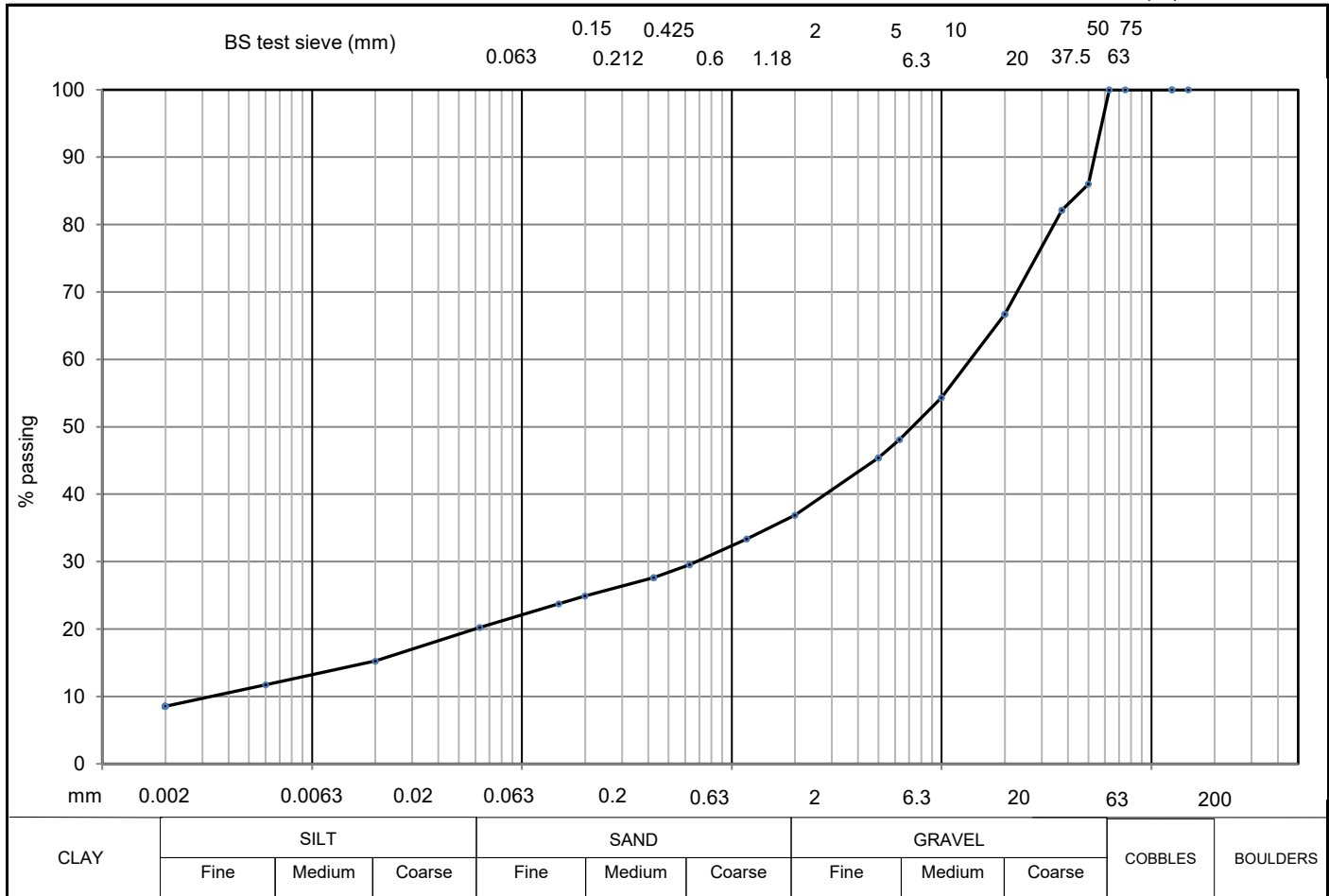
	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	DSRC205	6.05	36	23	13	
	DSRC205	9.30	35	NP		
△	DSRC205	14.10	58	24	34	
×	DSRC205	24.40	43	27	16	

CONTRACT	CHECKED
<b>35560/01</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP210
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)	SAMPLE No./TYPE	5L
DESCRIPTION	Yellowish brown sandy very clayey GRAVEL	SAMPLE DEPTH (m)	1.20
		SPECIMEN TOP (m)	1.20
		SPECIMEN BASE (m)	2.00



soil type	% fraction	SAND			GRAVEL			COBBLES	BOULDERS
		Fine	Medium	Coarse	Fine	Medium	Coarse		
CLAY	9								
SILT	12								
SILT & CLAY	20								
SAND	17								
GRAVEL	63								
COBBLE & BOULDER	0								
test method(s)	5.2# & 5.4								
test method									
5.2 - sieving									
5.3 - sedimentation by hydrometer									
5.4 - sedimentation by pipette									

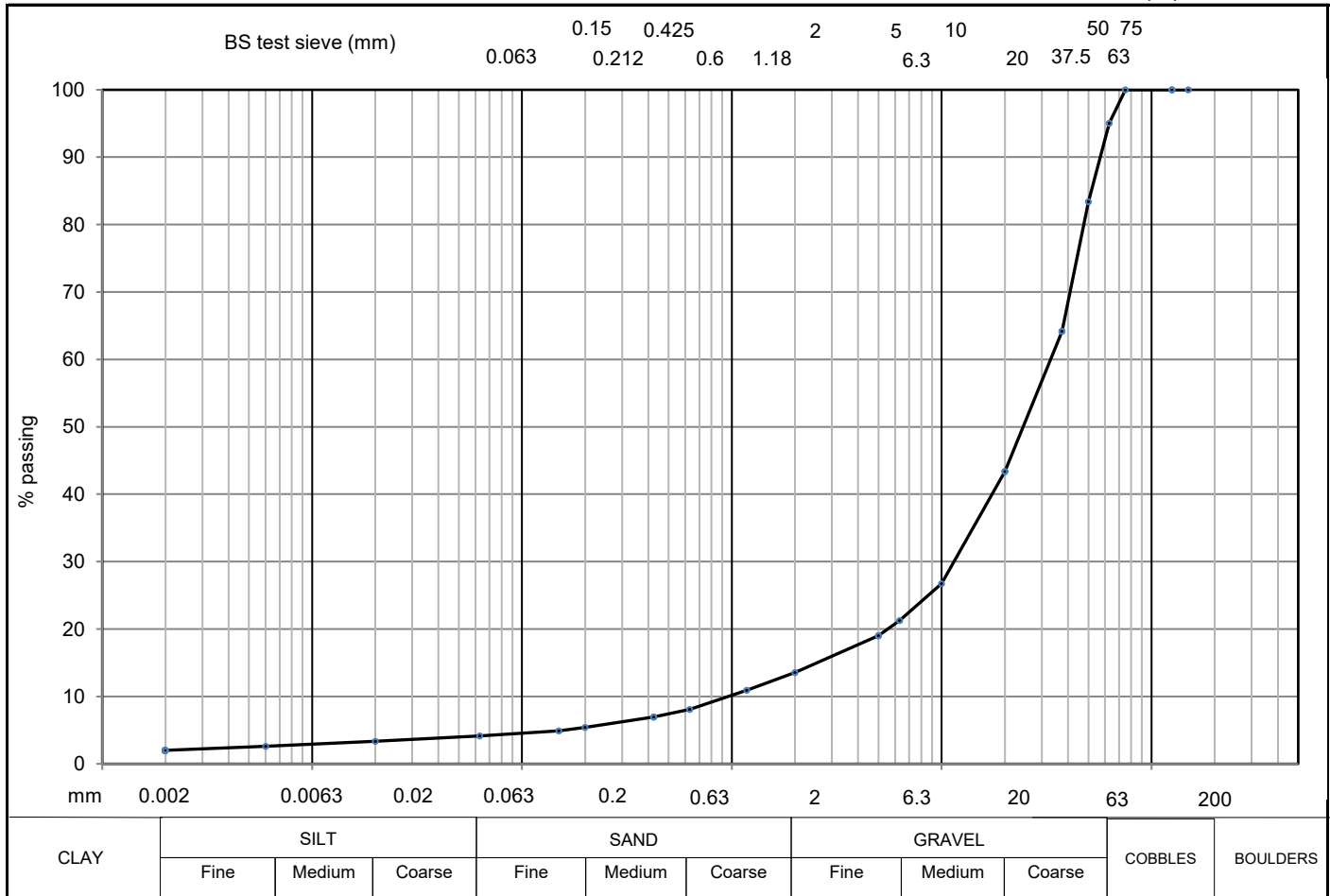
remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>35560/01</b>	<b>TB</b>

# PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP211
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)	SAMPLE No./TYPE	8L
DESCRIPTION	Light brown slightly clayey sandy GRAVEL with low cobble content	SAMPLE DEPTH (m)	1.10
		SPECIMEN TOP (m)	1.10
		SPECIMEN BASE (m)	2.00



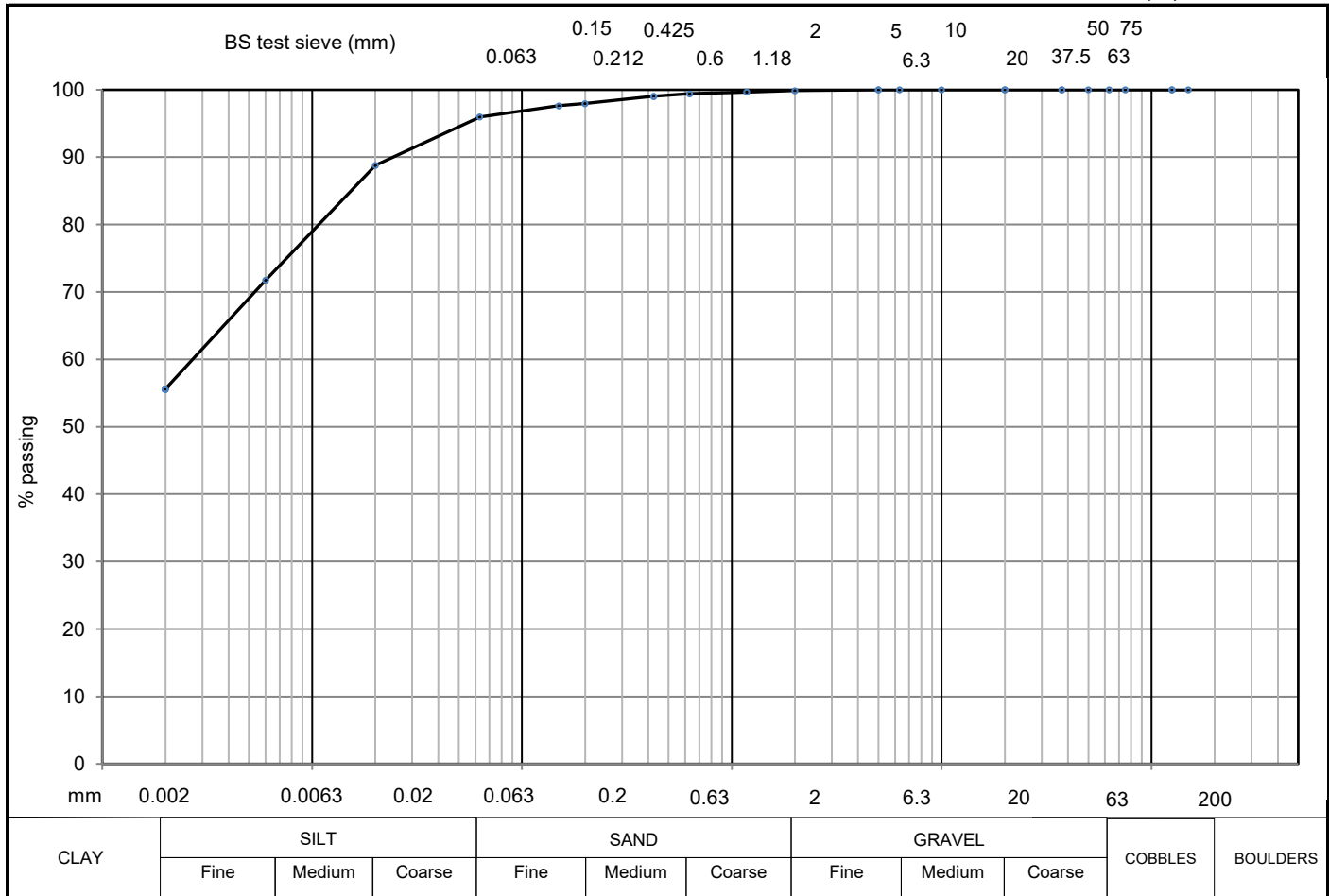
soil type	% fraction	SILT		SAND			GRAVEL			COBBLES	BOULDERS
		Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium		
CLAY	2										
SILT	2										
SILT & CLAY	4										
SAND	9										
GRAVEL	81										
COBBLE & BOULDER	5										
test method(s)	5.2# & 5.4										
test method											
5.2 - sieving											
5.3 - sedimentation by hydrometer											
5.4 - sedimentation by pipette											

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>35560/01</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP211
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)	SAMPLE No./TYPE	14L
DESCRIPTION	Brown mottled orange slightly sandy silty CLAY	SAMPLE DEPTH (m)	4.00
		SPECIMEN TOP (m)	4.70
		SPECIMEN BASE (m)	5.00



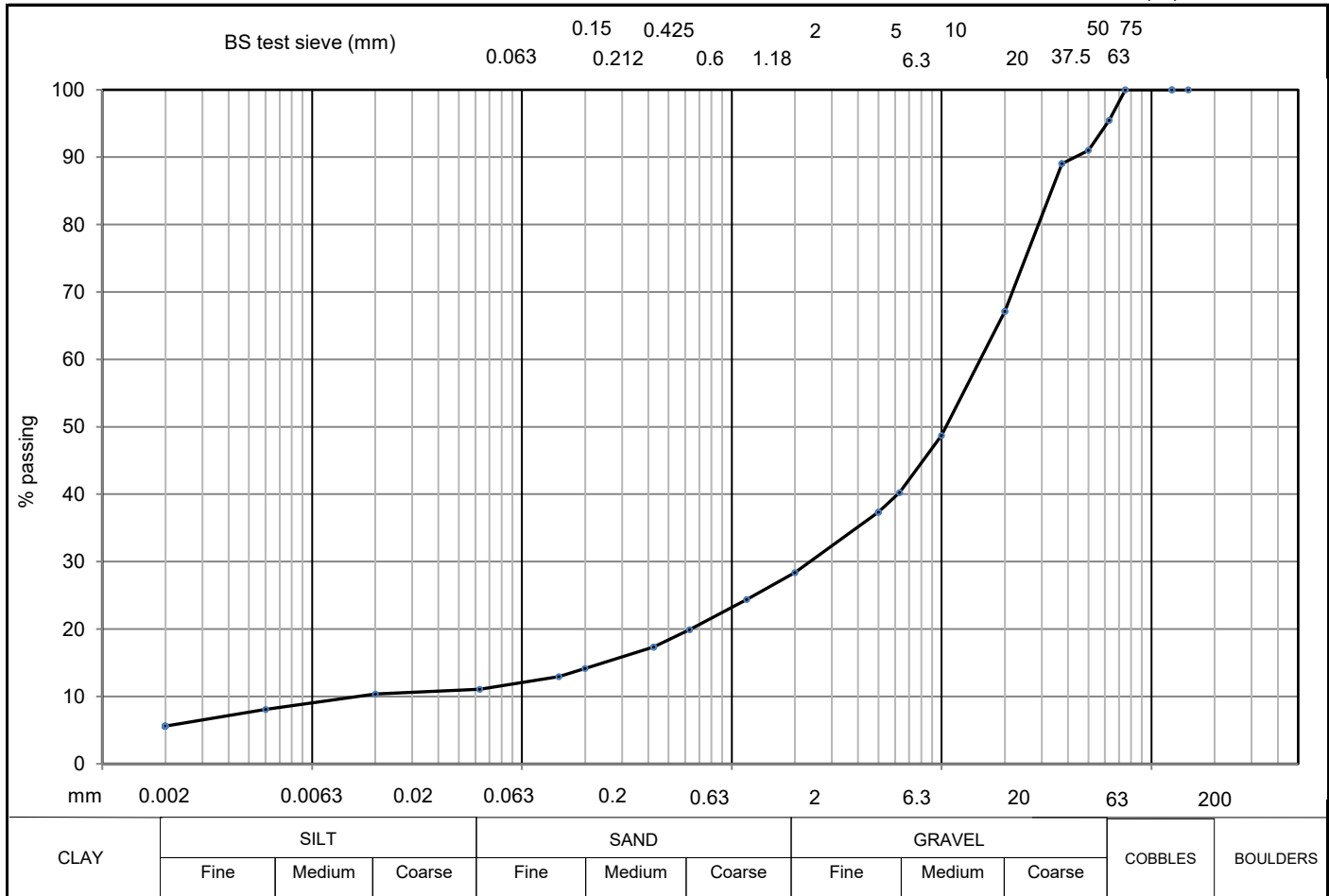
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	56			5	100	20	89
SILT	40	150		2	100	6	72
SILT & CLAY	96			1.18	100	2	56
SAND	4	75					
GRAVEL	0						
COBBLE & BOULDER	0	63					
test method(s)	5.2 & 5.4	50		0.63	99		
test method		37.5		0.425	99		
5.2 - sieving		20		0.2	98		
5.3 - sedimentation by hydrometer		10		0.15	98		
5.4 - sedimentation by pipette		6.3		0.063	96		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	CONTRACT <b>35560/01</b>	CHECKED <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	CP217
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)	SAMPLE No./TYPE	7L
DESCRIPTION	Yellowish brown clayey sandy GRAVEL with low cobble content	SAMPLE DEPTH (m)	2.20
		SPECIMEN TOP (m)	2.20
		SPECIMEN BASE (m)	3.20



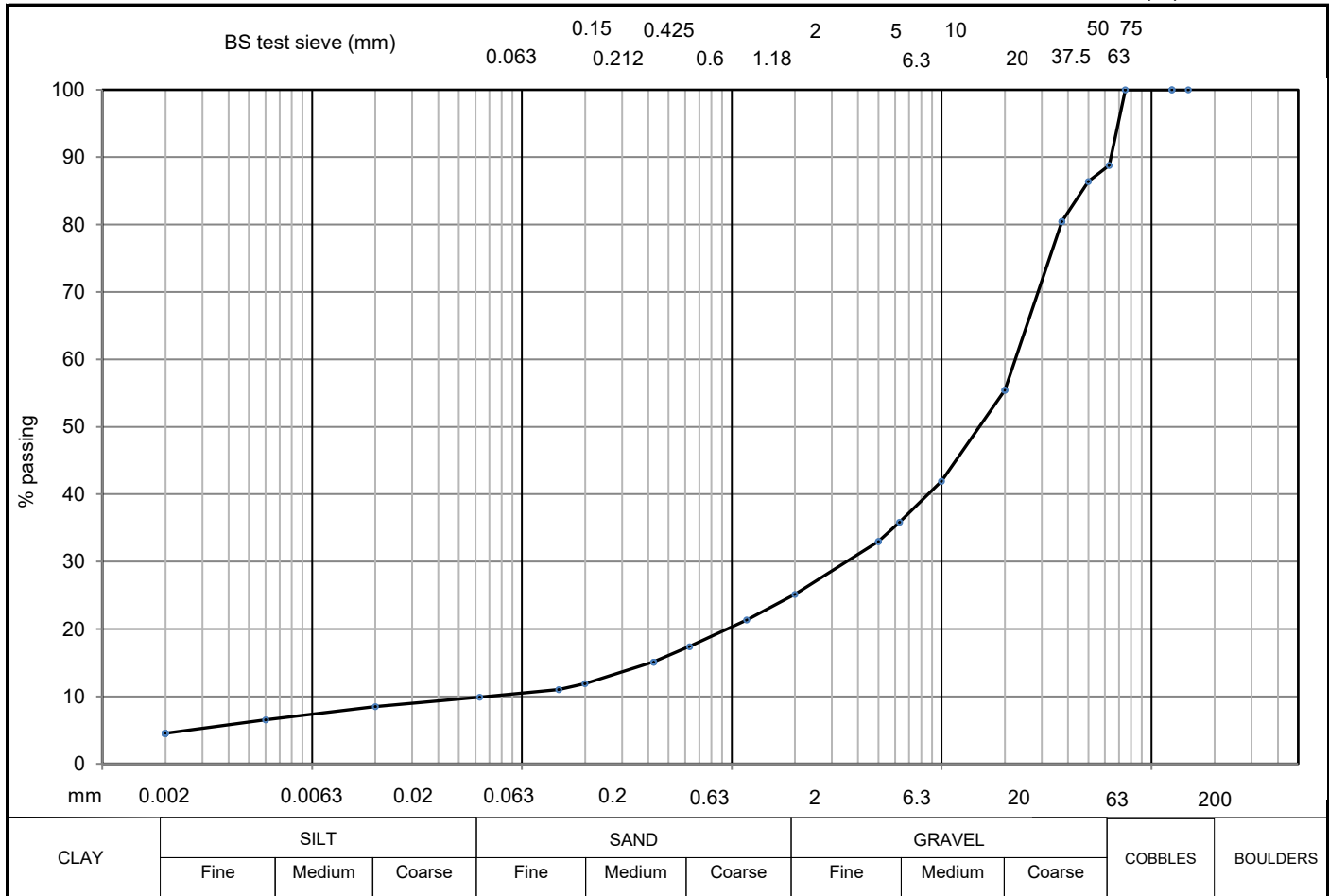
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	6						
SILT	6	150		5	37	20	10
SILT & CLAY	11						
SAND	17	75	100	2	28	6	8
GRAVEL	67						
COBBLE & BOULDER	5	63	95	1.18	24	2	6
test method(s)	5.2 & 5.4	50	91	0.63	20		
test method		37.5	89	0.425	17		
5.2 - sieving		20	67	0.2	14		
5.3 - sedimentation by hydrometer		10	49	0.15	13		
5.4 - sedimentation by pipette		6.3	40	0.063	11		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35560/01</b>	<b>CHECKED</b> <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC205
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)	SAMPLE No./TYPE	5L
DESCRIPTION	Yellowish brown clayey sandy GRAVEL with medium cobble content	SAMPLE DEPTH (m)	1.20
		SPECIMEN TOP (m)	1.20
		SPECIMEN BASE (m)	2.00



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	5			5	33	20	8
SILT	5	150		5	33	20	8
SILT & CLAY	10			2	25	6	7
SAND	15	75	100	2	25	6	7
GRAVEL	64			1.18	21	2	5
COBBLE & BOULDER	11	63	89	1.18	21	2	5
test method(s)	5.2 & 5.4	50	86	0.63	17		
test method		37.5	80	0.425	15		
5.2 - sieving		20	55	0.2	12		
5.3 - sedimentation by hydrometer		10	42	0.15	11		
5.4 - sedimentation by pipette		6.3	36	0.063	10		

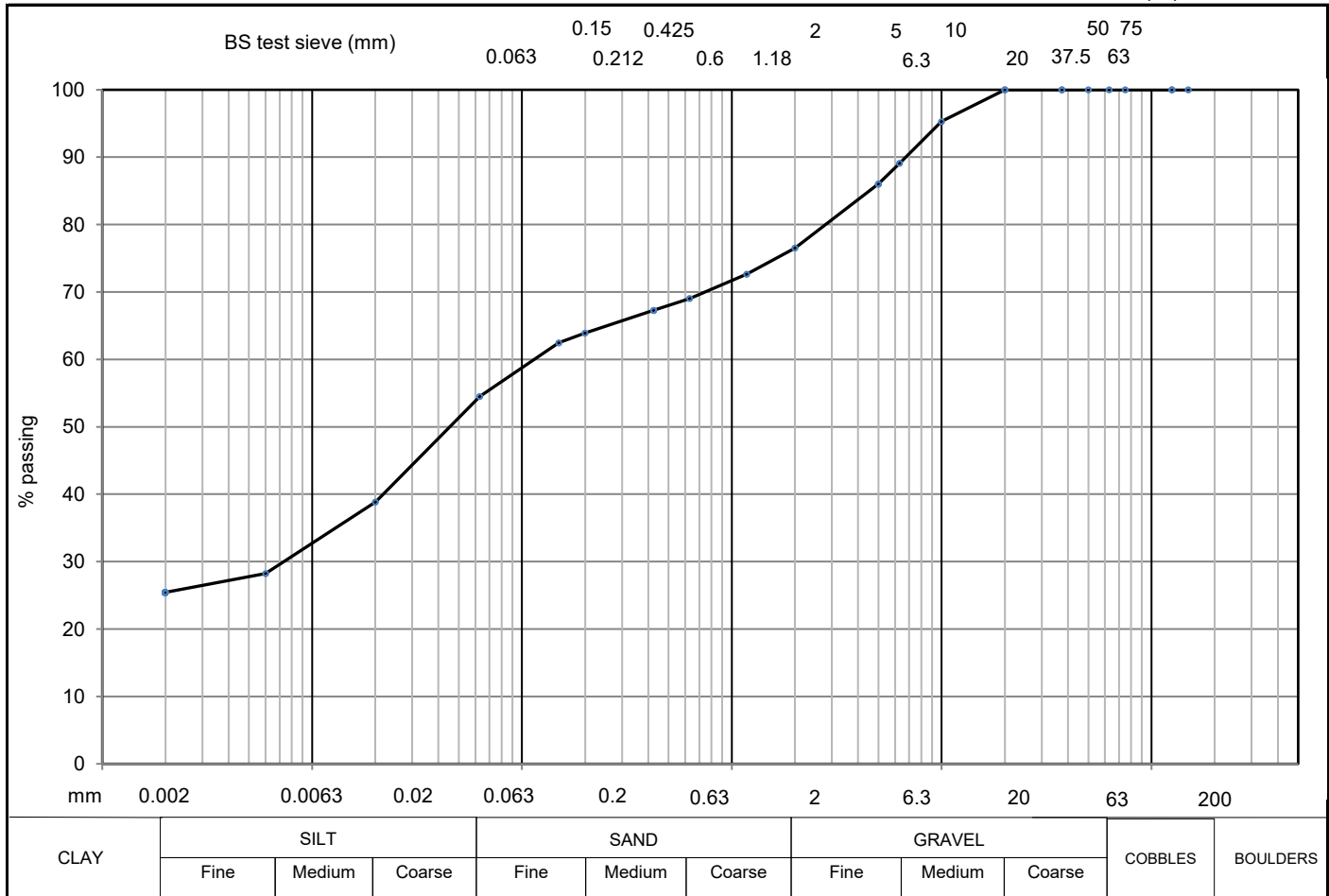
remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35560/01</b>	<b>CHECKED</b> <b>TB</b>
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# PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC205
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)	SAMPLE No./TYPE	12L
DESCRIPTION	Orangish brown slightly sandy slightly gravelly silty CLAY	SAMPLE DEPTH (m)	4.00
		SPECIMEN TOP (m)	4.00
		SPECIMEN BASE (m)	4.40



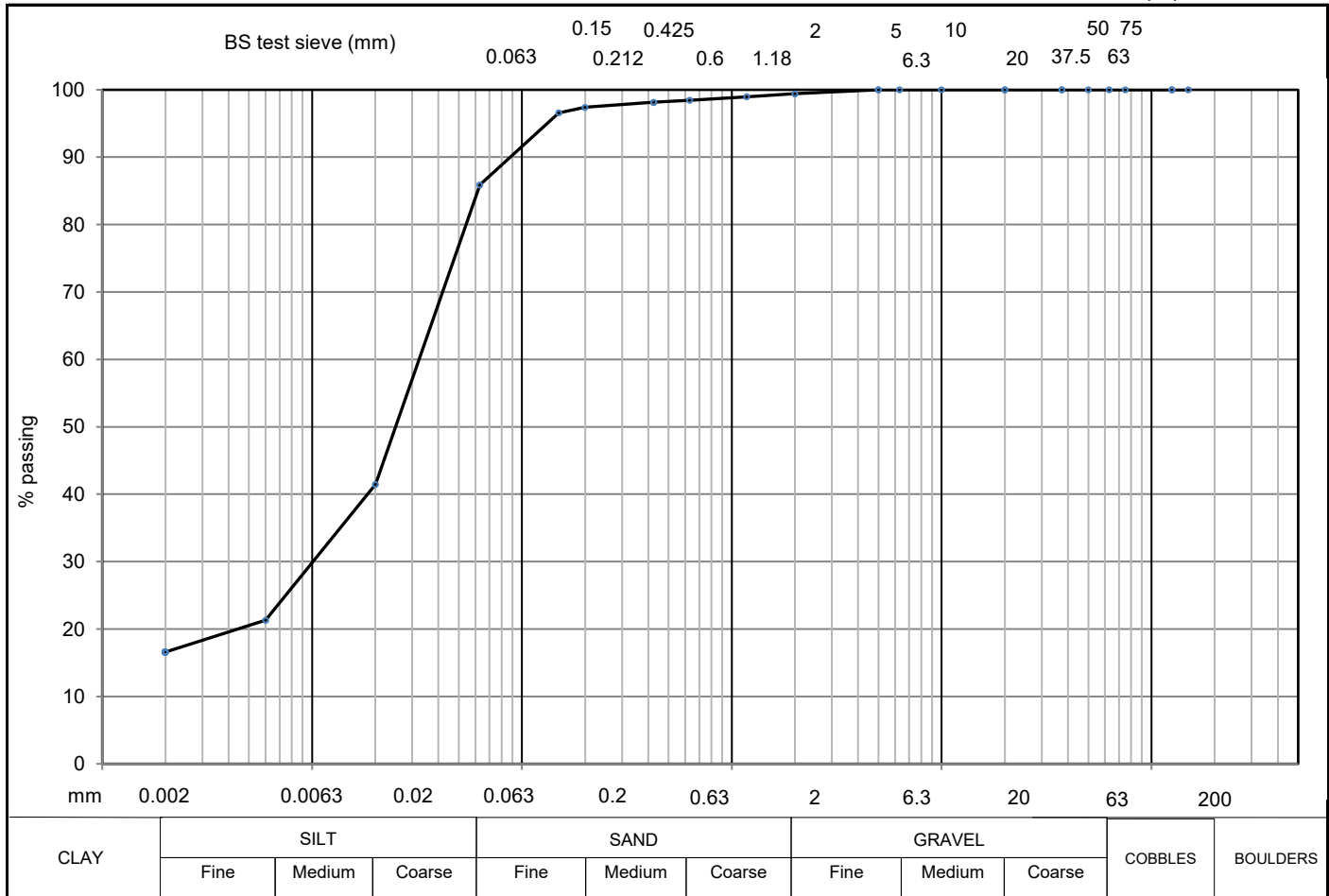
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	25			5	86	20	39
SILT	29	150		2	77	6	28
SILT & CLAY	55			1.18	73	2	25
SAND	22	75					
GRAVEL	23						
COBBLE & BOULDER	0	63					
test method(s)	5.2 & 5.4	50		0.63	69		
test method		37.5		0.425	67		
5.2 - sieving		20	100	0.2	64		
5.3 - sedimentation by hydrometer		10	95	0.15	62		
5.4 - sedimentation by pipette		6.3	89	0.063	55		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>35560/01</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC205
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)	SAMPLE No./TYPE	18L
DESCRIPTION	Light brown slightly sandy SILT	SAMPLE DEPTH (m)	6.00
		SPECIMEN TOP (m)	6.80
		SPECIMEN BASE (m)	7.00



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	17			5	100	20	41
SILT	69	150		2	99	6	21
SILT & CLAY	86			1.18	99	2	17
SAND	14	75					
GRAVEL	1						
COBBLE & BOULDER	0	63					
test method(s)	5.2 & 5.4	50		0.63	98		
test method		37.5		0.425	98		
5.2 - sieving		20		0.2	97		
5.3 - sedimentation by hydrometer		10		0.15	97		
5.4 - sedimentation by pipette		6.3		0.063	86		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35560/01</b>	<b>CHECKED</b> <b>TB</b>
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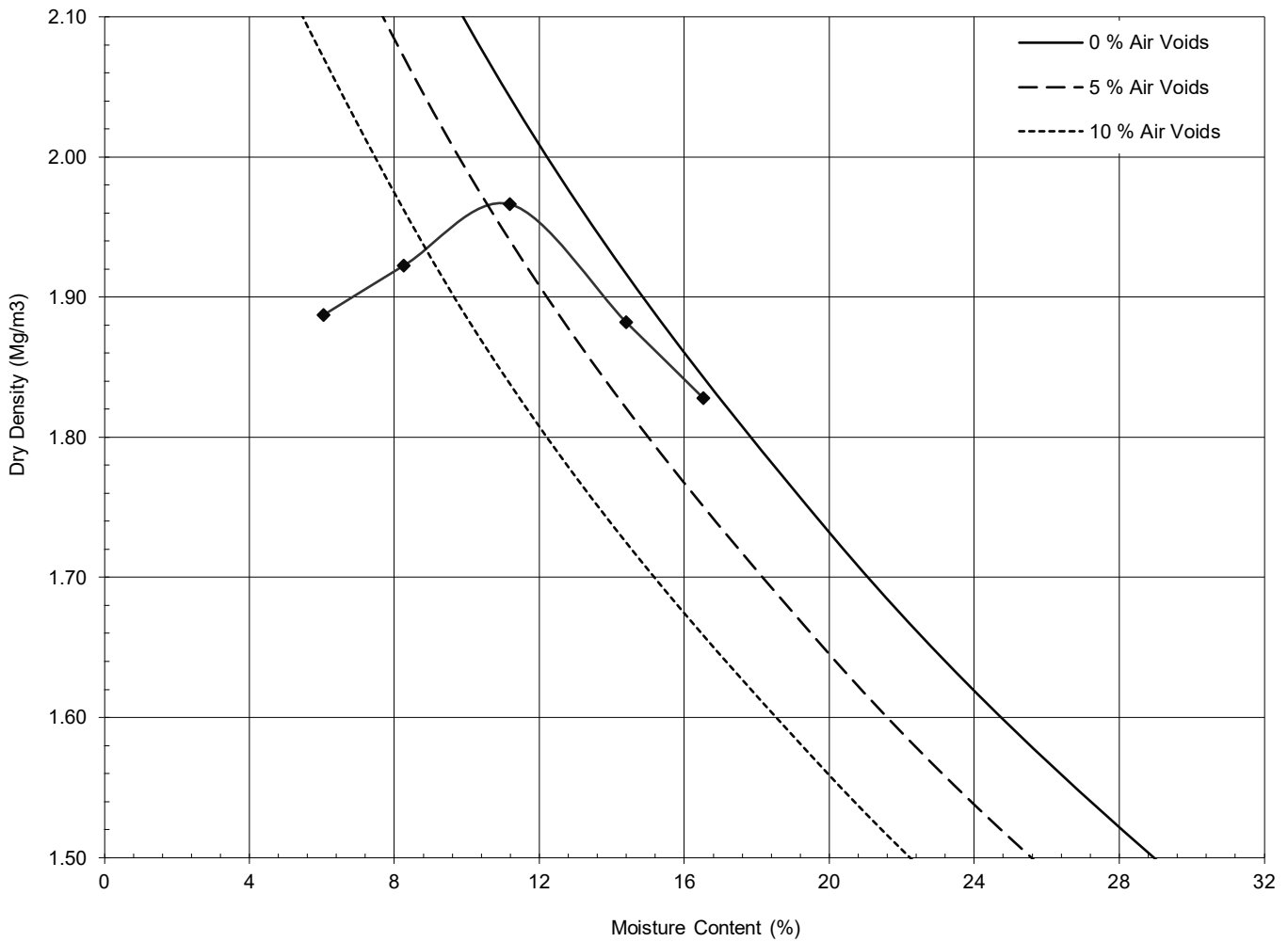


# DRY DENSITY/MOISTURE CONTENT RELATIONSHIP



BS. 1377 : Part 4 : 1990 : 3

CLIENT	OSBORNE	BH/TP No.	CP210
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)	SAMPLE No./TYPE	9L
DESCRIPTION	Yellowish brown slightly sandy silty CLAY	SAMPLE DEPTH (m)	3.00
		SPECIMEN DEPTH (m)	3.00



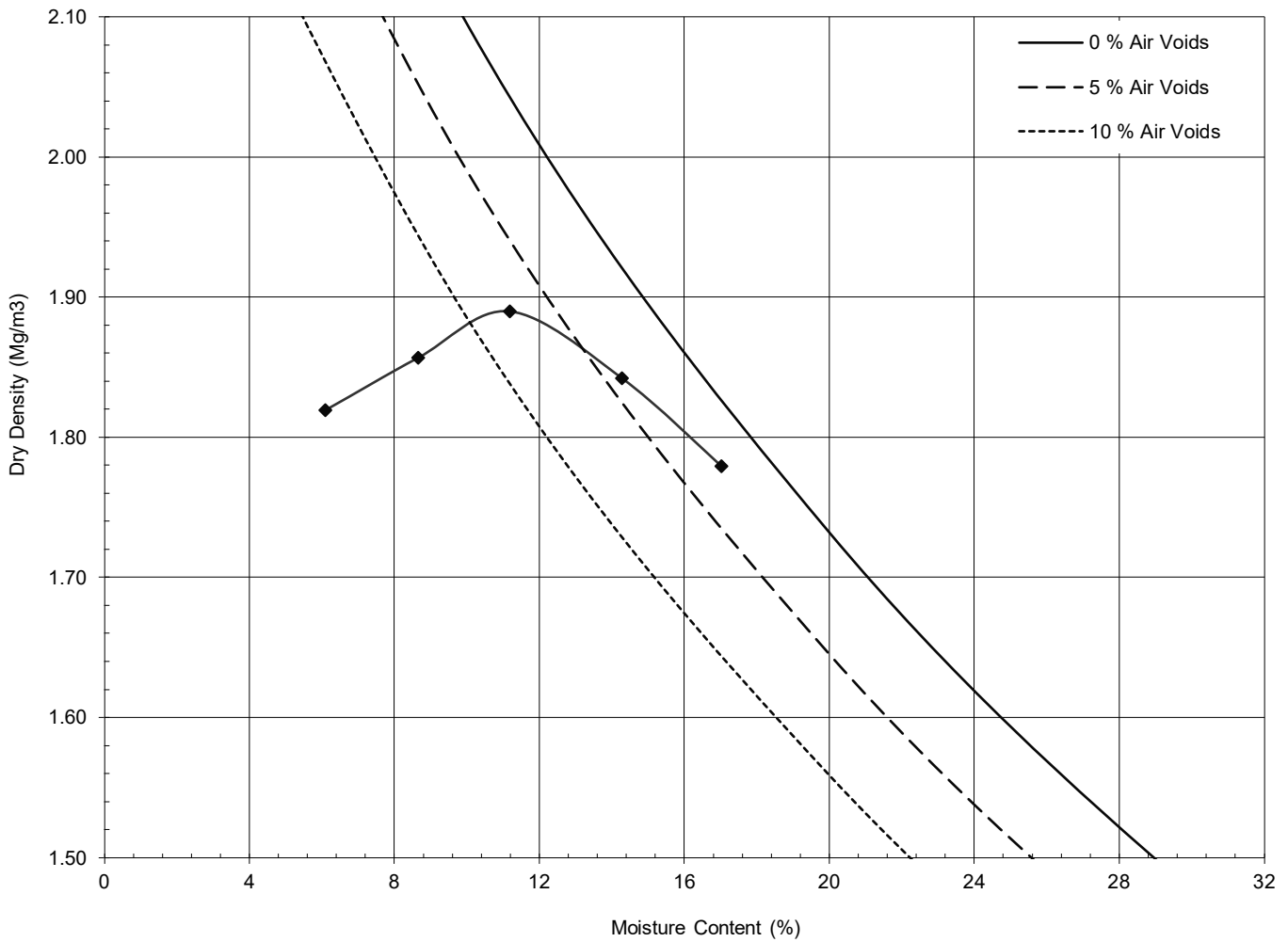
test method	3.5.4.1 4.5kg dynamic compaction - 1L mould				
preparation procedure	3.2.4.1 (grading zone 1)				
sample preparation	C R				
proportion retained on 37.5mm sieve	%	0	initial moisture content	%	14
proportion retained on 20mm sieve	%	0	maximum dry density	(Mg/m <sup>3</sup> )	1.97
particle density	(Mg/m <sup>3</sup> )	#2.65	optimum moisture content	%	11
remarks	# denotes particle density has been assigned an assumed value C denotes sample has been chopped to pass 20mm sieve S denotes sample has been shredded to pass 20mm sieve R denotes sample material has been recycled between/for points				
				CONTRACT	CHECKED
				<b>35560/01</b>	<b>TB</b>

# DRY DENSITY/MOISTURE CONTENT RELATIONSHIP



BS. 1377 : Part 4 : 1990 : 3

CLIENT	OSBORNE	BH/TP No.	DSRC205
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)	SAMPLE No./TYPE	15L
DESCRIPTION	Yellowish brown slightly sandy silty CLAY	SAMPLE DEPTH (m)	5.00
		SPECIMEN DEPTH (m)	5.00



test method	3.5.4.1 4.5kg dynamic compaction - 1L mould				
preparation procedure	3.2.4.1 (grading zone 1)				
sample preparation	C R				
proportion retained on 37.5mm sieve	%	0	initial moisture content	%	14
proportion retained on 20mm sieve	%	0	maximum dry density	(Mg/m <sup>3</sup> )	1.89
particle density	(Mg/m <sup>3</sup> )	#2.65	optimum moisture content	%	11
remarks	# denotes particle density has been assigned an assumed value C denotes sample has been chopped to pass 20mm sieve S denotes sample has been shredded to pass 20mm sieve R denotes sample material has been recycled between/for points				
				CONTRACT	CHECKED
				<b>35560/01</b>	<b>TB</b>

# SHEAR STRENGTH BY DIRECT SHEAR



**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No.

CP210

SAMPLE No./TYPE

10L

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (992)

SAMPLE DEPTH (m)

4.00-4.50

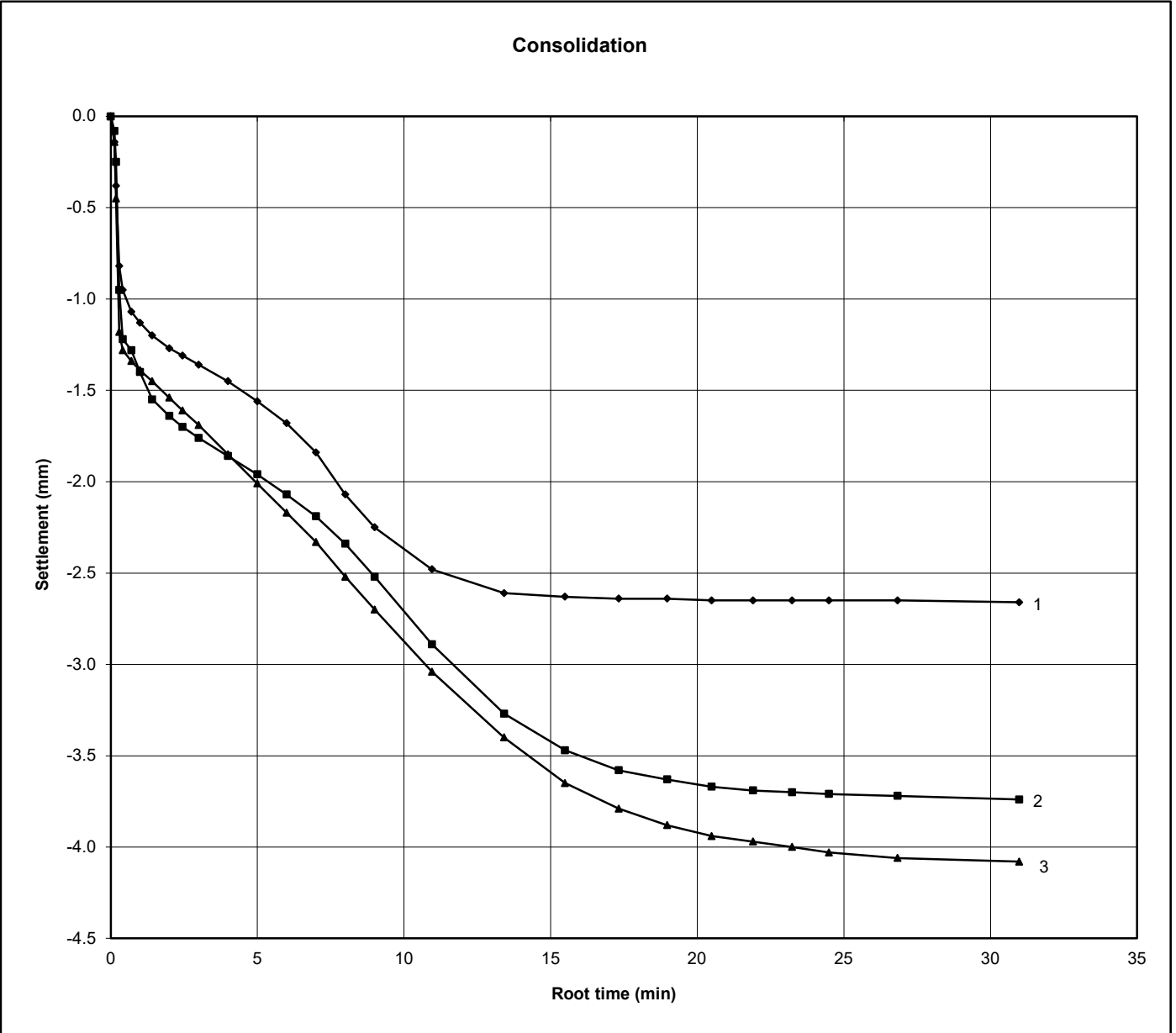
SPECIMEN DEPTH (m)

4.30-4.45

DESCRIPTION Yellowish brown slightly sandy silty CLAY

PREPARATION DETAILS	Remoulded using a tamping rod - 2% removed (retained on 2mm sieve).		
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CONSOLIDATION STAGE RESULTS			
Specimen	1	2	3
t100 (min)	108.80	245.10	291.20
t <sub>f</sub> (min)	1381.76	3112.77	3698.24
Machine speed (mm/min)	0.0010	0.0010	0.0010
Normal Stress (kPa)	75	150	300
Initial height (mm)	19.99	19.99	19.99
Final height (mm)	17.33	16.25	15.91



Geotechnical Engineering Ltd, Centurion House, Olympus Park, Gloucester, GL2 4NF. Tel. 01452 527743

remarks: Specimens are submerged throughout the test.	CONTRACT <b>35560/01</b>	CHECKED <b>NP</b>
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# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

CP210

SAMPLE No./TYPE

10L

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (992)

SAMPLE DEPTH (m)

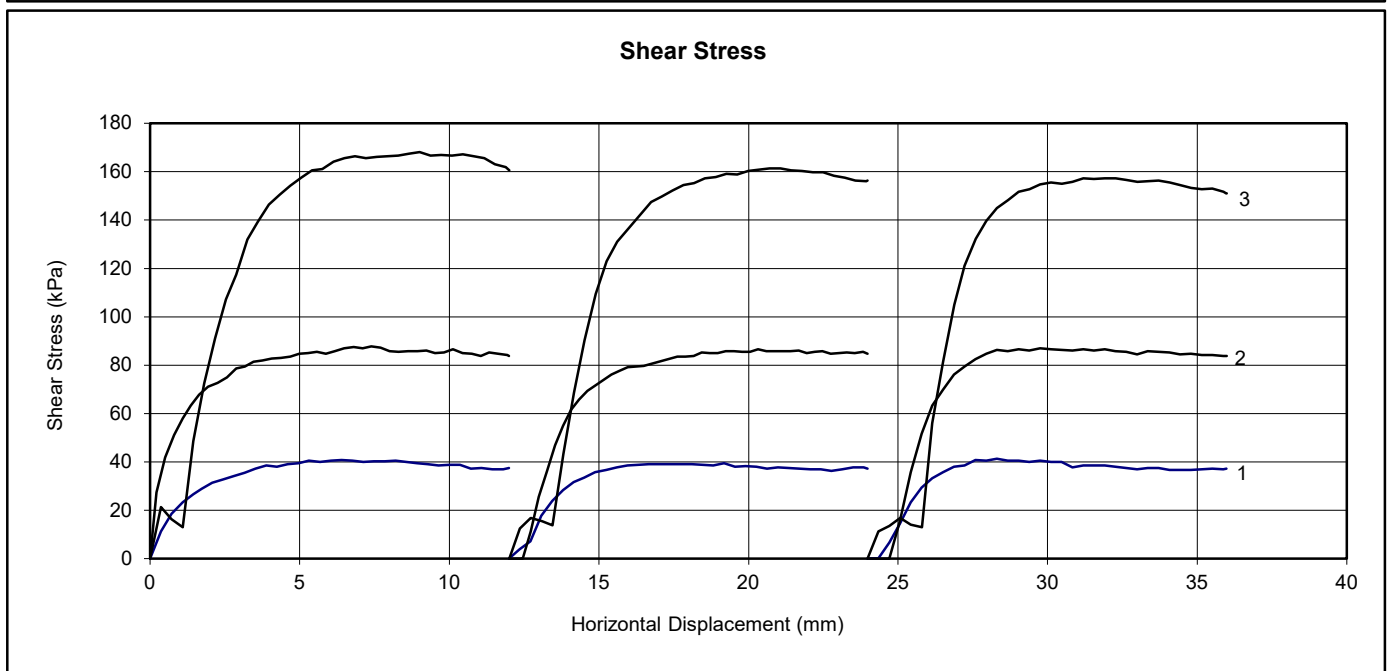
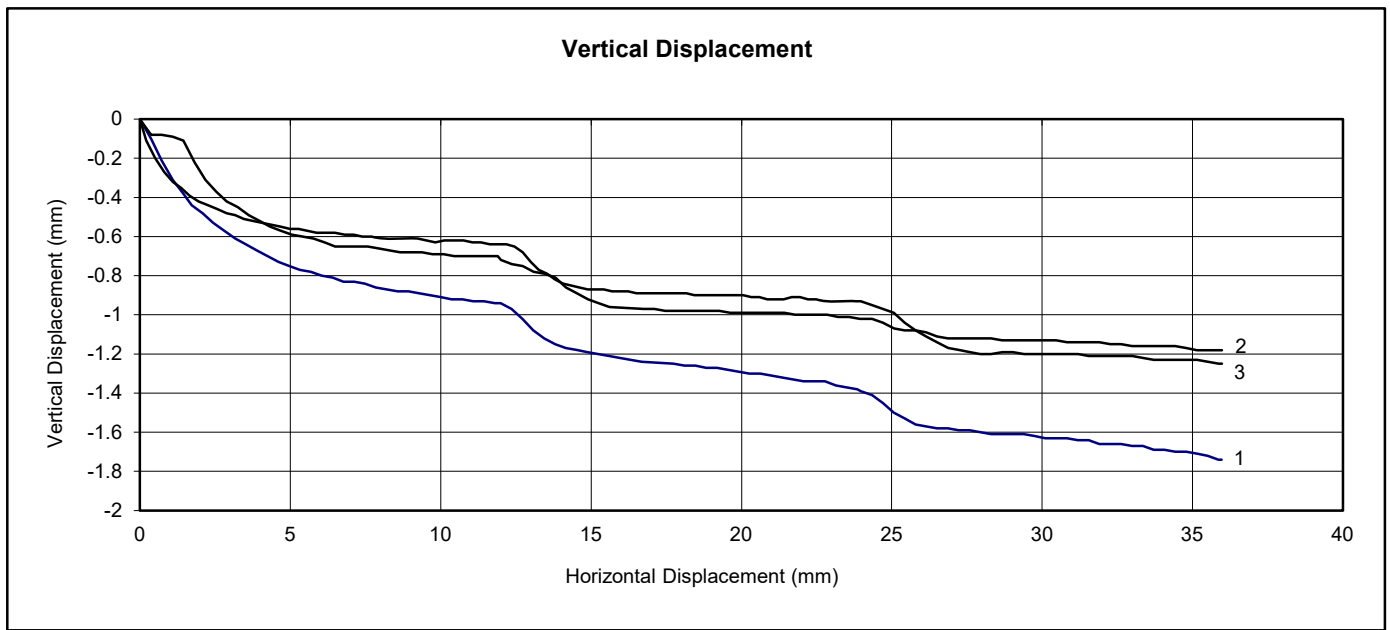
4.00-4.50

SPECIMEN DEPTH (m)

4.30-4.45

DESCRIPTION Yellowish brown slightly sandy silty CLAY

SHEAR STAGE RESULTS			
Specimen	1	2	3
Peak Shear Strength (kPa)	40.8	87.8	168.1
Residual Shear Strength (kPa)	36.7	83.9	151.1
Cum. Vertical Displ. (mm)	-1.740	-1.180	-1.250
Cum. Forward Displ. (mm)	35.970	35.980	35.980
Normal Stress (kPa)	75	150	300



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remarks:  
slow machine reversal

CONTRACT  
**35560/01**

CHECKED  
**NP**

# SHEAR STRENGTH BY DIRECT SHEAR



**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No.

CP210

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION-  
PHASE 2A (992)

SAMPLE No./TYPE

10L

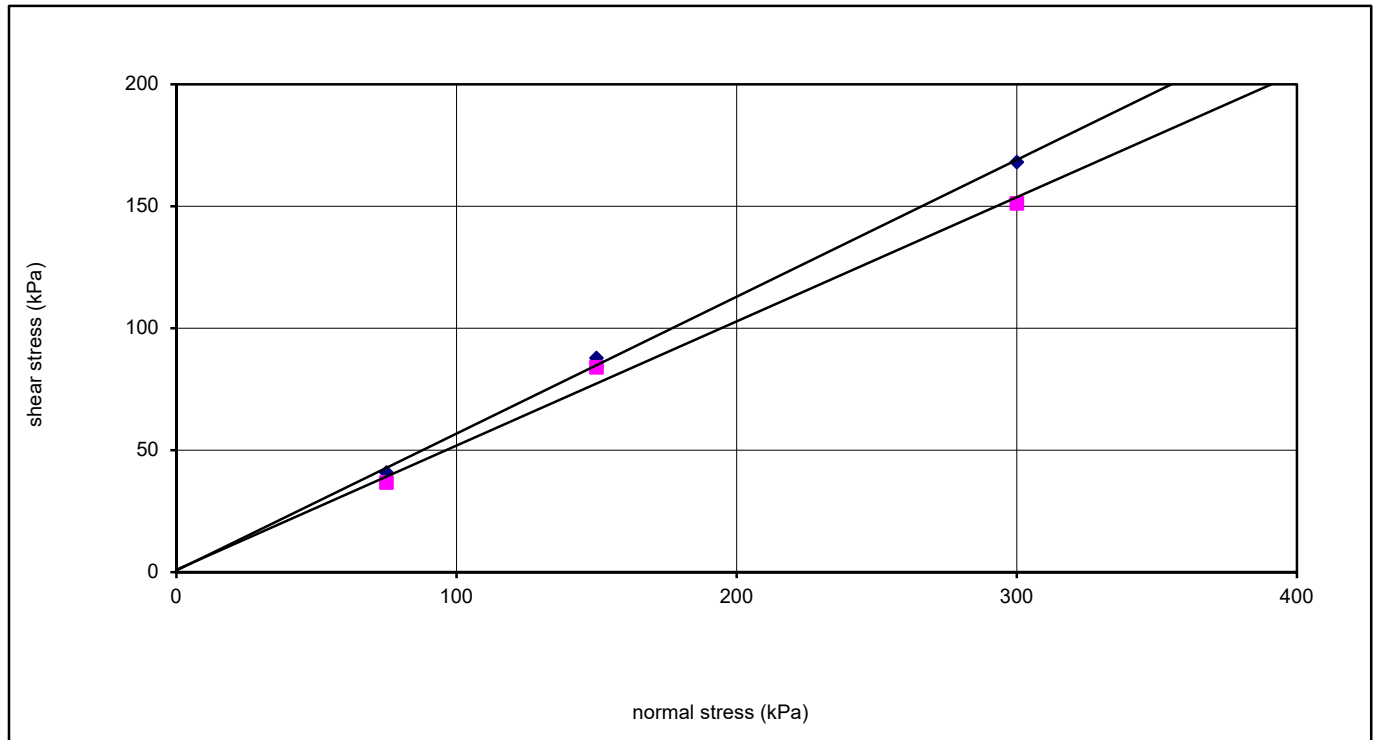
SAMPLE DEPTH (m)

4.00-4.50

SPECIMEN DEPTH (m)

4.30-4.45

DESCRIPTION Yellowish brown slightly sandy silty CLAY



**INITIAL CONDITIONS**

			specimen 1	specimen 2	specimen 3
specimen size (mm)	60	moisture content (%)	21.8	20.1	18.4
	Square		1.70	1.68	1.73
specimen height (mm)	19.99	bulk density Mg/m <sup>3</sup>	1.40	1.40	1.46
		voids ratio	0.931	0.927	0.851
		degree of saturation (%)	63	59	58
particle density (Mg/m <sup>3</sup> )	2.70 #	strain rate (mm/min)	0.001	0.001	0.001

**SHEARING STAGES**

specimen	normal stress (kPa)	peak shear stress (kPa)	horizontal displacement (mm)	residual shear stress (kPa)	traverses (No.)	total forward displacement (mm)
1	75	40.8	6.400	36.7	3	35.970
2	150	87.8	7.390	83.9	3	35.980
3	300	168.1	9.010	151.1	3	35.980

**SHEAR STRENGTH PARAMETERS**

peak angle of shearing resistance $\phi'$	29	residual angle of shearing resistance $\phi'_r$	27
peak effective cohesion intercept, $c'$ (kPa)	1	residual effective cohesion intercept, $c'_r$ (kPa)	1

remarks: # denotes particle density has been assigned an assumed value.

CONTRACT  
**35560/01**

CHECKED  
**NP**

◆ peak ■ residual

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# SHEAR STRENGTH BY DIRECT SHEAR



BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

CP211

SAMPLE No./TYPE

22CS

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (992)

SAMPLE DEPTH (m)

10.30-10.50

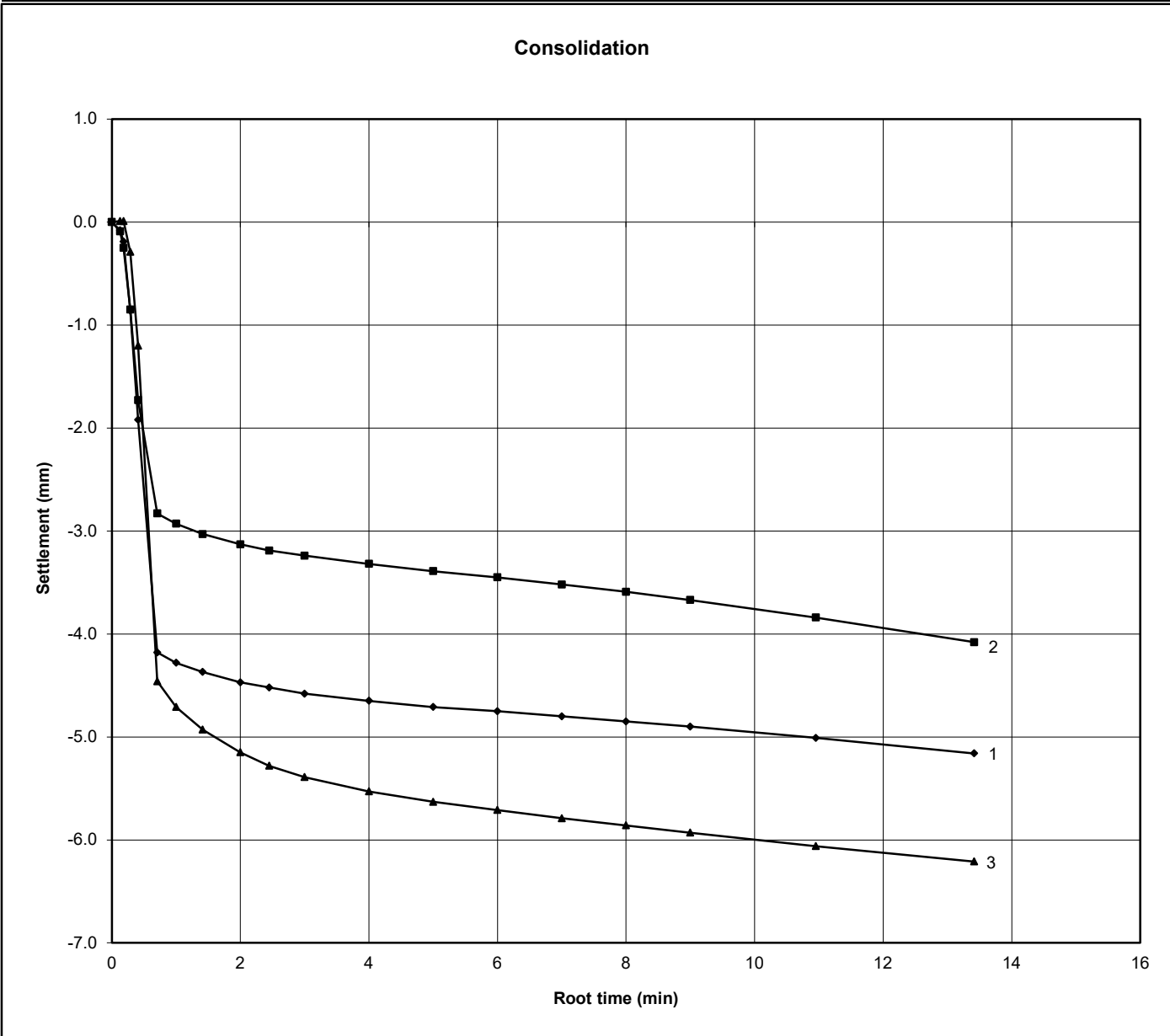
SPECIMEN DEPTH (m)

10.30

DESCRIPTION Brown slightly sandy CLAY

PREPARATION DETAILS	Remoulded using a tamping rod - 0% removed (retained on 2mm sieve).
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CONSOLIDATION STAGE RESULTS			
Specimen	1	2	3
t100 (min)	16.00	1.00	7.84
t <sub>f</sub> (min)	203.20	12.70	99.57
Machine speed (mm/min)	0.0100	0.0100	0.0100
Normal Stress (kPa)	75	150	300
Initial height (mm)	19.96	19.96	19.96
Final height (mm)	14.80	15.88	13.75



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remarks:	CONTRACT	CHECKED
	<b>35560/01</b>	<b>NP</b>



# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

CP211

SAMPLE No./TYPE

22CS

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION- PHASE 2A (992)

SAMPLE DEPTH (m)

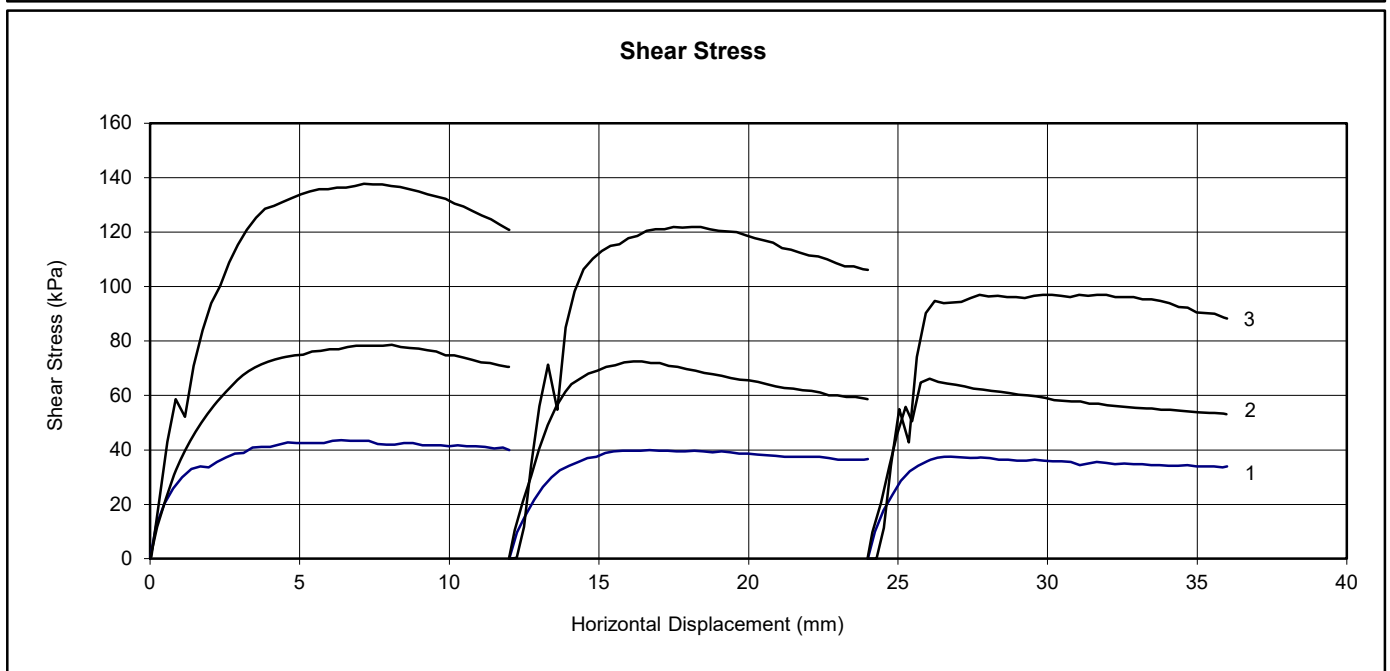
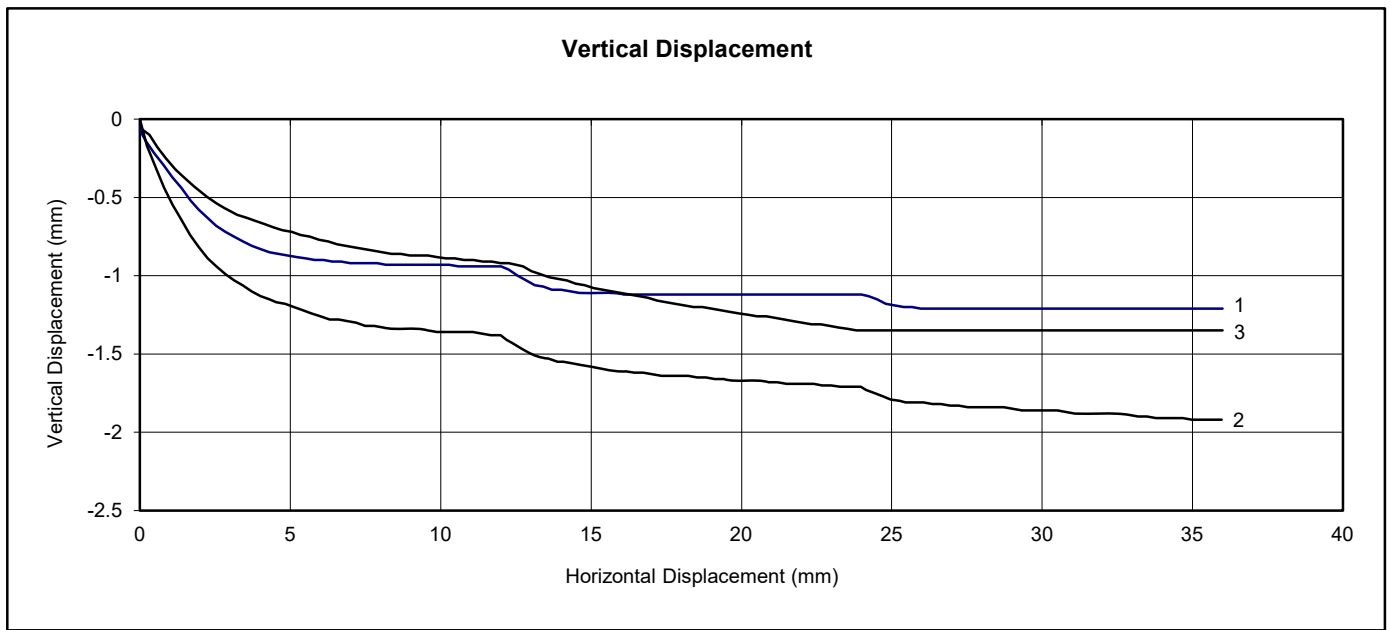
10.30-10.50

SPECIMEN DEPTH (m)

10.30

DESCRIPTION Brown slightly sandy CLAY

SHEAR STAGE RESULTS			
Specimen	1	2	3
Peak Shear Strength (kPa)	43.6	78.6	137.8
Residual Shear Strength (kPa)	33.6	53.1	88.3
Cum. Vertical Displ. (mm)	-1.210	-1.920	-1.350
Cum. Forward Displ. (mm)	36.000	35.970	36.000
Normal Stress (kPa)	75	150	300



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remarks:  
slow machine reversal

CONTRACT  
**35560/01**

CHECKED  
**NP**

# SHEAR STRENGTH BY DIRECT SHEAR



BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

CP211

SAMPLE No./TYPE

22CS

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION-  
PHASE 2A (992)

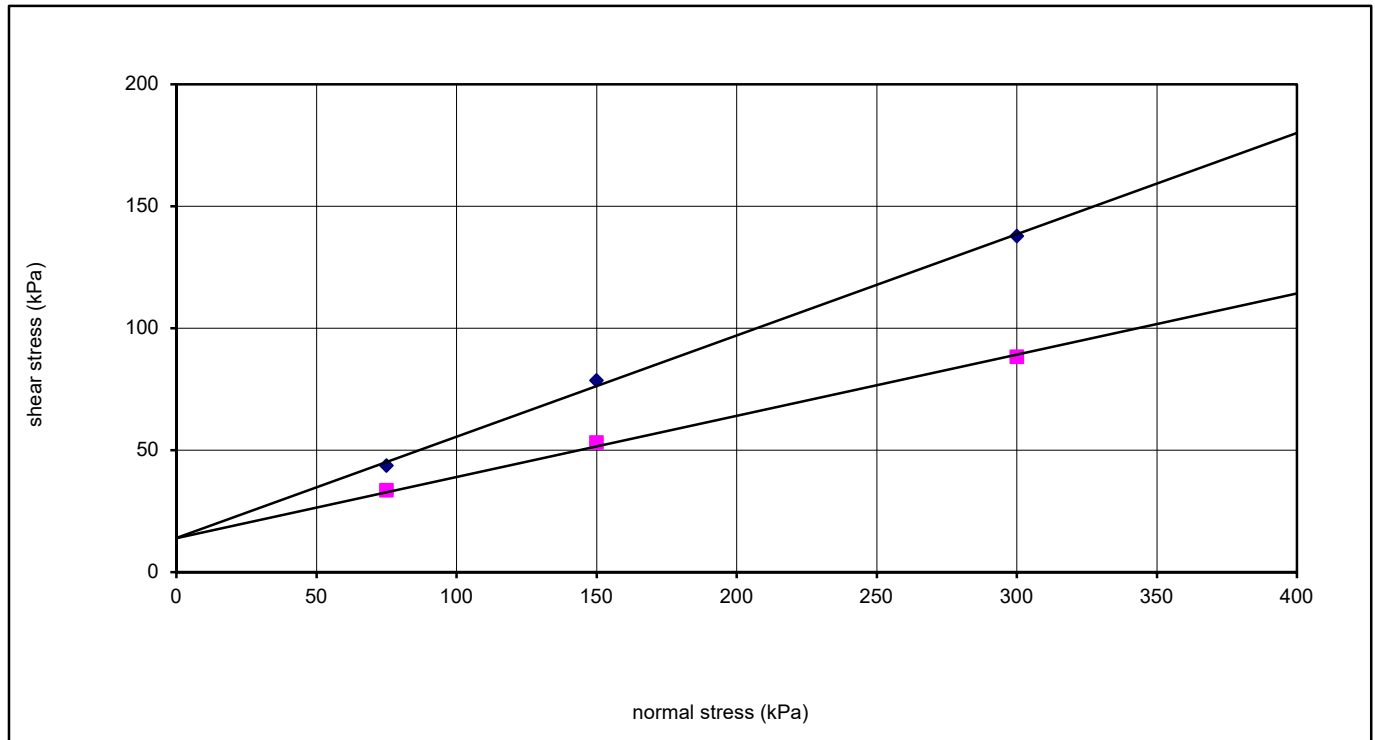
SAMPLE DEPTH (m)

10.30-10.50

DESCRIPTION Brown slightly sandy CLAY

SPECIMEN DEPTH (m)

10.30



INITIAL CONDITIONS						
				specimen 1	specimen 2	specimen 3
specimen size (mm)	60	moisture content (%)		27.0	25.3	24.8
	Square	bulk density Mg/m <sup>3</sup>		1.61	1.60	1.60
specimen height (mm)	19.96	dry density Mg/m <sup>3</sup>		1.27	1.28	1.28
		voids ratio		1.125	1.112	1.104
particle density (Mg/m <sup>3</sup> )	2.70 #	degree of saturation (%)		65	61	61
		strain rate (mm/min)		0.01	0.01	0.01

SHEARING STAGES						
specimen	normal stress (kPa)	peak shear stress (kPa)	horizontal displacement (mm)	residual shear stress (kPa)	traverses (No.)	total forward displacement (mm)
1	75	43.6	6.390	33.6	3	36.000
2	150	78.6	8.080	53.1	3	35.970
3	300	137.8	7.150	88.3	3	36.000

SHEAR STRENGTH PARAMETERS			
peak angle of shearing resistance $\phi'$	23	residual angle of shearing resistance $\phi'_r$	15
peak effective cohesion intercept, $c'$ (kPa)	14	residual effective cohesion intercept, $c'_r$ (kPa)	14

remarks: # denotes particle density has been assigned an assumed value.	CONTRACT	CHECKED
	<b>35560/01</b>	<b>NP</b>

◆ peak ■ residual

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# UNDRAINED TRIAXIAL COMPRESSION

BS.1377 : PART 7 : 1990 : 8



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)

borehole /trial pit no.	sample		specimen depth (m)	code	moisture content		dimensions		density		cell pressure (kPa)	rate of strain (%/min)	deviator stress (kPa)	failure strain (%)	failure mode	shear strength* (kPa)	description and remarks
	no./type	depth (m)			initial (%)	final (%)	length (mm)	diameter (mm)	bulk (Mg/m <sup>3</sup> )	dry (Mg/m <sup>3</sup> )							
CP210	15UT	6.50	6.55	UU100	26.6	25.3	206	104	1.99	1.57	100	2.0	143	17.0	I	71	Yellowish brown slightly sandy silty CLAY
CP210	23Cs	11.70	11.70	UU100	19.4	19.2	180	104	2.01	1.68	200	2.0	307	8.3	S	154	Yellowish brown slightly sandy slightly gravelly silty CLAY
DSRC205	17UT	6.00	6.10	UU100	19.7	18.1	206	104	2.14	1.79	75	2.0	214	7.3	O	107	Greenish brown sandy clayey SILT. Maximum load reached before failure of sample
DSRC205	37Cs	14.10	14.10	UU100	19.7	19.9	206	104	2.20	1.84	250	2.0	249	7.8	S	125	Greyish brown slightly sandy silty CLAY

general remarks: * shear strength taken as half deviator stress at failure for each stage membrane correction applied sample taken vertically (unless otherwise specified) strain rate 2%/min (unless otherwise specified)	code: UU - unconsolidated undrained M - multi stage S - set of three R - remoulded	failure mode: B - barrel (plastic failure) S - shear (brittle failure) I - intermediate O - other (see remarks)	membrane type/thickness: latex membrane used (unless otherwise specified) 38 - 0.2mm 70 - 0.4mm 100 - 0.4mm	<b>CONTRACT</b>  <b>35560/01</b>	<b>CHECKED</b>  <b>TB</b>
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# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	CP217
SITE	A417 - MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)	SAMPLE No./TYPE	19UT
DESCRIPTION	Brown mottled grey and orange slightly sandy clayey SILT	SAMPLE DEPTH (m)	7.20-7.65
		SPECIMEN DEPTH (m)	7.30-7.40

**TYPE OF SPECIMEN** Undisturbed / Vertical  
**TYPE OF TEST** Multi Specimen Single Stage  
**SIDE DRAINS FITTED** yes  
**DRAINAGE CONDITIONS** One end and radial boundary

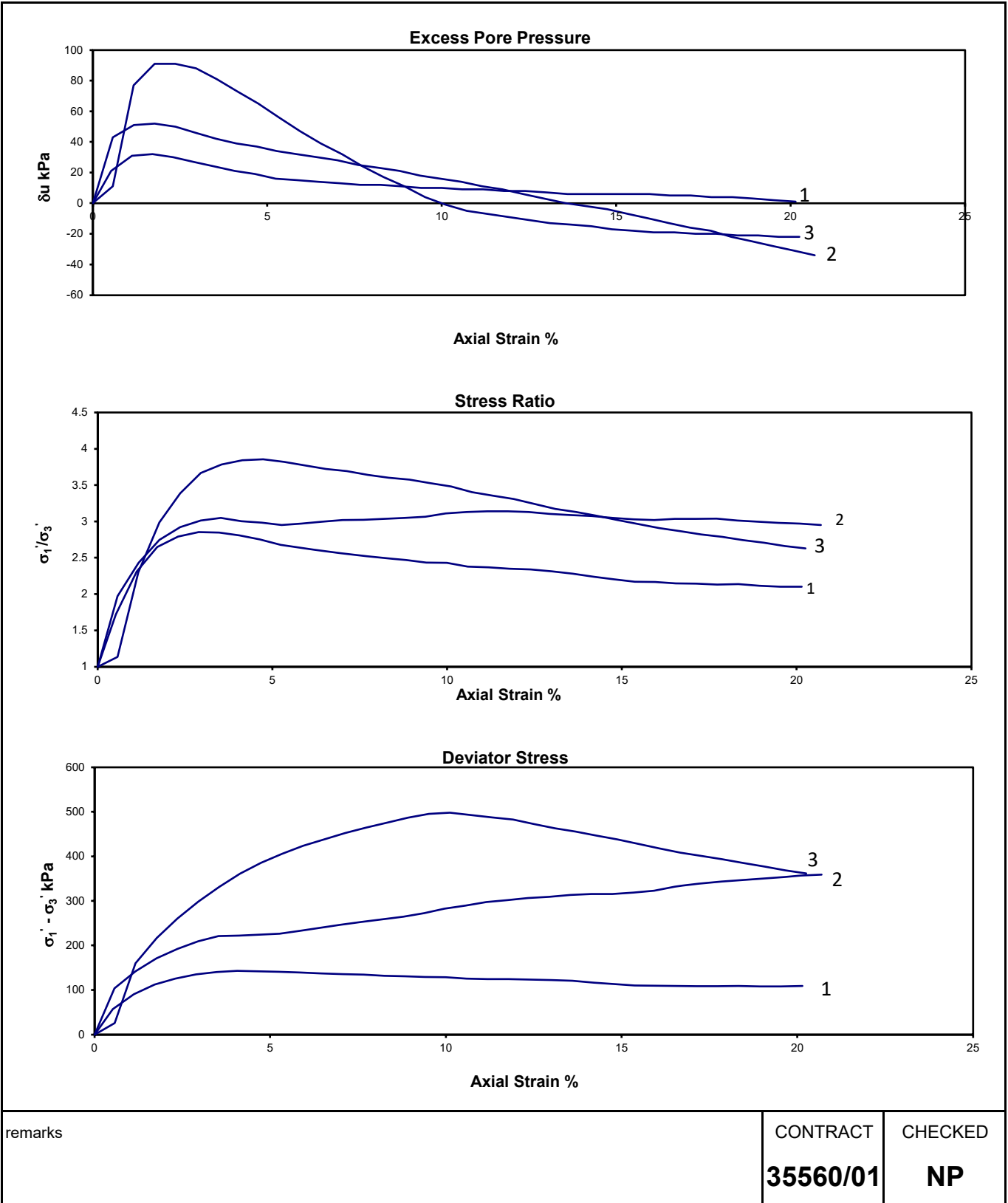
		SPECIMEN	1	2	3
<b>INITIAL CONDITIONS</b>	Length	mm	76.42	76.15	76.25
	Diameter	mm	37.92	37.89	37.63
	Moisture Content	%	22	20	21
	Bulk Density	Mg/m <sup>3</sup>	1.99	2.02	2.04
	Dry Density	Mg/m <sup>3</sup>	1.64	1.68	1.68
<b>FINAL CONDITIONS</b>	Moisture Content	%	24	23	21
	Bulk Density	Mg/m <sup>3</sup>	2.12	2.15	2.12
	Dry Density	Mg/m <sup>3</sup>	1.70	1.74	1.74
<b>SATURATION</b> (by cell pressure and back pressure increments)	Initial PWP	kPa	-4	0	0
	Saturated PWP	kPa	329	328	332
	Final Cell Pressure	kPa	350	350	350
	B Value		0.98	0.98	1
<b>CONSOLIDATION</b>	Cell Pressure	kPa	400	450	500
	Back Pressure	kPa	300	300	300
	Initial PWP	kPa	375	425	480
	Final PWP	kPa	292	289	294
<b>COMPRESSION</b>	Cell Pressure	kPa	400	450	500
	Back Pressure	kPa	300	300	300
	$\sigma_3$	kPa	100	150	200
	Rate of Strain	%/hr	1.192	1.193	1.192
<b>FAILURE CONDITIONS</b> (based on maximum deviator stress)	Strain ( $\epsilon$ )	%	4.1	20.7	10.1
	$\delta u$	kPa	21	-34	-1
	$\sigma_{3f}$	kPa	79	184	201
	$(\sigma_1' - \sigma_3')_f$	kPa	143	359	498
Membrane correction of 0.1kPa/% strain applied to the deviator stress. Side drain correction of 10kPa applied to deviator stress (38mm diameter).					
<b>FAILURE MODE</b> (also see photographs)			SHEAR	SHEAR	SHEAR
			<b>EFFECTIVE STRESS PARAMETERS</b>	<b>c' kPa :</b>	<b><math>\phi'</math> deg :</b>
			<b>0.0</b>	<b>31.0</b>	
remarks	* Calculated values		CONTRACT	CHECKED	
			<b>35560/01</b>	<b>NP</b>	

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	CP217
SITE	A417 - MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)	SAMPLE No./TYPE	19UT
		SAMPLE DEPTH (m)	7.20-7.65
		SPECIMEN DEPTH (m)	7.30-7.40



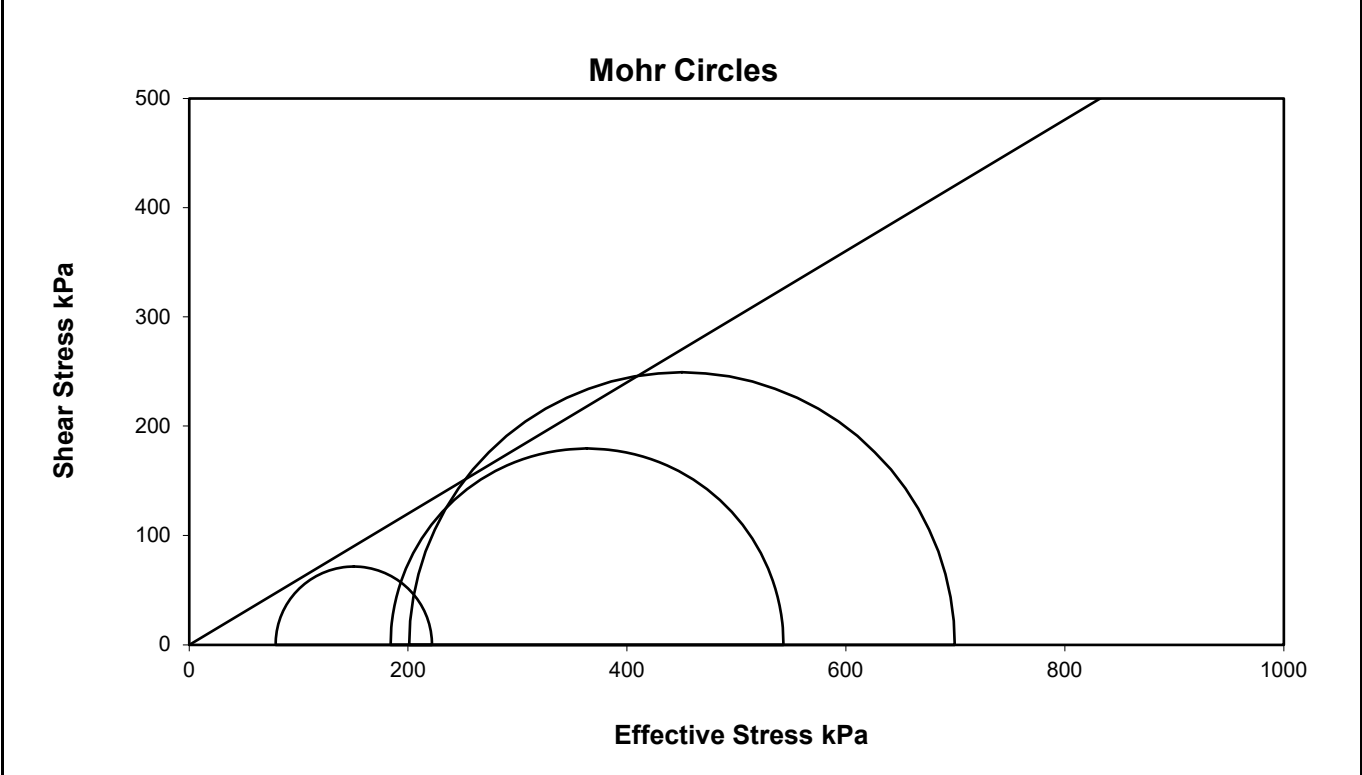
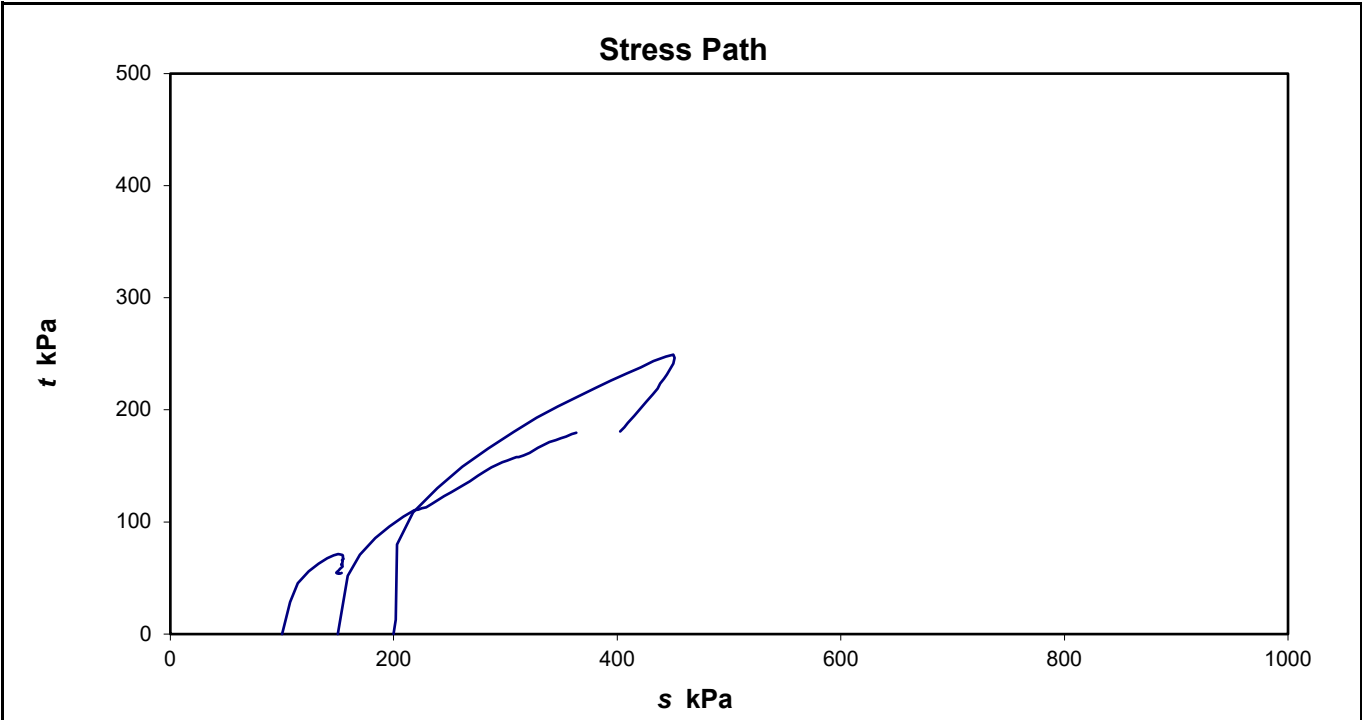
remarks	CONTRACT	CHECKED
	<b>35560/01</b>	<b>NP</b>

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	CP217
SITE	A417 - MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)	SAMPLE No./TYPE	19UT
		SAMPLE DEPTH (m)	7.20-7.65
		SPECIMEN DEPTH (m)	7.30-7.40




remarks	CONTRACT	CHECKED
	<b>35560/01</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	CP217
SITE	A417 - MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)	SAMPLE No./TYPE	19UT
		SAMPLE DEPTH (m)	7.20-7.65
		SPECIMEN DEPTH (m)	7.30-7.40

Specimen 1		Failure Mode	<div style="border: 1px solid black; padding: 2px; display: inline-block;">SHEAR</div>
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Specimen 2		Failure Mode	<div style="border: 1px solid black; padding: 2px; display: inline-block;">SHEAR</div>
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Specimen 3		Failure Mode	<div style="border: 1px solid black; padding: 2px; display: inline-block;">SHEAR</div>
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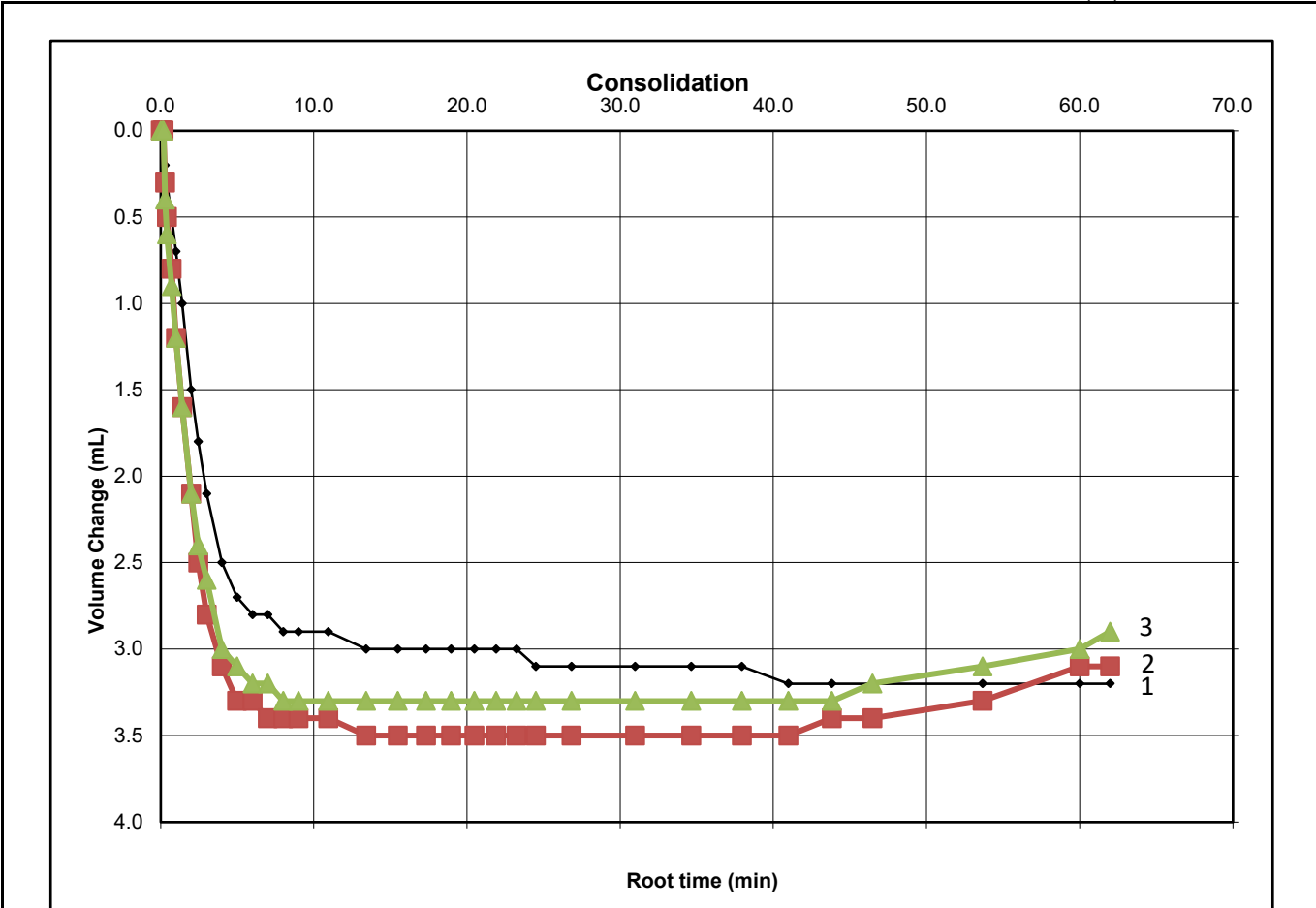
remarks Please note the photos are intended to show the mode of failure only.	CONTRACT <b>35560/01</b>	CHECKED <b>NP</b>
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# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	CP217
SITE	A417 - MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)	SAMPLE No./TYPE	19UT
		SAMPLE DEPTH (m)	7.20-7.65
		SPECIMEN DEPTH (m)	7.30-7.40



Specimen 1    Specimen 2    Specimen 3

Cell pressure	kPa	400	450	500
Back pressure	kPa	300	300	300
Effective pressure	kPa	100	150	200
Initial PWP	kPa	375	425	480
Final PWP	kPa	292	289	294
PWP Dissipation	%	110.67	108.80	103.33
Volume change	mL	3.2	3.1	2.9
	t100	34.48	29.97	23.59

remarks

CONTRACT  
**35560/01**

CHECKED  
**NP**

**ROCK WATER CONTENT**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	description and remarks
	no./type	depth (m)			
CP217	43Cs	21.10	21.50	4.3	Grey LIMESTONE
DSRC205	55Cs	28.40	28.60	12	Grey MUDSTONE
general remarks natural water content determined unless otherwise specified					
test method samples oven dried at 105°C				CONTRACT <b>35560/01</b>	CHECKED <b>TB</b>

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)								
CP210	18.65	A	X	P	115			65	18.18	97.56	1.91	1.35	2.58	Grey LIMESTONE
CP210	18.65	D	Y	P		50		115	10.15	115.00	0.77	1.45	1.12	Grey LIMESTONE
CP210	21.00	A	X	P	115			70	0.75	101.24	0.07	1.37	0.10	Grey MUDSTONE
CP210	21.00	D	Y	P		70		115	0.72	115.00	0.05	1.45	0.08	Grey MUDSTONE
CP211	20.15	A	X	P	105			30	0.29	63.33	0.07	1.11	0.08	Grey MUDSTONE
CP211	20.15	D	Y	P		60		105	0.25	105.00	0.02	1.40	0.03	Grey MUDSTONE
CP211	26.60	A	X	P	105			50	1.46	81.76	0.22	1.25	0.27	Grey MUDSTONE
CP211	26.60	D	Y	P		50		105	1.51	105.00	0.14	1.40	0.19	Grey MUDSTONE
CP211	29.00	A	X	N	115			45	6.69	81.17	1.02	1.24	1.26	Grey LIMESTONE
CP211	29.00	D	Y	N		50		115	4.74	115.00	0.36	1.45	0.52	Grey LIMESTONE
CP211	33.70	A	X	N	105			35	0.28	68.40	0.06	1.15	0.07	Grey MUDSTONE
CP211	33.70	D	Y	N		40		105	0.35	105.00	0.03	1.40	0.04	Grey MUDSTONE
DSRC205	11.50	A	X	N	105			30	0.29	63.33	0.07	1.11	0.08	Grey SILTSTONE
DSRC205	11.50	D	Y	N		40		105	0.09	105.00	0.01	1.40	0.01	Grey SILTSTONE
DSRC205	18.05	A	X	P	105			40	0.45	73.13	0.08	1.19	0.10	Grey and brown MUDSTONE
DSRC205	18.05	D	Y	P		40		105	0.33	105.00	0.03	1.40	0.04	Grey and brown MUDSTONE
DSRC205	22.40	A	X	P	105			30	0.48	63.33	0.12	1.11	0.13	Yellowish grey MUDSTONE
DSRC205	22.40	D	Y	P		60		105	0.37	105.00	0.03	1.40	0.05	Yellowish grey MUDSTONE
DSRC205	24.00	A	X	N	115			60	1.01	93.73	0.11	1.33	0.15	Grey MUDSTONE
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02														
test type		test orientation relative to discontinuities				moisture condition				CONTRACT		CHECKED		
A - axial		X - perpendicular		U - unknown		N - natural moisture content				<b>35560/01</b>		<b>TB</b>		
D - diametral		Y - parallel		P - partially air dried										
I - irregular lump		Z - oblique		S - soaked										



# POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (992)

borehole /trial pit no.	sample depth (m)	test type	test orientation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
DSRC205	24.00	D	Y	N		60	115	0.55	115.00	0.04	1.45	0.06	Grey MUDSTONE
DSRC205	28.00	A	X	N	105		55	1.08	85.75	0.15	1.27	0.19	Grey MUDSTONE
DSRC205	28.00	D	Y	N		50	105	0.55	105.00	0.05	1.40	0.07	Grey MUDSTONE

general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35560/01</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		



## Final Report

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**Report No.:** 20-02330-1

**Initial Date of Issue:** 29-Jan-2020

**Client** Geotechnical Engineering Ltd

**Client Address:** Centurion House  
Olympus Park  
Quedgeley  
Gloucester  
Gloucestershire  
GL2 4NF

**Contact(s):** GEL  
Tom Best

**Project** 35560/01 A417 Missing Link

**Quotation No.:** **Date Received:** 24-Jan-2020

**Order No.:** 35560/01LAB **Date Instructed:** 24-Jan-2020

**No. of Samples:** 2

**Turnaround (Wkdays):** 5 **Results Due:** 30-Jan-2020

**Date Approved:** 29-Jan-2020

**Approved By:**  


**Details:** Darrell Hall, Director

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**Project: 35560/01 A417 Missing Link**

<b>Client: Geotechnical Engineering Ltd</b>	<b>Chemtest Job No.:</b>				20-02330	20-02330
Quotation No.:	<b>Chemtest Sample ID.:</b>				958521	958522
	Client Sample ID.:				29C	36C
	Sample Location:				CP210	DSRC205
	Sample Type:				SOIL	SOIL
	Top Depth (m):				16.50	13.00
	Bottom Depth (m):				18.00	14.50
	Date Sampled:				23-Jan-2020	23-Jan-2020
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>		
Moisture	N	2030	%	0.020	13	15
pH	U	2010		4.0	6.8	7.6
Sulphate (2:1 Water Soluble) as SO <sub>4</sub>	U	2120	g/l	0.010	0.61	0.77
Total Sulphur	U	2175	%	0.010	0.61	0.76
Sulphate (Acid Soluble)	U	2430	%	0.010	0.14	0.15

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

## **Report Information**

### **Key**

---

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

---

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

---

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



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GEOTECHNICAL ENGINEERING LIMITED



For the attention of David Owen

Version No. 2  
Page No. 1 of 45  
Date of Issue 23/04/2020**TEST REPORT**

PROJECT/SITE	HE55105 A417 MISSING LINK GROUND INVESTIGATION – PHASE 2A (1106)	Samples received	20/01/2020
GEL REPORT NUMBER	35560/02	Schedule received	20/01/2020
Test report refers to	All schedules	Testing commenced	24/01/2020
		Status	Final

**SUMMARY OF RESULTS ATTACHED**

TEST METHOD & DESCRIPTION	QUANTITY	ACCREDITED TEST
BS EN ISO 17892-1: 2014:5. Water Content	17	YES
BS1377: Part 2: 1990:4.2-4.4&5.2-5.4, Liquid & Plastic Limits	17	YES
BS EN ISO 17892-1: 2014:5. Water Content (Subcontracted)	1	YES
BS1377: Part 2: 1990:4.2-4.4&5.2-5.4, Liquid & Plastic Limits (Subcontracted)	1	YES
BS EN ISO 17892-4: 2016: 5.2, Particle Size Distribution - Wet Sieve	6	YES
BS EN ISO 17892-4: 2016: 5.4, Particle Size Distribution - Pipette	6	YES
BS EN ISO 17892-5: 2017, Oedometer	2	YES
BS1377: Part 8: 1990: Effective Stress Testing (Subcontracted)	1	YES
BS1377: Part 8: 1990: Effective Stress Testing	2	YES
ISRM: 2007: Water Content of Rock	26	NO
ISRM: 2007: Uniaxial Compressive Strength Test	3	YES
ISRM: 2007: Point Load Strength Test	71	YES
BS EN 1097-2: 2010. Fragmentation of Aggregate (Los Angeles test method) (Subcontracted)	4	YES
BRE SD1 Reduced Suite: pH, Sulphate - water and acid soluble, sulphur (Subcontracted)	2	YES

Remarks This report may not be partially reproduced without written permission from this laboratory.  The results reported relate to samples received in the laboratory	Approved Signatories: T Best (Deputy Laboratory Manager) <b>E Crimp (Senior Engineer)</b> J Hanson (Director) N Parry (Director)
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Doc TR01 Rev No. 22 Revision date 02/01/20 DC:JH

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Sort code: 16-22-11 Bank account: 11125135

# LIQUID AND PLASTIC LIMITS

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)

borehole / trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
DSRC109	2B	1.00	1.00	10.3	BXE	76	43	25	18	Light brown sandy very clayey GRAVEL
DSRC109	34Cs	27.25	27.30	15.5	BXE	0	34	21	13	Grey slightly sandy silty CLAY
DSRC109	47Cs	40.75	40.80	14.4	BXE	0	35	20	15	Grey slightly sandy silty CLAY
DSRC109	58Cs	50.00	50.05	13.7	BXE	1	45	21	24	Grey slightly sandy silty CLAY
DSRC109	61Cs	52.95	53.00	11.9	BXE	0	43	21	22	Grey slightly sandy silty CLAY
DSRC109	72Cs	63.45	63.50	15.0	BXE	1	48	23	25	Grey slightly sandy silty CLAY
DSRC109	75Cs	66.70	66.75	15.8	BXE	8	48	23	25	Grey slightly gravelly slightly sandy silty CLAY
DSRC301	35Cs	30.50	30.55	20.5	BXE	1	35	21	14	Greyish brown mottled orange slightly sandy clayey SILT
DSRC301	41Cs	35.05	35.05	15.5	AXE	0	33	NP		Greyish brown slightly sandy clayey SILT
DSRC301	44Cs	37.95	38.10	18.3	AXE	0	36	22	14	Greyish brown slightly sandy clayey SILT
DSRC301	47Cs	41.30	41.35	14.5	BXE	0	36	20	16	Grey slightly sandy silty CLAY
DSRC301	52Cs	45.40	45.45	14.6	BXE	0	40	21	19	Grey slightly sandy silty CLAY
DSRC301	55Cs	48.50	48.55	13.2	BXE	0	37	21	16	Grey slightly sandy silty CLAY
DSRC301	58Cs	51.30	51.30	11.2	BX	0	40	20	20	Dark grey MUDSTONE
DSRC301	98Cs	88.15	88.15	14.3	BXE	1	44	22	22	Grey slightly sandy silty CLAY
RC507	50Cs	39.72	39.75	21.8	BYE	1	37	NP		Yellowish brown sandy SILT
RC507	53Cs	43.68	43.75	14.3	BXE	0	34	21	13	Grey slightly sandy silty CLAY

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

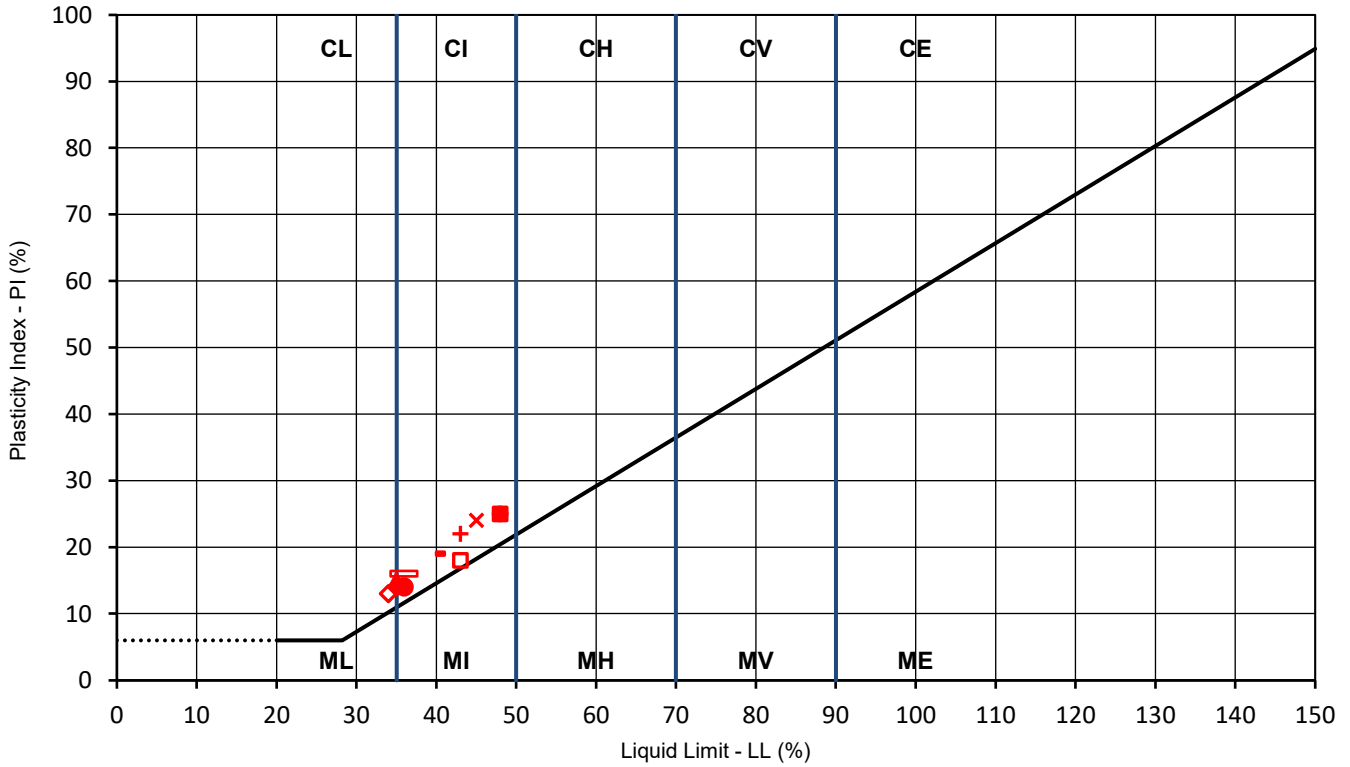
specimen preparation	test method	CONTRACT	CHECKED
A - as received	D - oven dried (60°C)	<b>35560/02</b>	<b>TB</b>
B - washed on 0.425mm sieve	E - oven dried (105°C)		
C - air dried	F - not known		
	X - cone penetrometer (test 4.3) Y - cone penetrometer (test 4.4) Z - casagrande apparatus (test 4.5)		

Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	DSRC109	1.00	43	25	18	
◇	DSRC109	27.30	34	21	13	
△	DSRC109	40.80	35	20	15	
×	DSRC109	50.05	45	21	24	
+	DSRC109	53.00	43	21	22	
○	DSRC109	63.50	48	23	25	
■	DSRC109	66.75	48	23	25	
◆	DSRC301	30.55	35	21	14	
	DSRC301	35.05	33	NP		
●	DSRC301	38.10	36	22	14	
▢	DSRC301	41.35	36	20	16	
▪	DSRC301	45.45	40	21	19	

CONTRACT	CHECKED
<b>35560/02</b>	<b>TB</b>

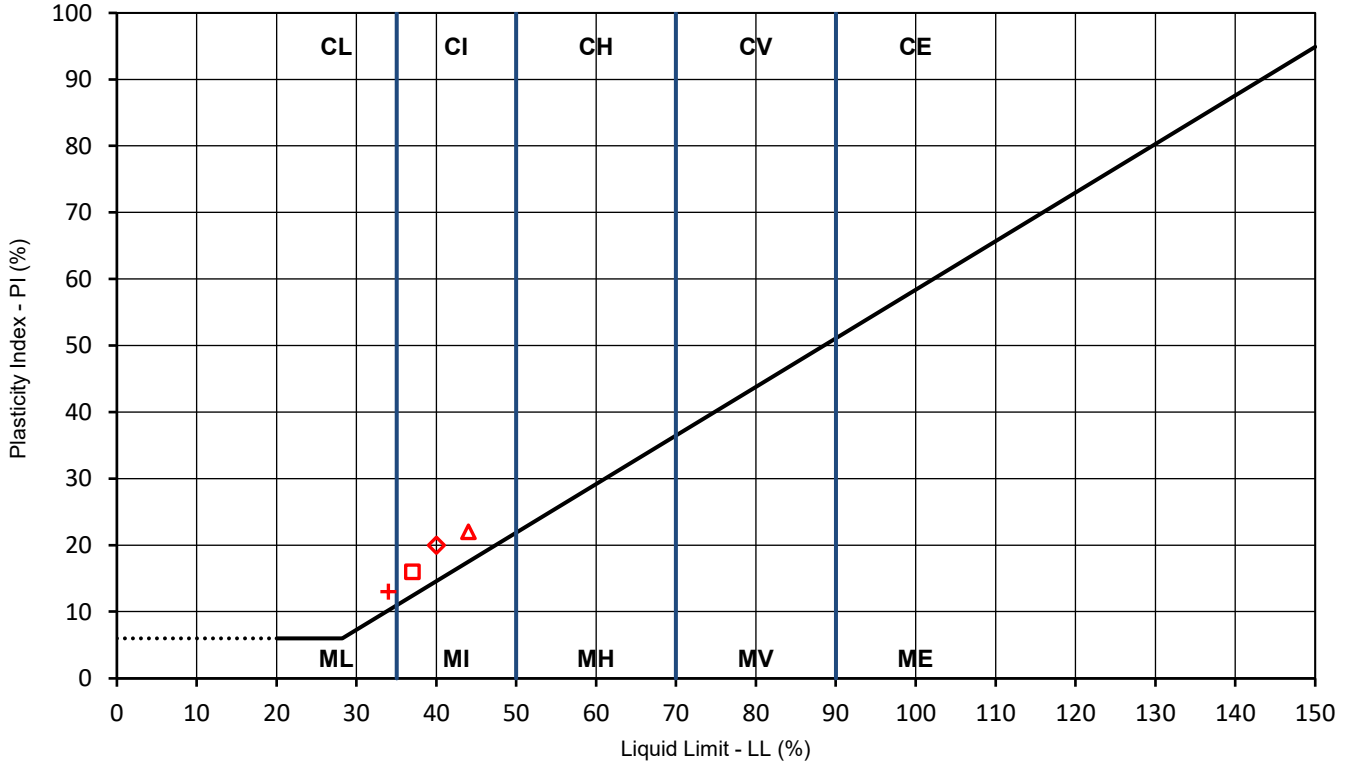


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**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	DSRC301	48.55	37	21	16	
◇	DSRC301	51.30	40	20	20	
△	DSRC301	88.15	44	22	22	
	RC507	39.75	37	NP		
+	RC507	43.75	34	21	13	

CONTRACT	CHECKED
<b>35560/02</b>	<b>TB</b>

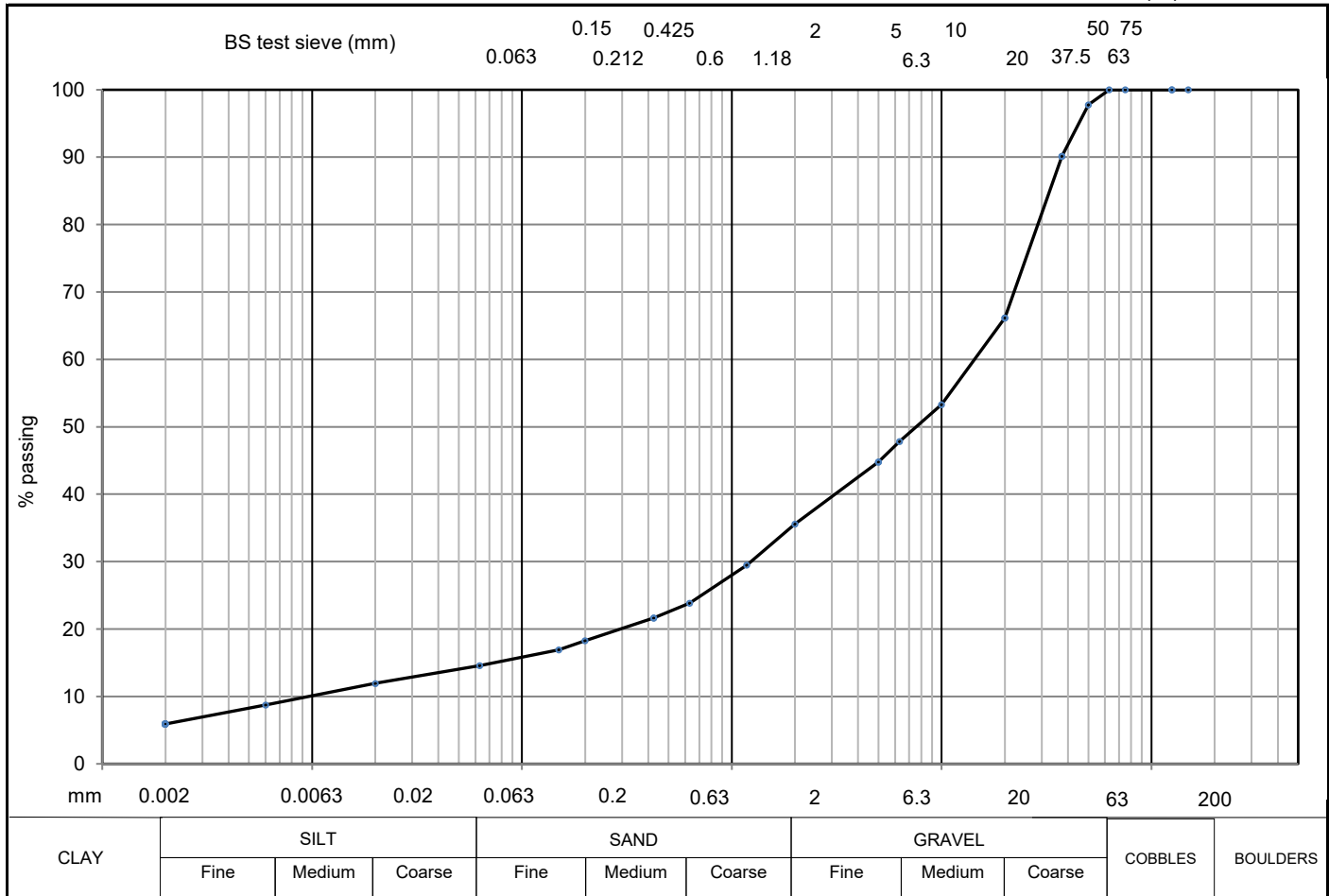


# PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC109
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)	SAMPLE No./TYPE	4L
DESCRIPTION	Light brown very clayey very sandy GRAVEL	SAMPLE DEPTH (m)	1.20
		SPECIMEN TOP (m)	1.20
		SPECIMEN BASE (m)	1.70



soil type	% fraction	SAND		GRAVEL			COBBLES	BOULDERS
		Fine	Coarse	Fine	Medium	Coarse		
CLAY	6							
SILT	9							
SILT & CLAY	15							
SAND	21							
GRAVEL	64							
COBBLE & BOULDER	0							

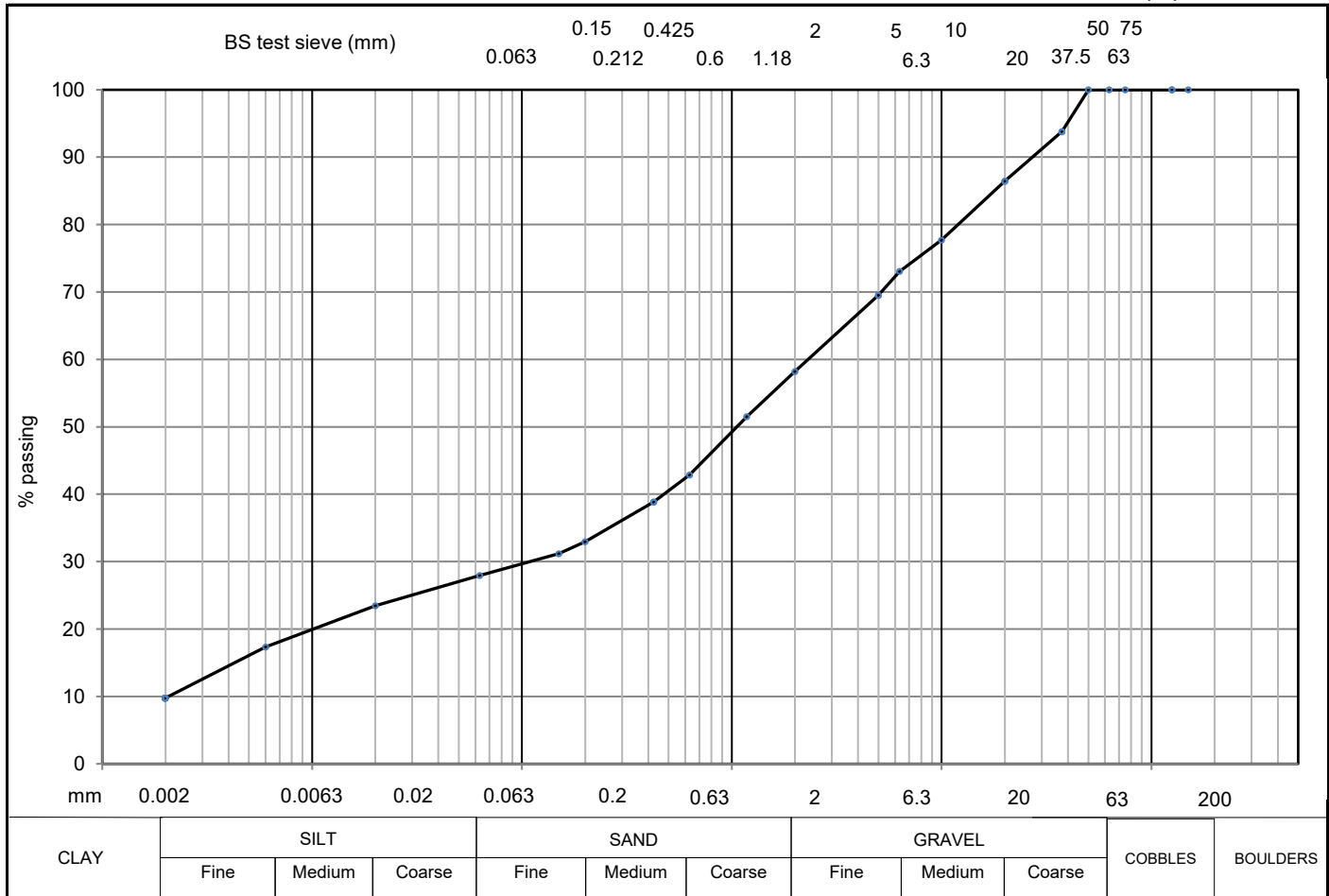
test method(s)	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
5.2 & 5.4	50	98	0.63	24		
test method	37.5	90	0.425	22		
	5.2 - sieving	20	66	0.2	18	
	5.3 - sedimentation by hydrometer	10	53	0.15	17	
	5.4 - sedimentation by pipette	6.3	48	0.063	15	

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	CONTRACT <b>35560/02</b>	CHECKED <b>TB</b>
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**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC301
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)	SAMPLE No./TYPE	2B
DESCRIPTION	Light brown very clayey very sandy GRAVEL	SAMPLE DEPTH (m)	1.00
		SPECIMEN TOP (m)	1.00
		SPECIMEN BASE (m)	1.20



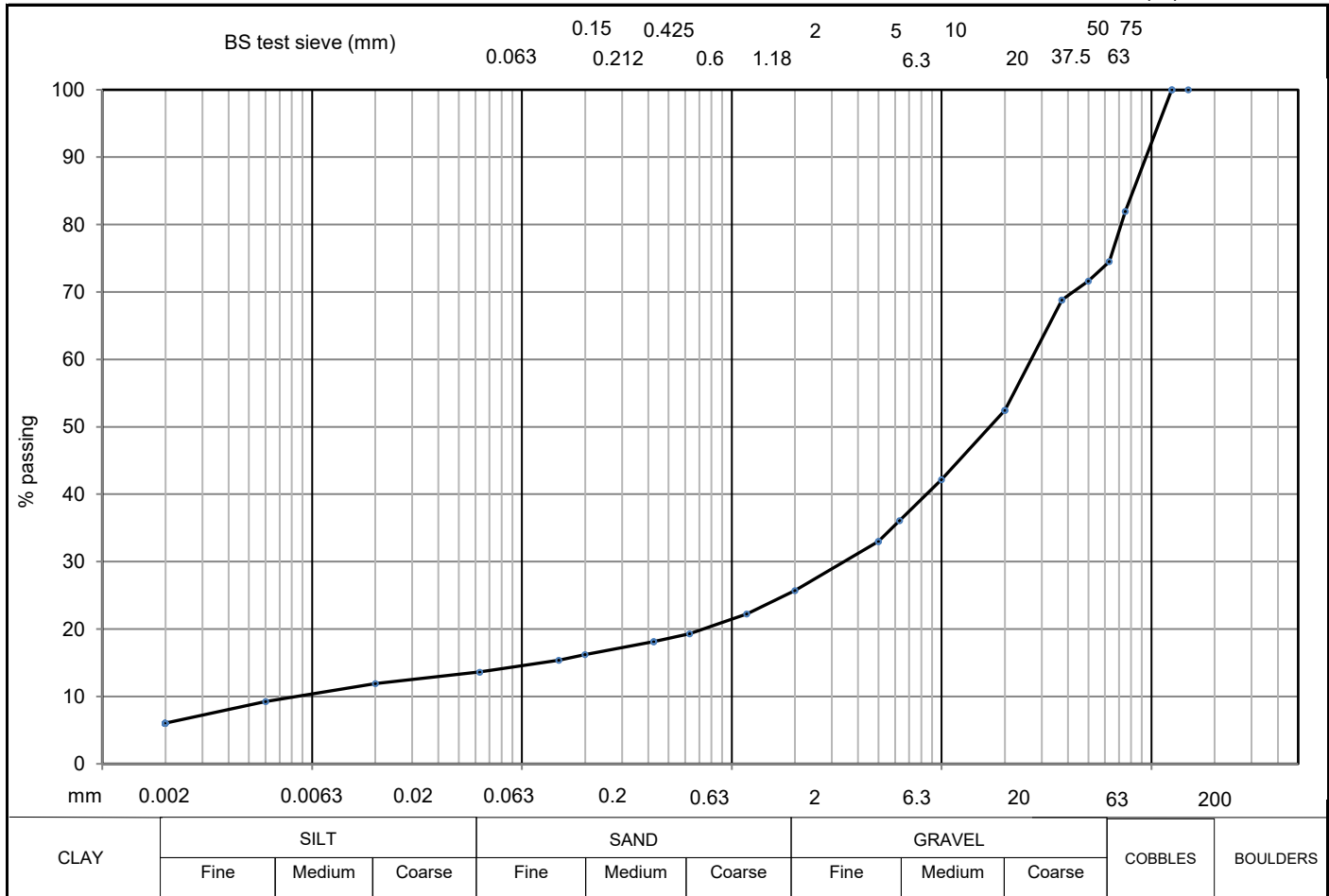
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	10			5	70	20	23
SILT	18	150		2	58	6	17
SILT & CLAY	28			1.18	52	2	10
SAND	30	75					
GRAVEL	42						
COBBLE & BOULDER	0	63					
test method(s)	5.2 & 5.4	50	100	0.63	43		
test method		37.5	94	0.425	39		
5.2 - sieving		20	86	0.2	33		
5.3 - sedimentation by hydrometer		10	78	0.15	31		
5.4 - sedimentation by pipette		6.3	73	0.063	28		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	CONTRACT <b>35560/02</b>	CHECKED <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC301
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)	SAMPLE No./TYPE	8C
DESCRIPTION	Yellowish brown sandy clayey GRAVEL with high cobble content	SAMPLE DEPTH (m)	4.20
		SPECIMEN TOP (m)	4.20
		SPECIMEN BASE (m)	4.70



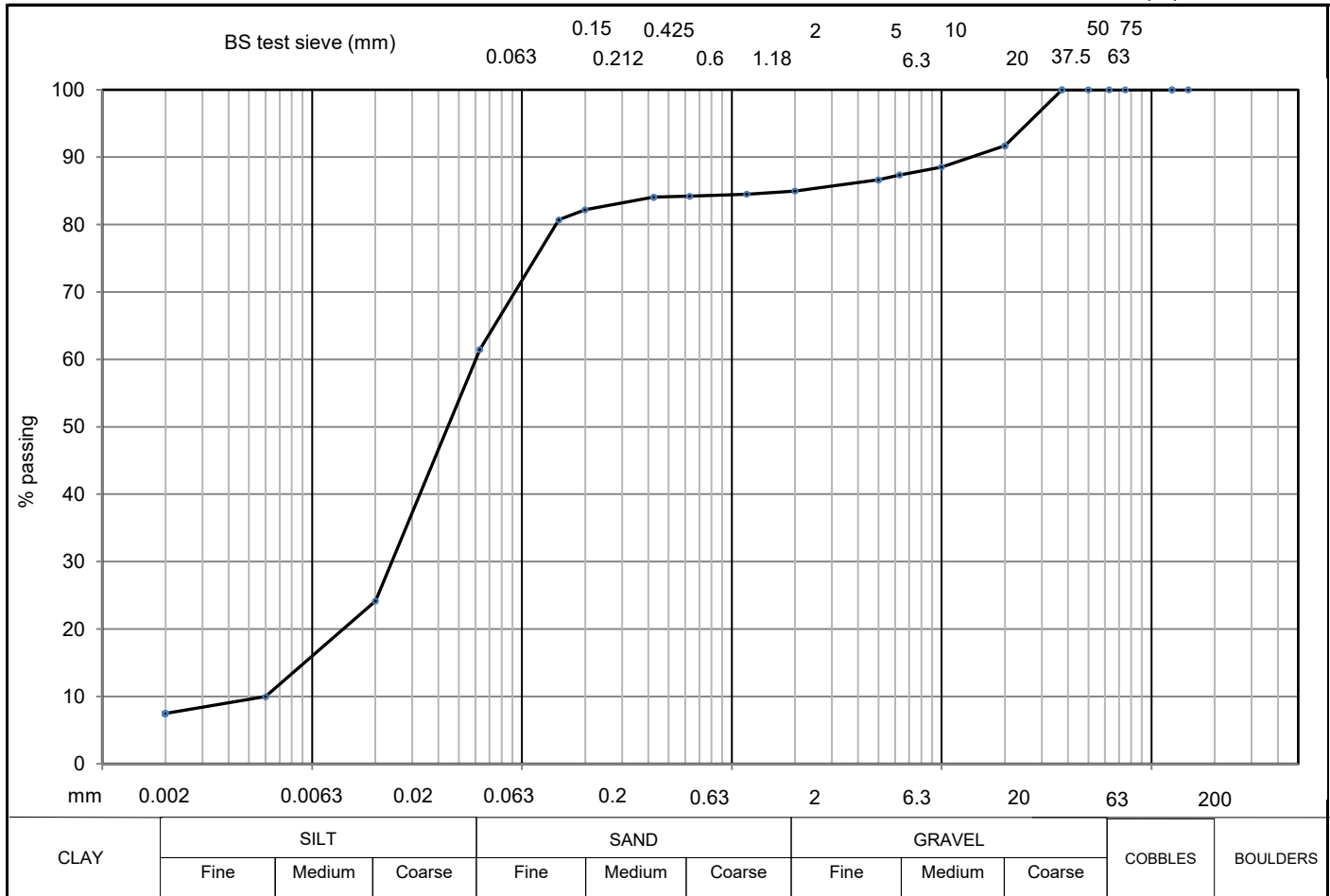
soil type	% fraction	SILT		SAND			GRAVEL			COBBLES	BOULDERS
		Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium		
CLAY	6										
SILT	8										
SILT & CLAY	14										
SAND	12										
GRAVEL	49										
COBBLE & BOULDER	25										
test method(s)	5.2 & 5.4										
test method											
5.2 - sieving											
5.3 - sedimentation by hydrometer											
5.4 - sedimentation by pipette											

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	CONTRACT <b>35560/02</b>	CHECKED <b>TB</b>
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**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC301
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)	SAMPLE No./TYPE	30C
DESCRIPTION	Yellowish brown slightly gravelly slightly sandy SILT	SAMPLE DEPTH (m)	25.20
		SPECIMEN TOP (m)	25.70
		SPECIMEN BASE (m)	26.00



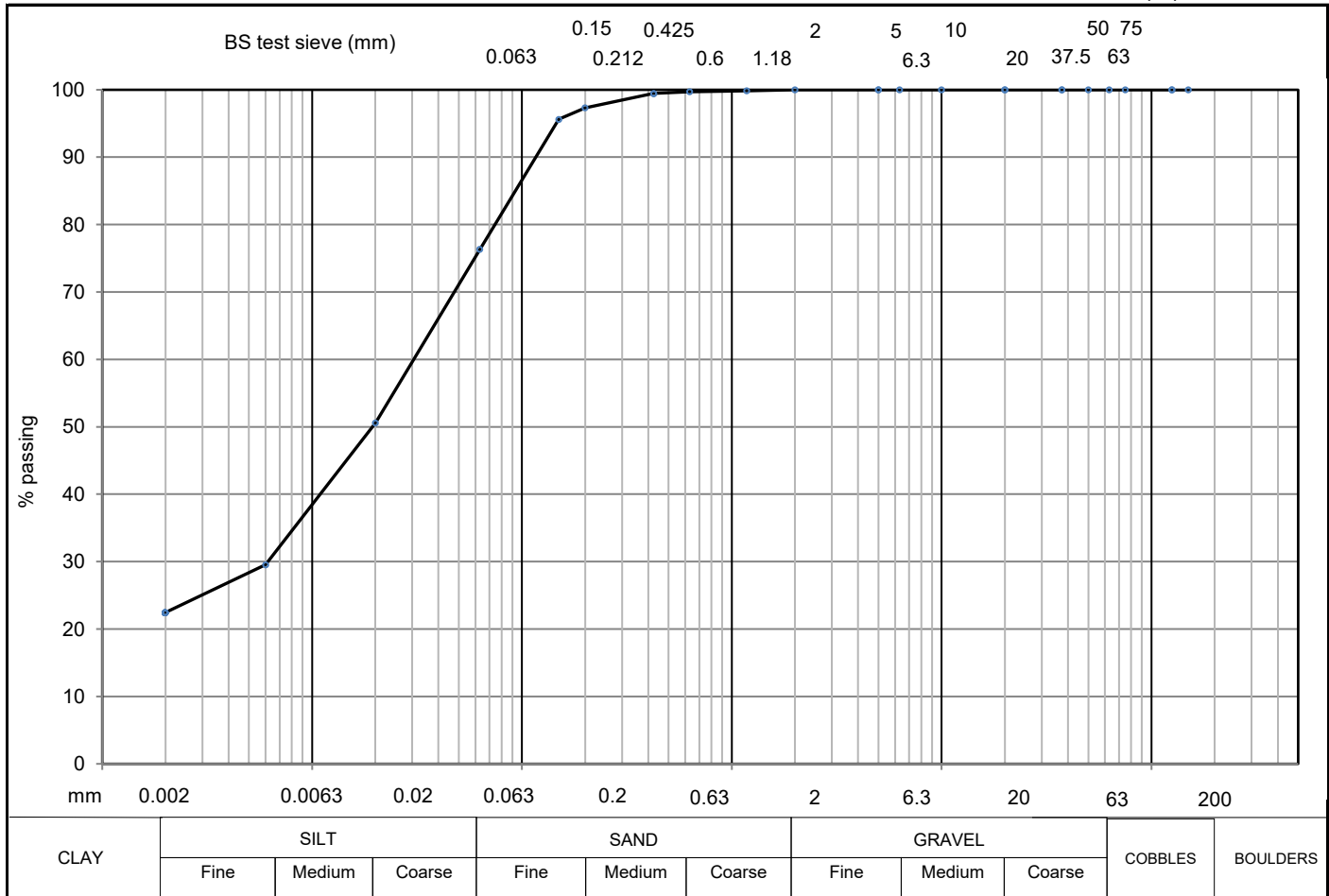
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	8			5	87	20	24
SILT	54	150		2	85	6	10
SILT & CLAY	61			1.18	85	2	7
SAND	23	75					
GRAVEL	15						
COBBLE & BOULDER	0	63					
test method(s)	5.2 & 5.4	50		0.63	84		
test method		37.5	100	0.425	84		
5.2 - sieving		20	92	0.2	82		
5.3 - sedimentation by hydrometer		10	89	0.15	81		
5.4 - sedimentation by pipette		6.3	87	0.063	61		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35560/02</b>	<b>CHECKED</b> <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC301
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)	SAMPLE No./TYPE	34C
DESCRIPTION	Orangish brown mottled grey slightly sandy clayey SILT	SAMPLE DEPTH (m)	29.70
		SPECIMEN TOP (m)	30.10
		SPECIMEN BASE (m)	30.40



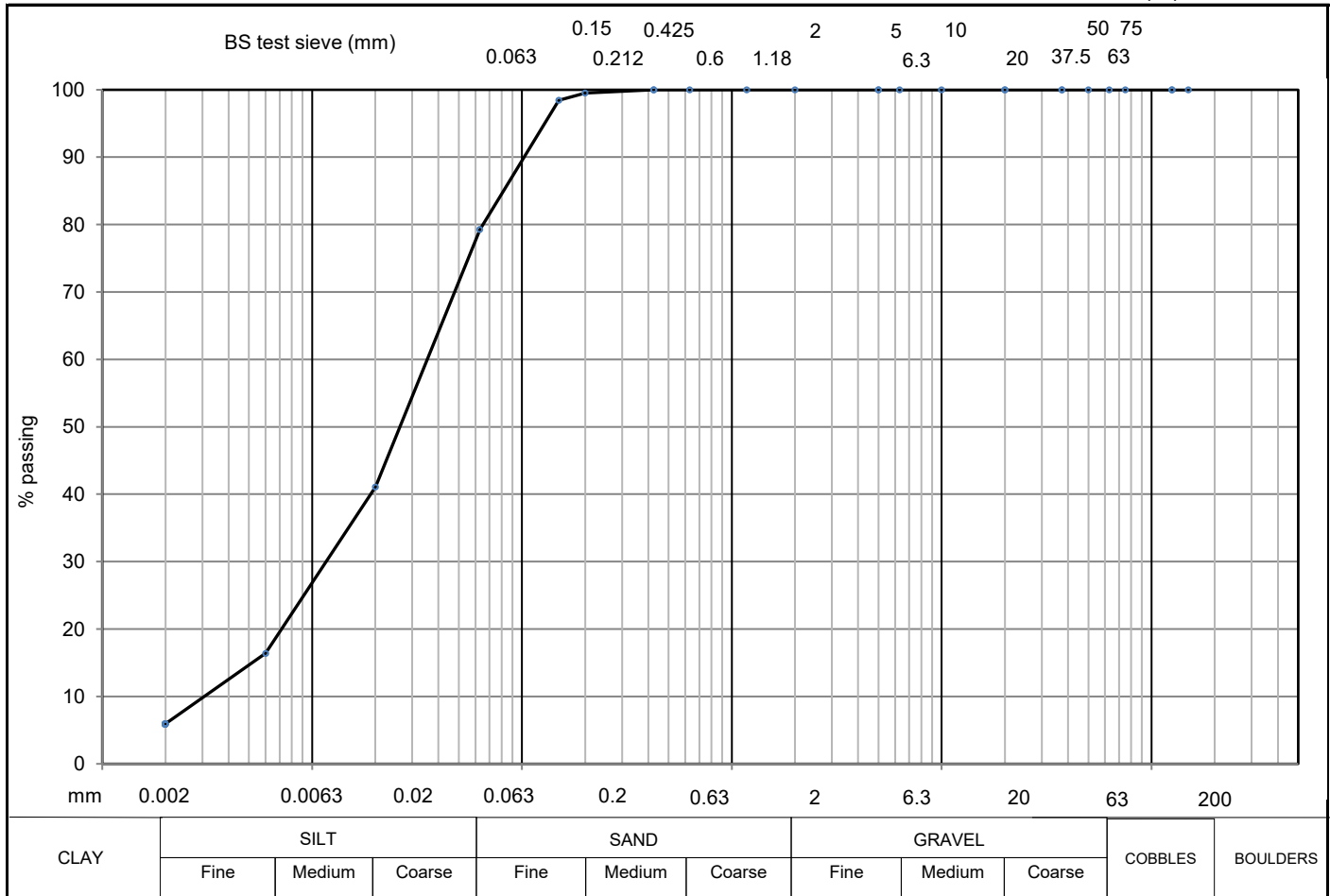
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	22						
SILT	54	150		5		20	51
SILT & CLAY	76						
SAND	24	75		2	100	6	30
GRAVEL	0						
COBBLE & BOULDER	0	63		1.18	100	2	22
test method(s)	5.2 & 5.4	50		0.63	100		
test method		37.5		0.425	99		
5.2 - sieving		20		0.2	97		
5.3 - sedimentation by hydrometer		10		0.15	96		
5.4 - sedimentation by pipette		6.3		0.063	76		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35560/02</b>	<b>CHECKED</b> <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC301
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)	SAMPLE No./TYPE	37C
DESCRIPTION	Light grey slightly sandy SILT	SAMPLE DEPTH (m)	32.70
		SPECIMEN TOP (m)	32.90
		SPECIMEN BASE (m)	33.10



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	6			5			
SILT	73	150		5		20	41
SILT & CLAY	79						
SAND	21	75		2		6	16
GRAVEL	0						
COBBLE & BOULDER	0	63		1.18		2	6
test method(s)	5.2 & 5.4						
test method		50		0.63			
5.2 - sieving		37.5		0.425	100		
5.3 - sedimentation by hydrometer		20		0.2	100		
5.4 - sedimentation by pipette		10		0.15	98		
		6.3		0.063	79		

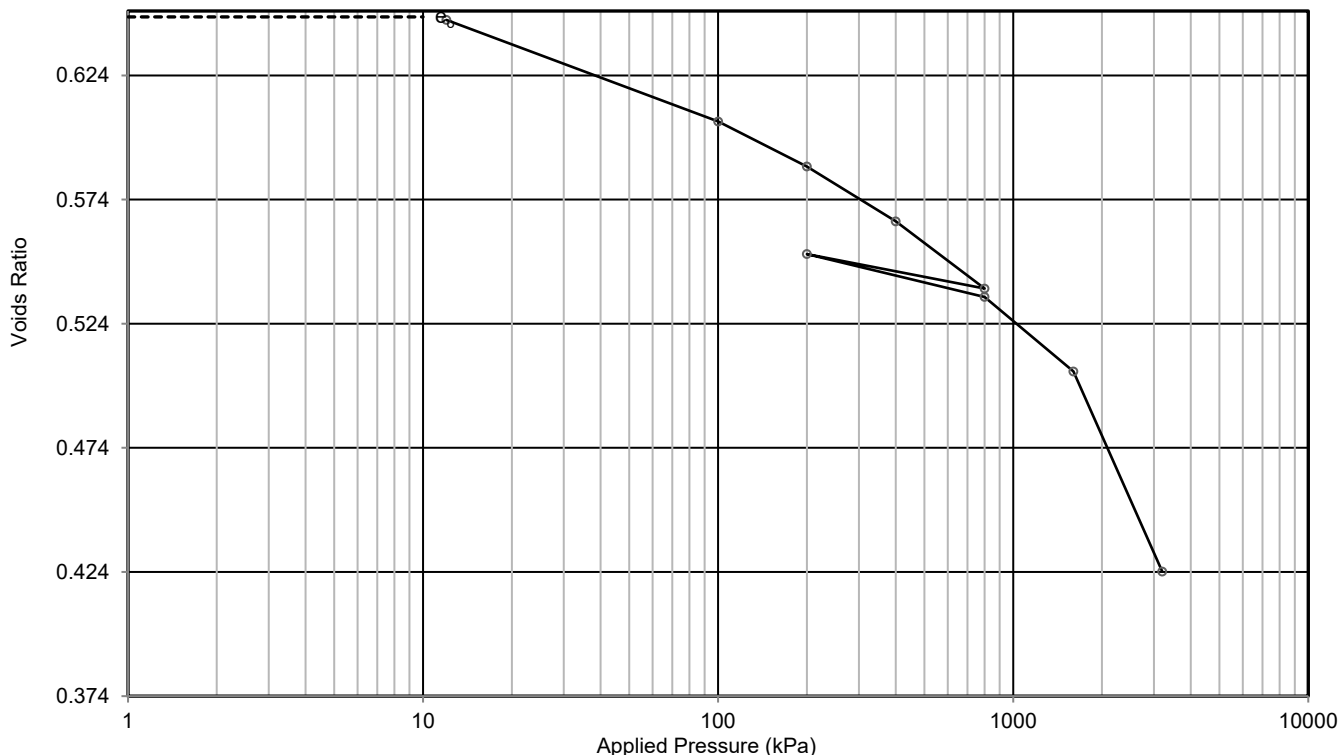
remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	CONTRACT <b>35560/02</b>	CHECKED <b>TB</b>
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**DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES**  
**BS EN ISO 17892 - 5 : 2017 : 6**



CLIENT	OSBORNE	BH/TP No.	DSRC301
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)	SAMPLE No./TYPE	35Cs
DESCRIPTION	Greenish grey mottled orange slightly sandy clayey SILT	SAMPLE DEPTH (m)	30.50
		SPECIMEN DEPTH (m)	30.55

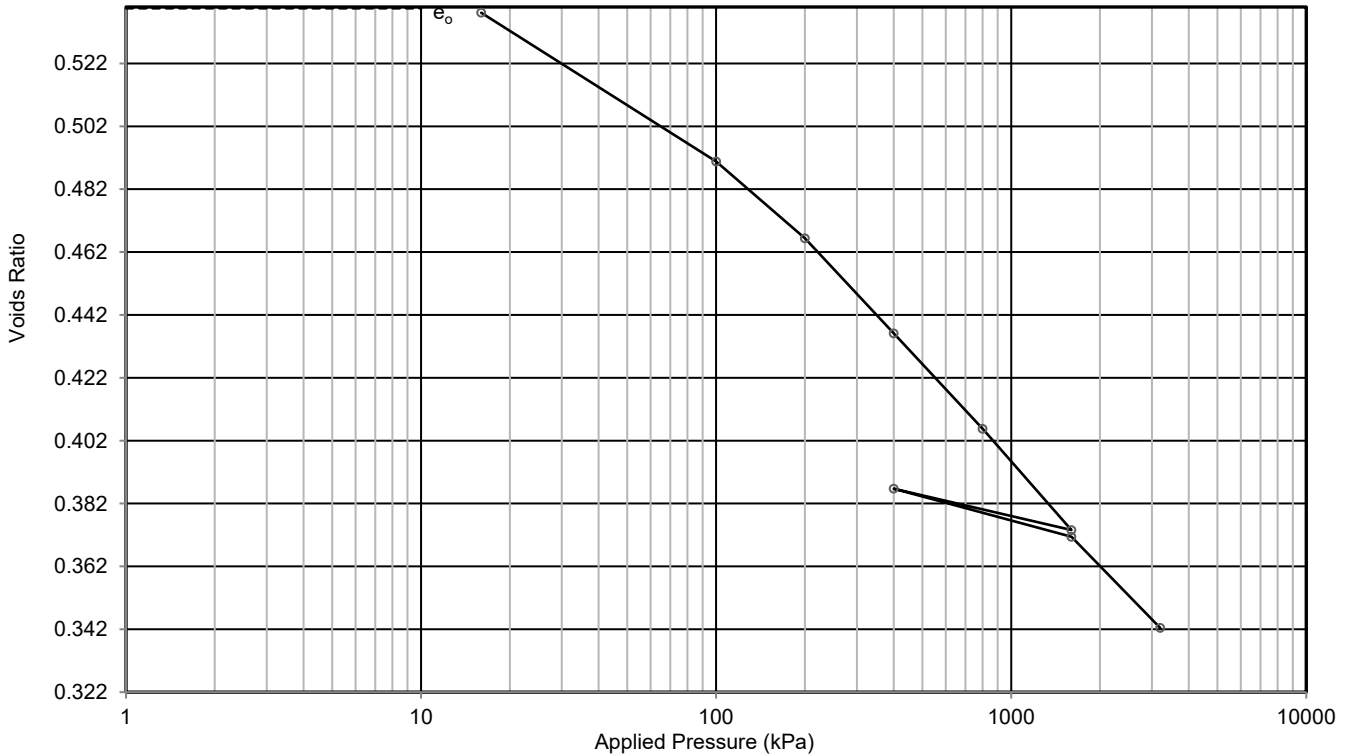


test and sample details			test results			
			pressure stage (kPa)	voids ratio	laboratory coefficients of compressibility $m_v$ ( $m^2/MN$ )	consolidation $C_v$ ( $m^2/yr$ )
specimen diameter	mm	63.55				
specimen height	mm	16.62				
initial moisture content	%	22.7				
final moisture content	%	22.6				
initial bulk density	Mg/m <sup>3</sup>	2.01	12	0.646		
initial dry density	Mg/m <sup>3</sup>	1.64	100	0.605	0.28	10
initial voids ratio		0.648	200	0.587	0.11	6.1
initial degree of saturation	%	95	400	0.565	0.070	7.6
particle density	Mg/m <sup>3</sup>	#2.70	800	0.538	0.043	3.2
swelling pressure	kPa	12	200	0.552	0.015	
			800	0.535	0.019	22
P'o to P'o +100 kPa		-	1600	0.505	0.024	7.5
laboratory temperature	°C	20 ± 2	3200	0.424	0.033	
method of time fitting		root time				
remarks	# denotes particle density has been assigned an assumed value				CONTRACT	CHECKED
					<b>35560/02</b>	<b>EC</b>

**DETERMINATION OF ONE-DIMENSIONAL CONSOLIDATION PROPERTIES**  
**BS EN ISO 17892 - 5 : 2017 : 6**



CLIENT	OSBORNE	BH/TP No.	DSRC301
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)	SAMPLE No./TYPE	47Cs
DESCRIPTION	Grey slightly gravelly silty CLAY	SAMPLE DEPTH (m)	41.30
		SPECIMEN DEPTH (m)	41.31

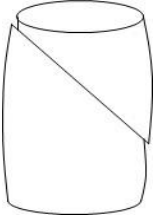


test and sample details			test results			
specimen diameter	mm	63.51	pressure stage (kPa)	voids ratio	laboratory coefficients of compressibility $m_v$ ( $m^2/MN$ )	consolidation $C_v$ ( $m^2/yr$ )
specimen height	mm	17.20				
initial moisture content	%	16.3	16	0.538		
final moisture content	%	18.3	100	0.491	0.37	1.8
initial bulk density	Mg/m <sup>3</sup>	2.04	200	0.466	0.16	13
initial dry density	Mg/m <sup>3</sup>	1.75	400	0.436	0.10	5.9
initial voids ratio		0.540	800	0.406	0.053	12
initial degree of saturation	%	81	1600	0.374	0.029	3.9
particle density	Mg/m <sup>3</sup>	#2.70	400	0.387	0.0080	
swelling pressure	kPa	16	1600	0.371	0.0092	7.1
P'o to P'o +100 kPa		-	3200	0.342	0.013	4.1
laboratory temperature	°C	20 ± 2				
method of time fitting		root time				
remarks	# denotes particle density has been assigned an assumed value				CONTRACT	CHECKED
					<b>35560/02</b>	<b>EC</b>

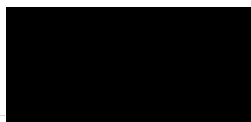
## Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: DSRC301  
Sample No.: 38  
Depth (m): 33.15-33.40

Description:  
Firm grey slightly clayey SILT.

<b>SPECIMEN DETAILS</b>		
Depth within original sample		20 mm from top
Orientation within original sample		Vertical
<b>TEST DETAILS</b>		
Specimen Type and Preparation		Cs (Undisturbed)
Cell Preparation		Checks performed in accordance with Clause 3.5
Specimen Number		<b>Single</b>
Initial Diameter	mm	104.24
Initial Length	mm	200.07
Initial Water Content	%	18.5
Initial Wet Density	Mg/m <sup>3</sup>	2.17
Drainage Conditions		One end and radial boundary
<b>SATURATION STAGE</b>		Method: Clause 5.3
Final Cell Pressure	kPa	900
Final Pore Pressure	kPa	867
Final Pore Pressure Parameter B		0.97
Duration	day(s)	2
<b>CONSOLIDATION STAGE</b>		
Cell Pressure	kPa	900
Back Pressure	kPa	300
Effective Pressure	kPa	600
Final Pore Pressure	kPa	302
Final Pore Pressure Dissipation	%	100
Duration	day(s)	1
<b>SHEARING STAGE</b>		
Cell Pressure	kPa	900
Rate of Axial Displacement	mm/min	0.046
Initial Pore Pressure	kPa	302
Initial Effective Stress	kPa	598
<b>CONDITIONS AT FAILURE</b>	<i>criteria</i>	Maximum deviator stress
Pore Pressure	kPa	44
Minor Effective Principal Stress	kPa	856
Deviator Stress	kPa	2277
Major Effective Principal Stress	kPa	3133
Effective Principal Stress Ratio		3.66
Pore Pressure Parameter A		-0.11
Axial Strain	%	13.1
Membrane & filter correction applied to Deviator Stress	kPa	5
Duration	day(s)	1
Final Water Content	%	16.6
Final Wet Density	Mg/m <sup>3</sup>	2.24
<b>EFFECTIVE STRESS PARAMETERS</b>		
Cohesion	kPa	Not applicable
Angle of Shear Resistance	degrees	Not applicable
<b>FAILURE SKETCH</b>		

Checked and Approved by



13/02/2020

Project Number:

GEO / 30586

Project Name:

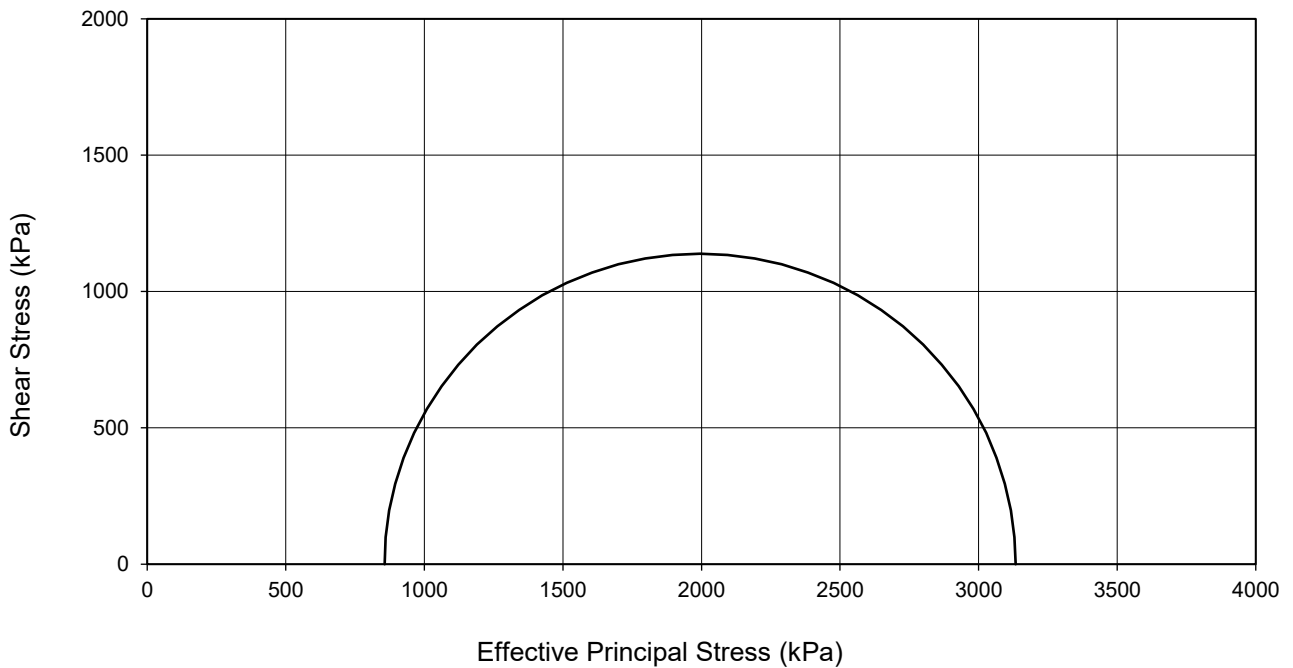
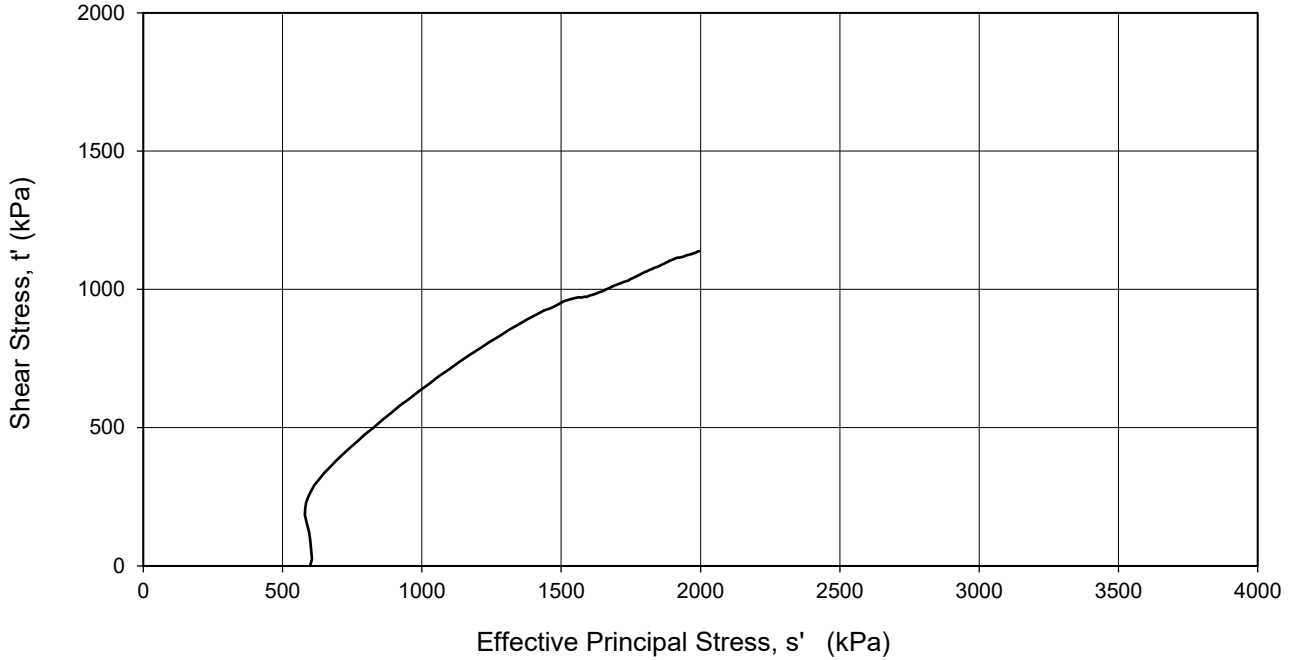
**A417 MISSING LINK  
35560-02**




## Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: DSRC301  
 Sample No.: 38  
 Depth (m): 33.15-33.40

Description:  
 Firm grey slightly clayey SILT.



Checked and Approved by



P Heritage - Project Manager  
 13/02/2020

Project Number:

**GEO / 30586**

Project Name:

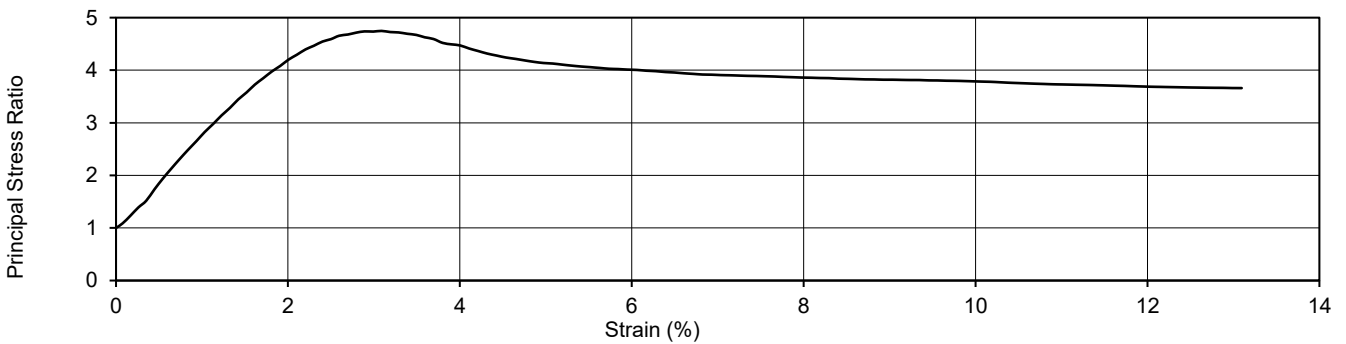
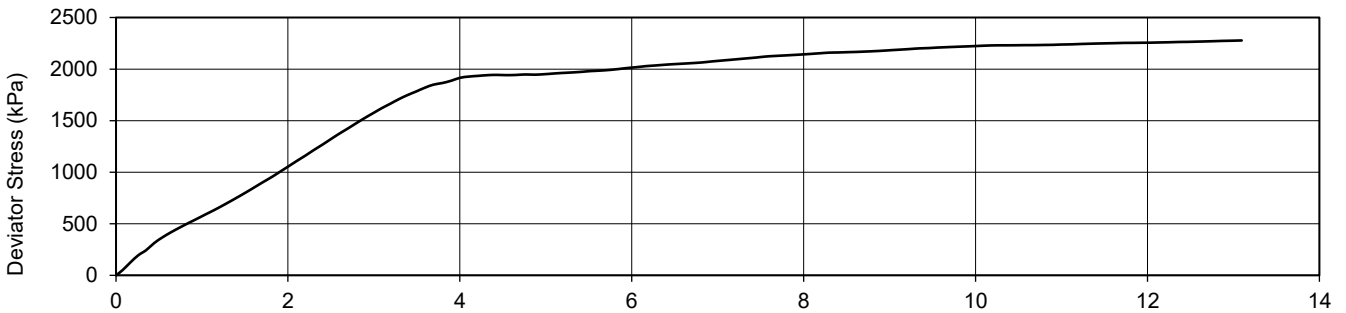
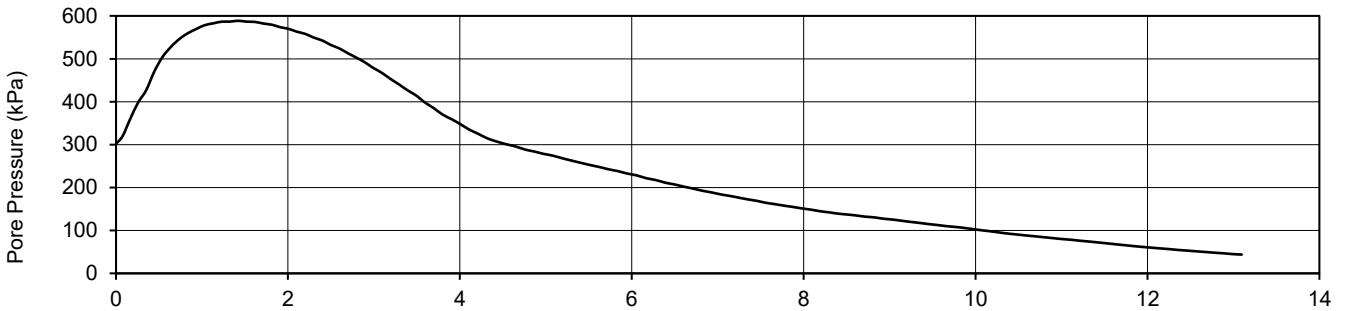
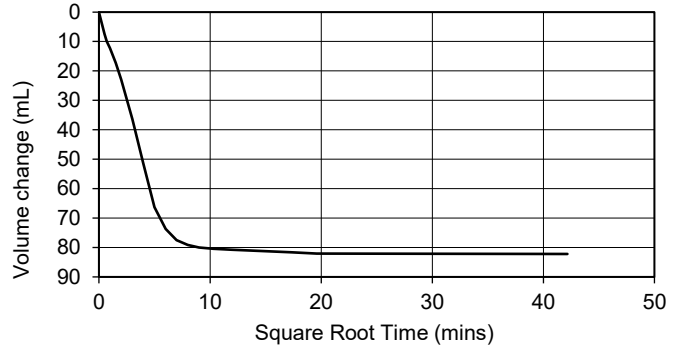
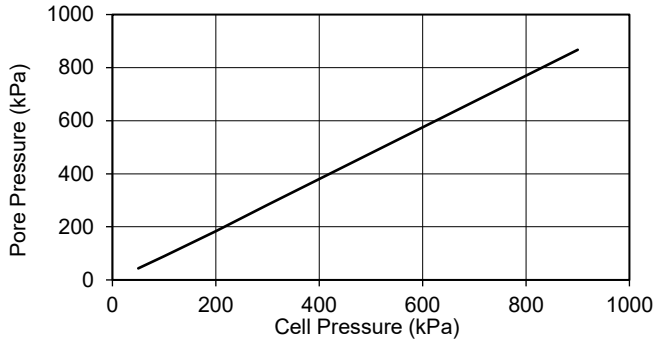
**A417 MISSING LINK  
 35560-02**

**GEOLABS**®



## Consolidated Undrained Triaxial Compression Test with Measurement of Pore Pressure

Borehole No.: DSRC301  
 Sample No.: 38  
 Depth (m): 33.15-33.40



Checked and Approved by



P Heritage - Project Manager  
13/02/2020

Project Number:

**GEO / 30586**

Project Name:

**A417 MISSING LINK  
35560-02**

**GEOLABS**®





# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC301
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)	SAMPLE No./TYPE	41CS
		SAMPLE DEPTH (m)	35.05-35.25
DESCRIPTION	Greyish brown slightly sandy clayey SILT	SPECIMEN DEPTH (m)	35.10-35.24

**TYPE OF SPECIMEN** Undisturbed / Vertical  
**TYPE OF TEST** Single Specimen Single Stage  
**SIDE DRAINS FITTED** Yes  
**DRAINAGE CONDITIONS** One end and radial boundary

		SPECIMEN	1
<b>INITIAL CONDITIONS</b>	Length	mm	139.9
	Diameter	mm	69.99
	Moisture Content	%	14
	Bulk Density	Mg/m <sup>3</sup>	2.21
	Dry Density	Mg/m <sup>3</sup>	1.94
<b>FINAL CONDITIONS</b>	Moisture Content	%	14
	Bulk Density	Mg/m <sup>3</sup>	2.29
	Dry Density	Mg/m <sup>3</sup>	2.00
<b>SATURATION</b> (by cell pressure and back pressure increments)	Initial PWP	kPa	-2
	Saturated PWP	kPa	290
	Final Cell Pressure	kPa	300
	B Value		1
<b>CONSOLIDATION</b>	Cell Pressure	kPa	500
	Back Pressure	kPa	300
	Initial PWP	kPa	489
	Final PWP	kPa	306
<b>COMPRESSION</b>	Cell Pressure	kPa	500
	Back Pressure	kPa	300
	$\sigma_3$	kPa	200
	Rate of Strain	%/hr	2
<b>FAILURE CONDITIONS</b> (based on maximum deviator stress)	Strain ( $\epsilon$ )	%	2.7
	$\delta u$	kPa	95
	$\sigma_{3f}$	kPa	105
	$(\sigma_1' - \sigma_3)_f$	kPa	2494

Membrane correction of 0.1kPa/% strain applied to deviator stress.  
 Side drain correction of 5kPa applied to deviator stress (70mm diameter)

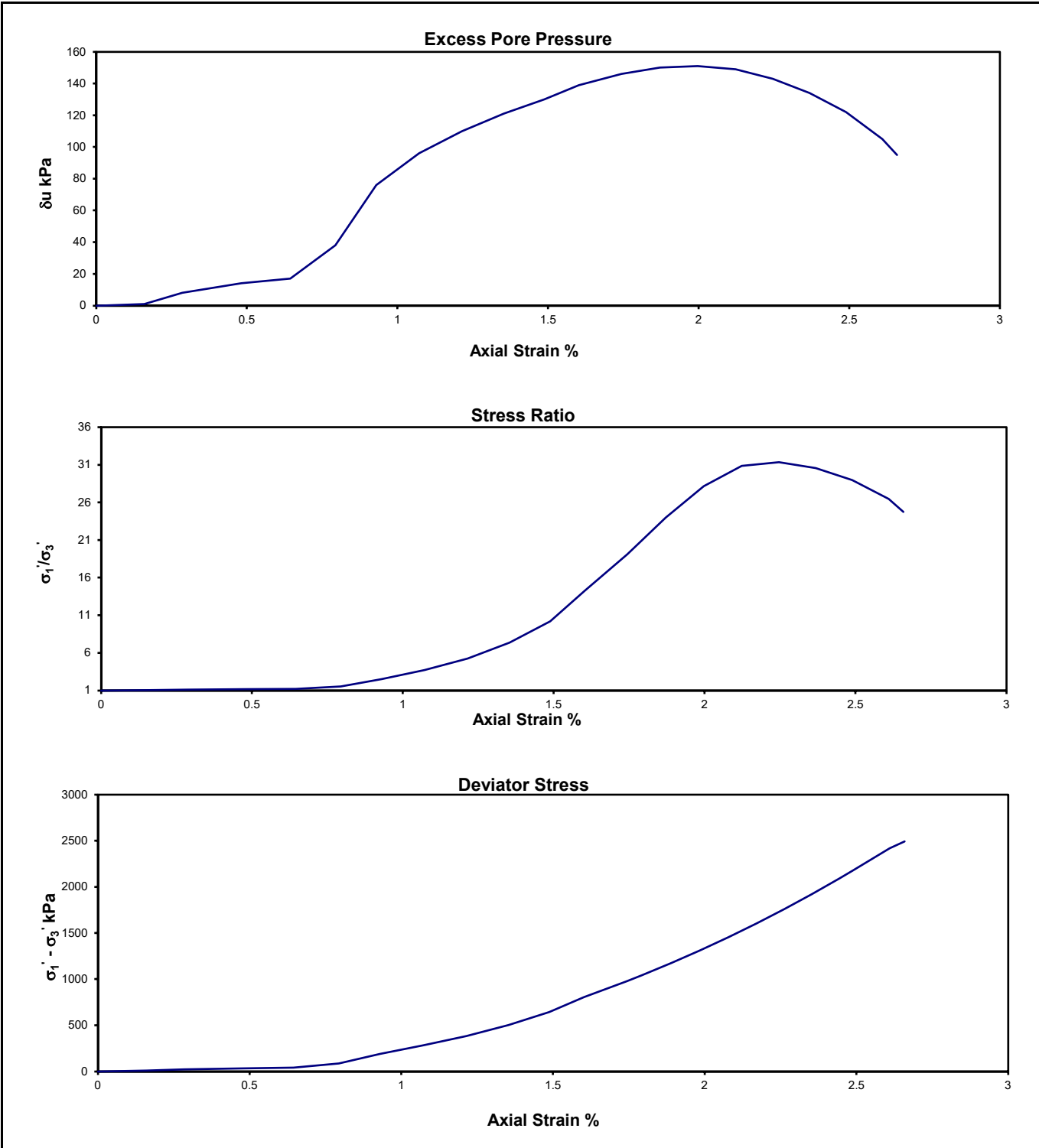
<b>FAILURE MODE</b> (see photo)	NONE	<b>EFFECTIVE STRESS PARAMETERS</b>	<b>c' kPa :</b>	<b><math>\phi'</math> deg :</b>
			CONTRACT	CHECKED
remarks	Specimen reached the limit of a 10kN load cell during the shear stage, suspected grain lock up.		<b>35560/02</b>	<b>NP</b>

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC301
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)	SAMPLE No./TYPE	41CS
		SAMPLE DEPTH (m)	35.05-35.25
		SPECIMEN DEPTH (m)	35.10-35.24



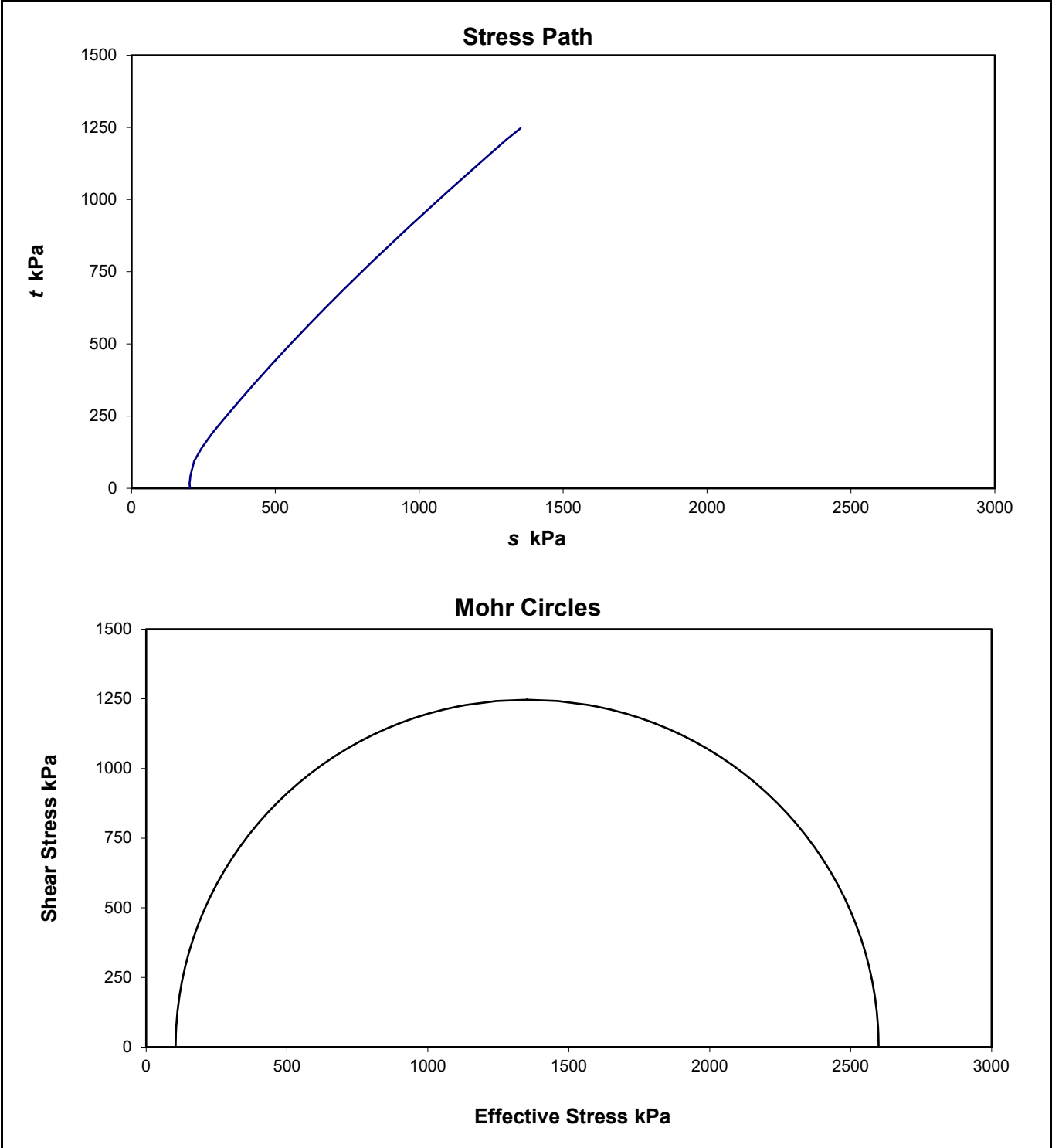
remarks	CONTRACT	CHECKED
	<b>35560/02</b>	<b>NP</b>

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC301
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)	SAMPLE No./TYPE	41CS
		SAMPLE DEPTH (m)	35.05-35.25
		SPECIMEN DEPTH (m)	35.10-35.24



remarks	CONTRACT	CHECKED
	<b>35560/02</b>	<b>NP</b>

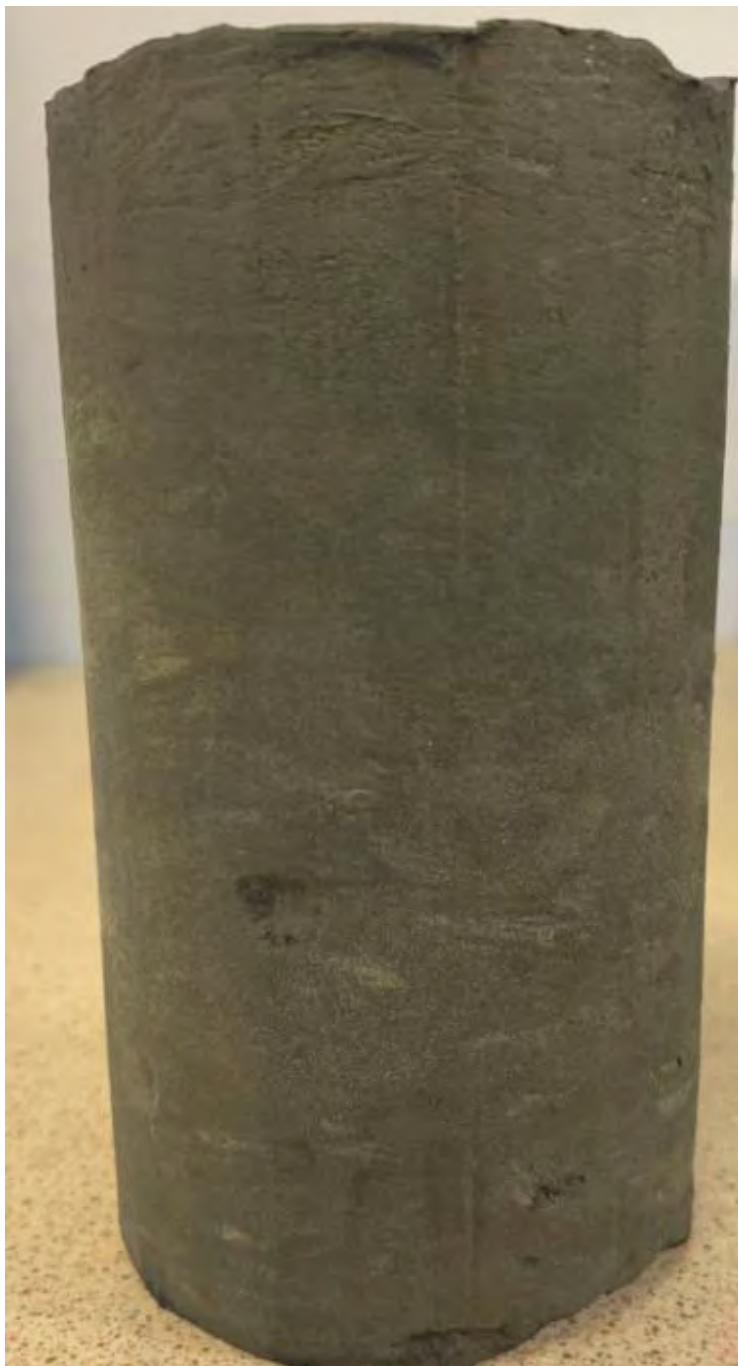




# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC301
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)	SAMPLE No./TYPE	41CS
		SAMPLE DEPTH (m)	35.05-35.25
		SPECIMEN DEPTH (m)	35.10-35.24



Failure Mode

remarks

Please note the photos are intended to show the mode of failure only.

CONTRACT

**35560/02**

CHECKED

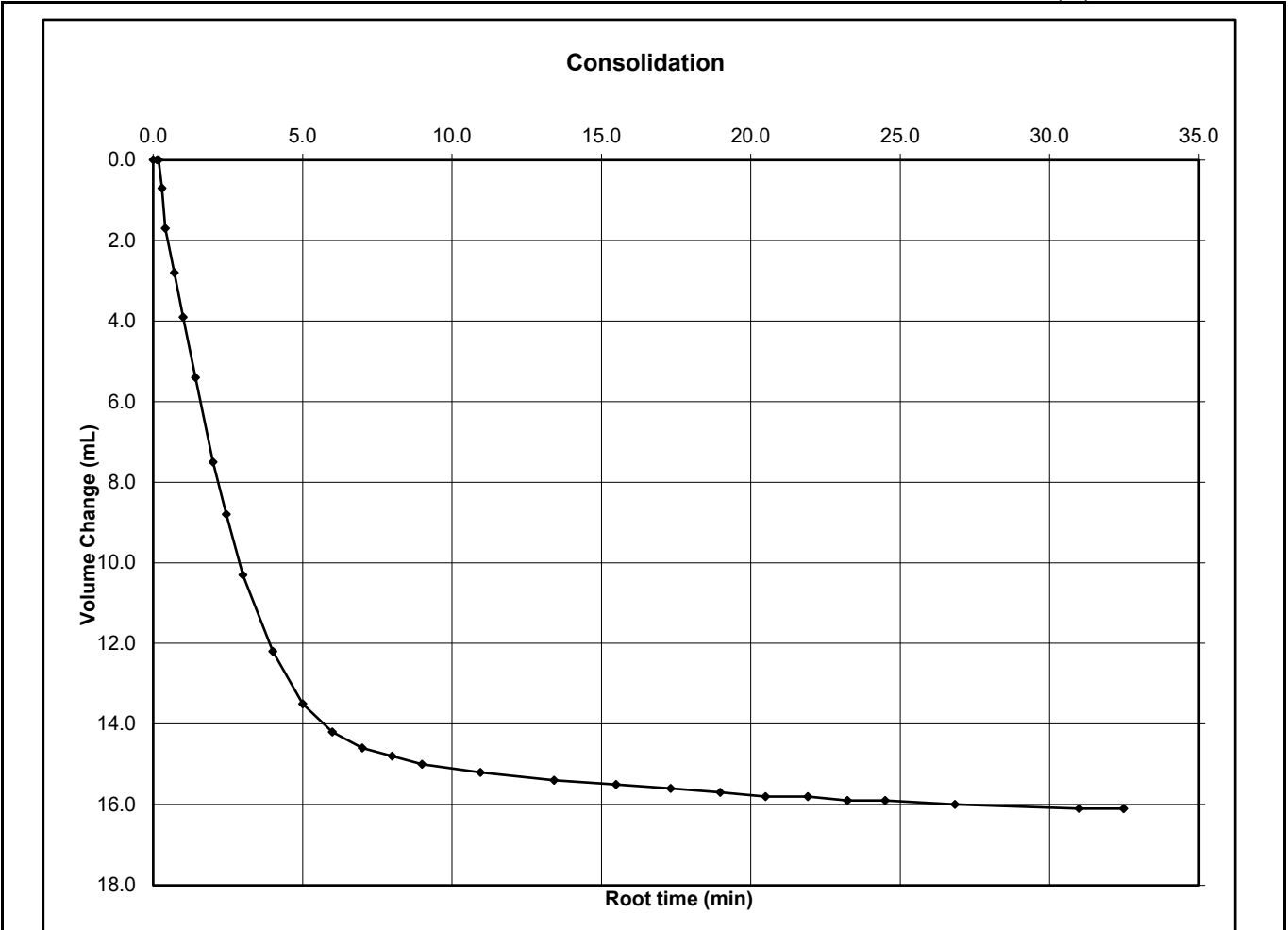
**NP**



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC301
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION	SAMPLE No./TYPE	41CS
	- PHASE 2A (1106)	SAMPLE DEPTH (m)	35.05-35.25
		SPECIMEN DEPTH (m)	35.10-35.24



Cell pressure	kPa	500
Back pressure	kPa	300
Effective pressure	kPa	200
Initial PWP	kPa	489
Final PWP	kPa	306
PWP Dissipation	%	96.83
Volume change	mL	16.1
	t100	18.72

remarks	CONTRACT	CHECKED
	<b>35560/02</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC301
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)	SAMPLE No./TYPE	44CS
		SAMPLE DEPTH (m)	37.95-38.30
DESCRIPTION	Greyish brown slightly clayey sandy SILT	SPECIMEN DEPTH (m)	38.15-38.30

**TYPE OF SPECIMEN** Undisturbed / Vertical  
**TYPE OF TEST** Single Specimen Single Stage  
**SIDE DRAINS FITTED** Yes  
**DRAINAGE CONDITIONS** One end and radial boundary

		SPECIMEN	1
<b>INITIAL CONDITIONS</b>	Length	mm	120.73
	Diameter	mm	69.86
	Moisture Content	%	17
	Bulk Density	Mg/m <sup>3</sup>	2.15
	Dry Density	Mg/m <sup>3</sup>	1.83
<b>FINAL CONDITIONS</b>	Moisture Content	%	17
	Bulk Density	Mg/m <sup>3</sup>	2.29
	Dry Density	Mg/m <sup>3</sup>	1.95
<b>SATURATION</b> (by cell pressure and back pressure increments)	Initial PWP	kPa	-7
	Saturated PWP	kPa	234
	Final Cell Pressure	kPa	250
	B Value		0.98
<b>CONSOLIDATION</b>	Cell Pressure	kPa	700
	Back Pressure	kPa	300
	Initial PWP	kPa	685
	Final PWP	kPa	300
<b>COMPRESSION</b>	Cell Pressure	kPa	700
	Back Pressure	kPa	300
	$\sigma_3$	kPa	400
	Rate of Strain	%/hr	2
<b>FAILURE CONDITIONS</b> (based on maximum deviator stress)	Strain ( $\epsilon$ )	%	11.4
	$\delta u$	kPa	63
	$\sigma_{3f}$	kPa	337
	$(\sigma_1' - \sigma_3)_f$	kPa	834

Membrane correction of 0.1kPa/% strain applied to deviator stress.  
 Side drain correction of 5kPa applied to deviator stress (70mm diameter)

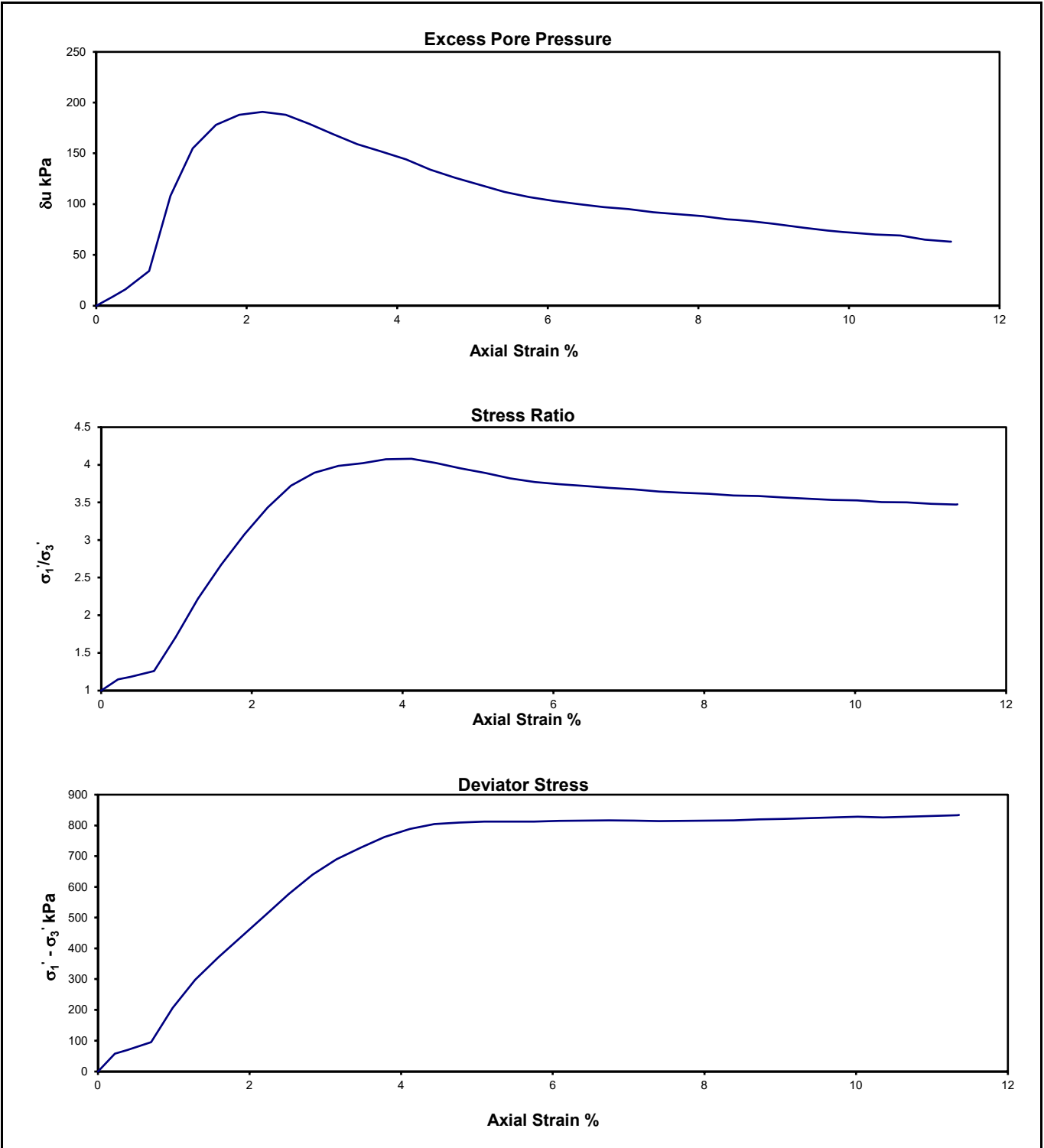
<b>FAILURE MODE</b> (see photo)	SHEAR	<b>EFFECTIVE STRESS PARAMETERS</b>	<b>c' kPa :</b>	<b><math>\phi'</math> deg :</b>
			CONTRACT	CHECKED
remarks			<b>35560/02</b>	<b>NP</b>

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC301
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)	SAMPLE No./TYPE	44CS
		SAMPLE DEPTH (m)	37.95-38.30
		SPECIMEN DEPTH (m)	38.15-38.30



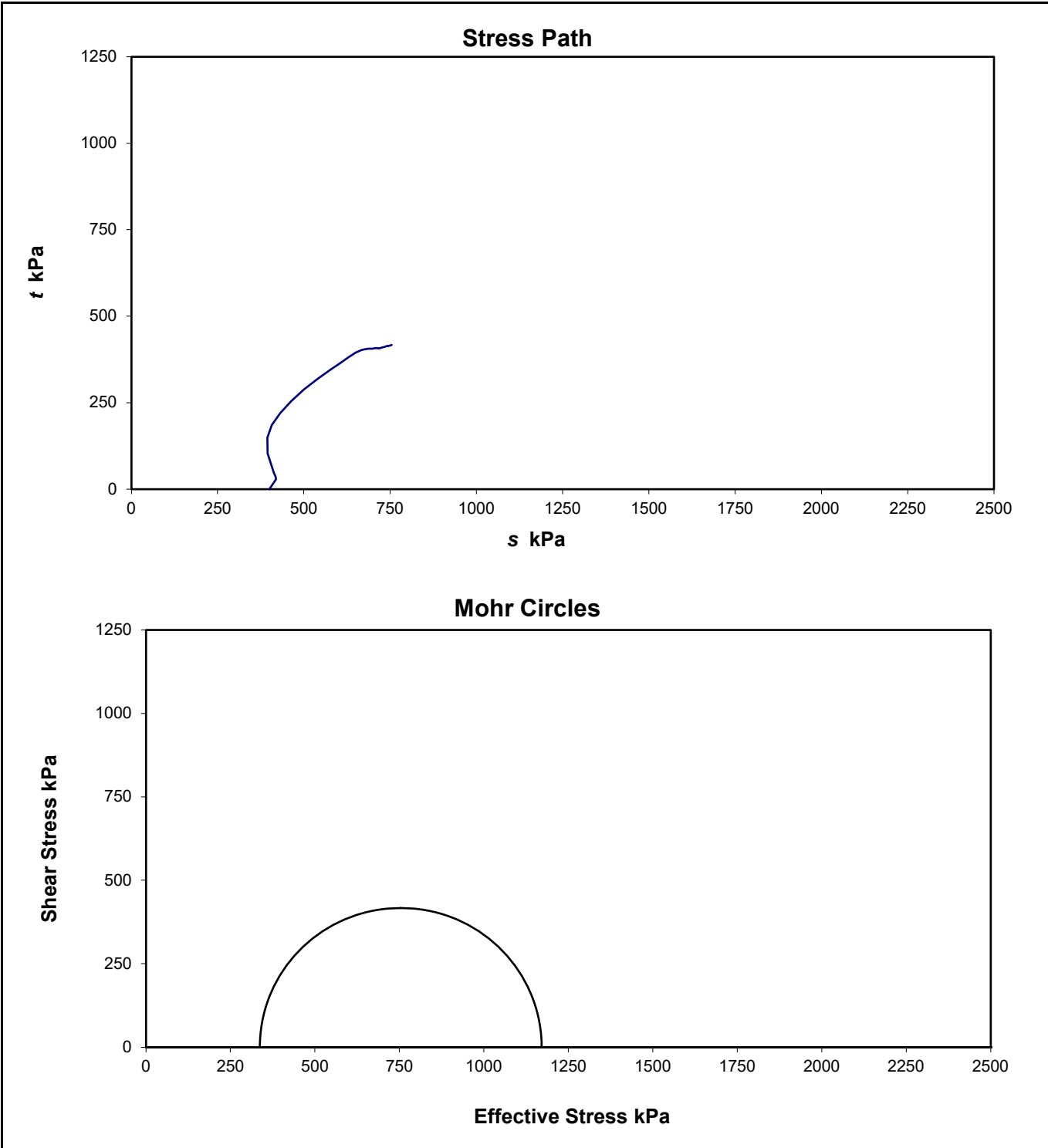
remarks	CONTRACT	CHECKED
	<b>35560/02</b>	<b>NP</b>

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC301
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)	SAMPLE No./TYPE	44CS
		SAMPLE DEPTH (m)	37.95-38.30
		SPECIMEN DEPTH (m)	38.15-38.30



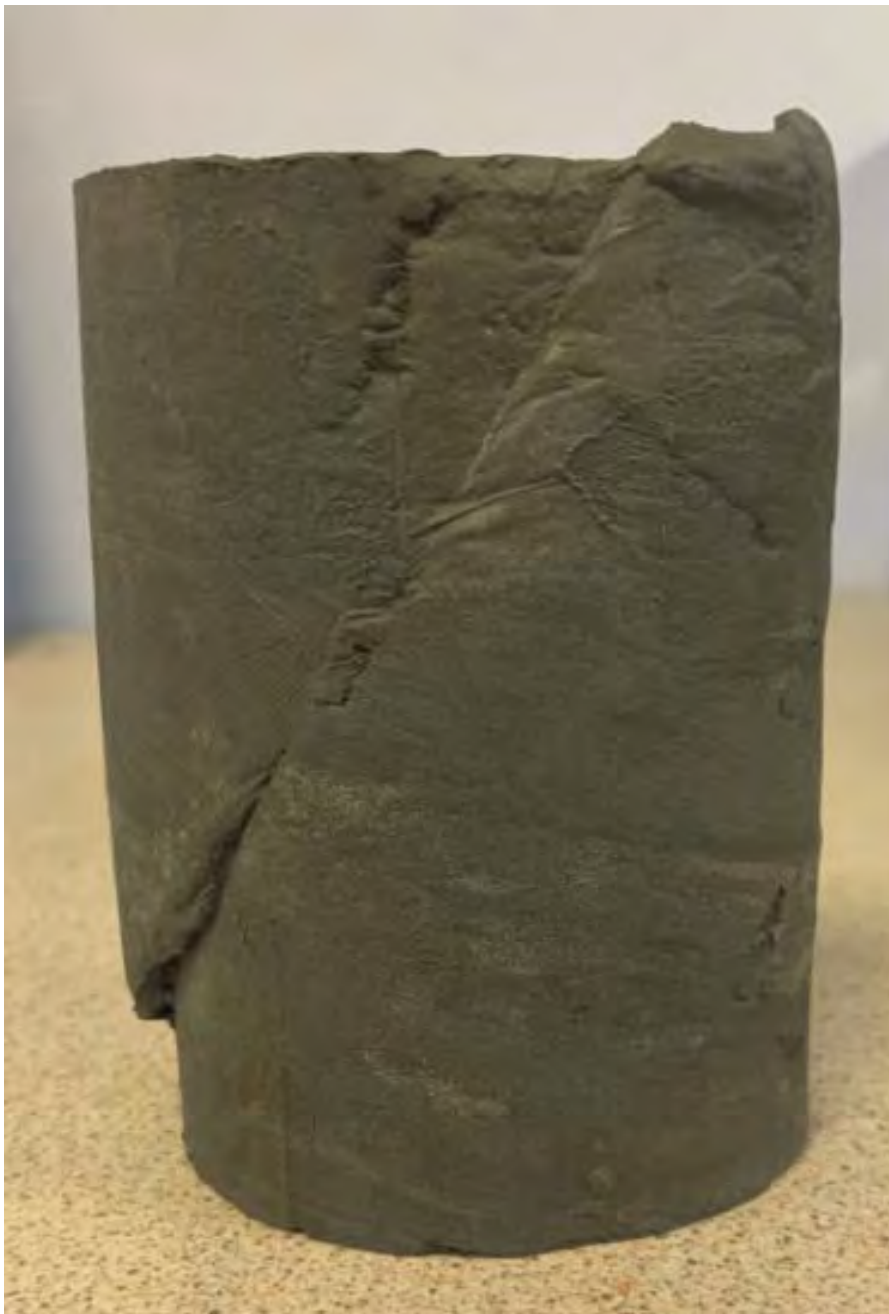
remarks	CONTRACT	CHECKED
	<b>35560/02</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC301
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)	SAMPLE No./TYPE	44CS
		SAMPLE DEPTH (m)	37.95-38.30
		SPECIMEN DEPTH (m)	38.15-38.30



Failure Mode SHEAR

remarks

Please note the photos are intended to show the mode of failure only.

CONTRACT

**35560/02**

CHECKED

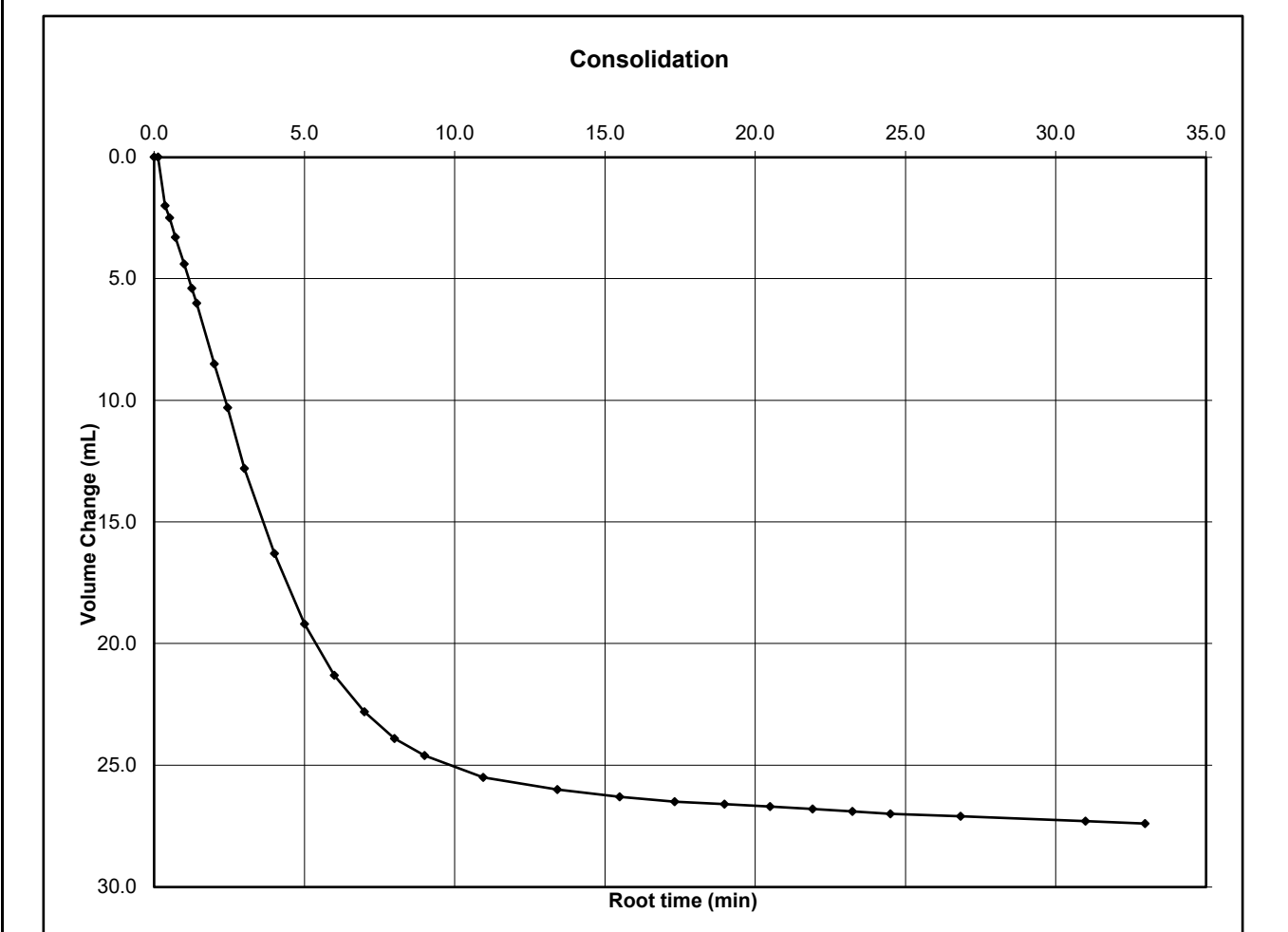
**NP**



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC301
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION	SAMPLE No./TYPE	44CS
	- PHASE 2A (1106)	SAMPLE DEPTH (m)	37.95-38.30
		SPECIMEN DEPTH (m)	38.15-38.30



Cell pressure	kPa	700
Back pressure	kPa	300
Effective pressure	kPa	400
Initial PWP	kPa	685
Final PWP	kPa	300
PWP Dissipation	%	100.00
Volume change	mL	27.4
	t100	43.86

remarks	CONTRACT	CHECKED
	<b>35560/02</b>	<b>NP</b>

**ROCK WATER CONTENT**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	description and remarks
	no./type	depth (m)			
DSRC109	28Cs	22.15	22.15	6.8	Grey and orangish brown SILTSTONE
DSRC109	31Cs	24.10	24.10	4.8	Grey SILTSTONE
DSRC109	37Cs	31.00	31.00	8.2	Grey SILTSTONE
DSRC109	50Cs	43.60	43.60	12	Grey MUDSTONE
DSRC109	67Cs	58.45	58.50	12	Grey MUDSTONE
DSRC109	78Cs	69.70	69.75	13	Grey MUDSTONE
DSRC109	81Cs	72.00	72.05	12	Grey MUDSTONE with rare shell fragments
DSRC109	84Cs	75.55	75.60	12	Grey MUDSTONE
DSRC109	91Cs	80.38	80.40	11	Grey MUDSTONE
DSRC109	99Cs	88.40	88.50	11	Grey MUDSTONE
DSRC109	105Cs	92.93	93.10	11	Grey MUDSTONE
DSRC109	109Cs	97.02	27.05	11	Grey MUDSTONE
DSRC109	114Cs	101.60	101.65	11	Grey MUDSTONE
DSRC109	117Cs	104.40	104.40	12	Grey MUDSTONE
DSRC301	64Cs	57.65	57.70	12	Grey MUDSTONE
DSRC301	69Cs	62.10	62.15	12	Grey MUDSTONE
DSRC301	74Cs	65.82	65.85	10	Grey MUDSTONE
DSRC301	77Cs	68.97	68.97	13	Grey MUDSTONE
DSRC301	83Cs	74.85	74.85	11	Grey MUDSTONE
general remarks natural water content determined unless otherwise specified					
test method samples oven dried at 105°C				CONTRACT <b>35560/02</b>	
				CHECKED <b>EC</b>	



**ROCK WATER CONTENT**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	description and remarks
	no./type	depth (m)			
DSRC301	88Cs	78.82	78.85	12	Grey MUDSTONE
DSRC301	93Cs	82.87	82.90	11	Grey MUDSTONE
DSRC301	96Cs	86.55	86.55	11	Grey MUDSTONE
DSRC301	101Cs	90.65	90.65	9.8	Grey MUDSTONE
DSRC301	105Cs	95.15	95.15	9.7	Grey MUDSTONE
DSRC301	108Cs	98.18	98.18	10	Grey MUDSTONE
RC507	17Cs	8.17	8.20	12	Yellowish brown MUDSTONE
general remarks natural water content determined unless otherwise specified					
test method samples oven dried at 105°C				CONTRACT <b>35560/02</b>	
				CHECKED <b>TB</b>	

# UNIAXIAL COMPRESSIVE STRENGTH OF ROCK

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)

borehole /trial pit no.	sample		specimen depth (m)	diameter D (mm)	height H (mm)	H/D	moisture content (%)	bulk density (Mg/m <sup>3</sup> )	loading rate (kN/min)	time to failure (min:sec)	UCS (MPa)	description, codes and remarks
	no./type	depth (m)										
DSRC109	40Cs	33.60	33.60	116.3	242.0	2.08	10.7	2.25	4	07:05	2.67	Grey SILTSTONE, P, AxCa. H/D ratio falls outside ISRM specification
DSRC301	58Cs	51.30	51.30	86.2	257.2	2.99	11.2	2.32	2	05:41	1.96	Dark grey MUDSTONE, N, AxCa.
DSRC301	113Cs	102.97	102.97	100.1	240.0	2.40	8.4	2.36	4	08:04	4.11	Grey MUDSTONE, P, Sh. H/D ratio falls outside ISRM specification

general remarks

sample obtained from vertically drilled core (unless specified), test machine - VJT6000

coding:	moisture condition	sample storage	failure mode
	N - natural moisture content	U - not wrapped	Ax - axial cleavage
	F - fully saturated	F - wrapped in cling film/foil	Ca - cataclasis
	S - soaked	W - waxed	Sh - shear
	P - air/partially dried	G - contained in sealed Geoline	Ex - explosive
			Ot - other

CONTRACT	CHECKED
<b>35560/02</b>	<b>EC</b>

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
DSRC109	2.70	A	X	N	115		50	5.93	85.56	0.81	1.27	1.03	Yellowish brown LIMESTONE
DSRC109	2.70	D	Y	N		55	115	4.74	115.00	0.36	1.45	0.52	Yellowish brown LIMESTONE
DSRC109	4.90	A	X	N	115		50	5.26	85.56	0.72	1.27	0.91	Yellowish brown LIMESTONE
DSRC109	4.90	D	Y	N		45	115	2.37	115.00	0.18	1.45	0.26	Yellowish brown LIMESTONE
DSRC109	8.70	A	X	N	115		40	11.72	76.53	2.00	1.21	2.42	Yellowish brown LIMESTONE
DSRC109	8.70	D	Y	N		40	115	8.52	115.00	0.64	1.45	0.94	Yellowish brown LIMESTONE
DSRC109	11.50	A	X	N	115		50	5.76	85.56	0.79	1.27	1.00	Yellowish brown LIMESTONE
DSRC109	11.50	D	Y	N		50	115	10.45	115.00	0.79	1.45	1.15	Yellowish brown LIMESTONE
DSRC109	13.20	A	X	N	115		45	7.11	81.17	1.08	1.24	1.34	Yellowish brown LIMESTONE
DSRC109	13.20	D	Y	N		50	115	14.30	115.00	1.08	1.45	1.57	Yellowish brown LIMESTONE
DSRC109	18.20	A	X	N	115		65	4.85	97.56	0.51	1.35	0.69	Grey LIMESTONE
DSRC109	18.20	D	Y	N		70	115	13.45	115.00	1.02	1.45	1.48	Grey LIMESTONE
DSRC109	22.15	A	X	N	120		70	3.81	103.42	0.36	1.39	0.49	Grey and orangish brown SILTSTONE
DSRC109	22.15	D	Y	N		90	120	3.90	120.00	0.27	1.48	0.40	Grey and orangish brown SILTSTONE
DSRC109	24.10	A	X	N	115		50	5.69	85.56	0.78	1.27	0.99	Grey SILTSTONE
DSRC109	24.10	D	Y	N		60	115	9.03	115.00	0.68	1.45	0.99	Grey SILTSTONE
DSRC109	31.00	A	X	N	115		60	1.57	93.73	0.18	1.33	0.24	Grey SILTSTONE
DSRC109	31.00	D	Y	N		60	115	5.80	115.00	0.44	1.45	0.64	Grey SILTSTONE
DSRC109	33.60	A	X	P	115		30	0.15	66.28	0.03	1.14	0.04	Grey SILTSTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular      U - unknown	N - natural moisture content	<b>35560/02</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
DSRC109	33.60	D	Y	P		40	115	0.21	115.00	0.02	1.45	0.02	Grey SILTSTONE
DSRC109	36.60	A	X	N	120		70	0.63	103.42	0.06	1.39	0.08	Grey MUDSTONE
DSRC109	36.60	D	Y	N		80	120	0.61	120.00	0.04	1.48	0.06	Grey MUDSTONE
DSRC109	40.80	A	X	N	105		55	0.30	85.75	0.04	1.27	0.05	Grey MUDSTONE
DSRC109	40.80	D	Y	N		60	105	0.30	105.00	0.03	1.40	0.04	Grey MUDSTONE
DSRC109	43.60	A	X	P	115		40	0.70	76.53	0.12	1.21	0.14	Grey MUDSTONE
DSRC109	43.60	D	Y	P		35	115	0.67	115.00	0.05	1.45	0.07	Grey MUDSTONE
DSRC109	47.40	A	X	P	90		50	1.17	75.69	0.20	1.21	0.25	Light grey MUDSTONE
DSRC109	47.40	D	Y	P		35	90	1.43	90.00	0.18	1.30	0.23	Light grey MUDSTONE
DSRC109	50.10	A	X	N	90		45	0.19	71.81	0.04	1.18	0.04	Grey MUDSTONE
DSRC109	50.10	D	Y	N		45	90	0.25	90.00	0.03	1.30	0.04	Grey MUDSTONE
DSRC109	53.05	A	X	N	90		60	0.82	82.92	0.12	1.26	0.15	Grey MUDSTONE
DSRC109	53.05	D	Y	N		60	90	0.11	90.00	0.01	1.30	0.02	Grey MUDSTONE
DSRC109	58.55	A	X	N	90		40	1.05	67.70	0.23	1.15	0.26	Grey MUDSTONE
DSRC109	58.55	D	Y	N		40	90	0.38	90.00	0.05	1.30	0.06	Grey MUDSTONE
DSRC109	61.10	A	X	P	90		30	0.57	58.63	0.17	1.07	0.18	Grey MUDSTONE
DSRC109	61.10	D	Y	P		30	90	0.37	90.00	0.05	1.30	0.06	Grey MUDSTONE
DSRC109	63.60	A	X	N	90		40	1.03	67.70	0.22	1.15	0.26	Grey MUDSTONE
DSRC109	63.60	D	Y	N		40	90	0.40	90.00	0.05	1.30	0.06	Grey MUDSTONE
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02													
test type		test orientation relative to discontinuities				moisture condition				CONTRACT	CHECKED		
A - axial		X - perpendicular		U - unknown		N - natural moisture content				<b>35560/02</b>	<b>EC</b>		
D - diametral		Y - parallel		P - partially air dried									
I - irregular lump		Z - oblique		S - soaked									

# POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)

borehole /trial pit no.	sample depth (m)	test type	test orientation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
DSRC109	66.80	A	X	N	90		40	0.94	67.70	0.21	1.15	0.24	Dark grey MUDSTONE
DSRC109	66.80	D	Y	N		40	90	0.26	90.00	0.03	1.30	0.04	Dark grey MUDSTONE
DSRC109	69.85	A	X	N	90		40	0.87	67.70	0.19	1.15	0.22	Dark grey MUDSTONE
DSRC109	69.85	D	Y	N		45	90	1.05	90.00	0.13	1.30	0.17	Dark grey MUDSTONE
DSRC109	72.10	A	X	N	90		40	0.82	67.70	0.18	1.15	0.20	Dark grey MUDSTONE
DSRC109	72.10	D	Y	N		30	90	0.92	90.00	0.11	1.30	0.15	Dark grey MUDSTONE
DSRC109	75.65	A	X	N	90		45	0.91	71.81	0.18	1.18	0.21	Dark grey MUDSTONE
DSRC109	75.65	D	Y	N		45	90	0.30	90.00	0.04	1.30	0.05	Dark grey MUDSTONE
DSRC109	80.45	A	X	N	100		45	1.35	75.69	0.24	1.21	0.28	Dark grey MUDSTONE
DSRC109	80.45	D	Y	N		55	100	0.57	100.00	0.06	1.37	0.08	Dark grey MUDSTONE
DSRC109	88.45	A	X	N	100		40	1.17	71.36	0.23	1.17	0.27	Dark grey MUDSTONE
DSRC109	88.45	D	Y	N		60	100	0.93	100.00	0.09	1.37	0.13	Dark grey MUDSTONE
DSRC109	92.95	A	X	N	100		50	1.71	79.79	0.27	1.23	0.33	Dark grey MUDSTONE
DSRC109	92.95	D	Y	N		40	100	0.46	100.00	0.05	1.37	0.06	Dark grey MUDSTONE
DSRC109	97.10	A	X	N	100		50	1.88	79.79	0.29	1.23	0.36	Grey MUDSTONE
DSRC109	97.10	D	Y	N		50	100	1.10	100.00	0.11	1.37	0.15	Grey MUDSTONE
DSRC109	101.70	A	X	N	100		60	2.13	87.40	0.28	1.29	0.36	Grey MUDSTONE
DSRC109	101.70	D	Y	N		60	100	0.86	100.00	0.09	1.37	0.12	Grey MUDSTONE
DSRC109	104.40	A	X	N	100		40	1.07	71.36	0.21	1.17	0.25	Grey MUDSTONE

general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35560/02</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
DSRC109	104.40	D	Y	N		40	100	0.77	100.00	0.08	1.37	0.11	Grey MUDSTONE
DSRC301	3.10	A	X	P	115		60	6.83	93.73	0.78	1.33	1.03	Yellowish brown LIMESTONE
DSRC301	3.10	D	Y	P		50	115	5.09	115.00	0.38	1.45	0.56	Yellowish brown LIMESTONE
DSRC301	7.70	A	Y	N	115		45	5.71	81.17	0.87	1.24	1.08	Yellowish brown LIMESTONE
DSRC301	7.70	D	Y	N		60	115	2.33	115.00	0.18	1.45	0.26	Yellowish brown LIMESTONE
DSRC301	9.55	A	X	P	115		30	1.01	66.28	0.23	1.14	0.26	Yellowish brown LIMESTONE
DSRC301	9.55	D	Y	P		40	115	0.83	115.00	0.06	1.45	0.09	Yellowish brown LIMESTONE
DSRC301	10.35	A	X	N	115		45	1.68	81.17	0.25	1.24	0.32	Orangish brown LIMESTONE
DSRC301	10.35	D	Y	N		40	115	1.10	115.00	0.08	1.45	0.12	Orangish brown LIMESTONE
DSRC301	12.85	A	X	N	115		50	6.30	85.56	0.86	1.27	1.10	Yellowish brown LIMESTONE
DSRC301	12.85	D	Y	N		40	115	14.52	115.00	1.10	1.45	1.60	Yellowish brown LIMESTONE
DSRC301	15.70	A	X	P	115		55	7.12	89.74	0.88	1.30	1.15	Light brown LIMESTONE
DSRC301	15.70	D	Y	P		60	115	7.04	115.00	0.53	1.45	0.77	Light brown LIMESTONE
DSRC301	17.80	A	X	N	115		50	5.21	85.56	0.71	1.27	0.91	Yellowish brown LIMESTONE
DSRC301	17.80	D	Y	N		60	115	4.23	115.00	0.32	1.45	0.47	Yellowish brown LIMESTONE
DSRC301	20.30	A	X	P	115		45	1.61	81.17	0.24	1.24	0.30	Orangish brown LIMESTONE
DSRC301	20.30	D	Y	P		50	115	0.37	115.00	0.03	1.45	0.04	Orangish brown LIMESTONE
DSRC301	22.40	A	X	P	115		50	0.45	85.56	0.06	1.27	0.08	Grey MUDSTONE
DSRC301	22.40	D	Y	P		40	115	0.17	115.00	0.01	1.45	0.02	Grey MUDSTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular      U - unknown	N - natural moisture content	<b>35560/02</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
DSRC301	41.35	A	X	N	90		30	0.15	58.63	0.04	1.07	0.05	Grey MUDSTONE
DSRC301	41.35	D	Y	N		40	90	0.12	90.00	0.01	1.30	0.02	Grey MUDSTONE
DSRC301	45.40	A	X	N	90		30	0.28	58.63	0.08	1.07	0.09	Grey MUDSTONE
DSRC301	45.40	D	Y	N		35	90	0.43	90.00	0.05	1.30	0.07	Grey MUDSTONE
DSRC301	48.55	A	X	N	90		30	0.46	58.63	0.13	1.07	0.14	Grey MUDSTONE
DSRC301	48.55	D	Y	N		50	90	0.09	90.00	0.01	1.30	0.01	Grey MUDSTONE
DSRC301	51.50	A	X	N	90		40	0.82	67.70	0.18	1.15	0.20	Dark grey MUDSTONE
DSRC301	51.50	D	Y	N		40	90	0.68	90.00	0.08	1.30	0.11	Dark grey MUDSTONE
DSRC301	54.40	A	X	P	90		35	2.21	63.33	0.55	1.11	0.61	Grey MUDSTONE
DSRC301	54.40	D	Y	P		35	90	0.05	90.00	0.01	1.30	0.01	Grey MUDSTONE
DSRC301	57.70	A	X	N	90		40	0.74	67.70	0.16	1.15	0.19	Grey MUDSTONE
DSRC301	57.70	D	Y	N		40	90	0.05	90.00	0.01	1.30	0.01	Grey MUDSTONE
DSRC301	60.25	A	X	P	90		30	0.17	58.63	0.05	1.07	0.05	Grey MUDSTONE
DSRC301	60.25	D	Y	P		40	90	2.85	90.00	0.35	1.30	0.46	Grey MUDSTONE
DSRC301	62.20	A	X	N	90		50	1.47	75.69	0.26	1.21	0.31	Grey MUDSTONE
DSRC301	62.20	D	Y	N		50	90	1.02	90.00	0.13	1.30	0.16	Grey MUDSTONE
DSRC301	65.90	A	X	N	105		40	1.44	73.13	0.27	1.19	0.32	Grey MUDSTONE
DSRC301	65.90	D	Y	N		50	105	0.94	105.00	0.08	1.40	0.12	Grey MUDSTONE
DSRC301	69.00	A	X	N	105		40	1.33	73.13	0.25	1.19	0.30	Grey MUDSTONE
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02													
test type		test orientation relative to discontinuities				moisture condition				CONTRACT	CHECKED		
A - axial		X - perpendicular		U - unknown		N - natural moisture content				<b>35560/02</b>	<b>TB</b>		
D - diametral		Y - parallel		P - partially air dried									
I - irregular lump		Z - oblique		S - soaked									

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
DSRC301	69.00	D	Y	N		50	105	0.28	105.00	0.03	1.40	0.04	Grey MUDSTONE
DSRC301	72.55	A	X	P	105		30	0.51	63.33	0.13	1.11	0.14	Grey MUDSTONE
DSRC301	72.55	D	Y	P		30	105	0.21	105.00	0.02	1.40	0.03	Grey MUDSTONE
DSRC301	74.95	A	X	N	105		30	1.05	63.33	0.26	1.11	0.29	Grey MUDSTONE
DSRC301	74.95	D	Y	N		40	105	0.09	105.00	0.01	1.40	0.01	Grey MUDSTONE
DSRC301	78.90	A	X	N	105		40	1.21	73.13	0.23	1.19	0.27	Grey MUDSTONE
DSRC301	78.90	D	Y	N		40	105	0.59	105.00	0.05	1.40	0.07	Grey MUDSTONE
DSRC301	82.90	A	X	N	105		40	1.16	73.13	0.22	1.19	0.26	Grey MUDSTONE
DSRC301	82.90	D	Y	N		40	105	0.43	105.00	0.04	1.40	0.05	Grey MUDSTONE
DSRC301	86.60	A	X	N	105		40	1.64	73.13	0.31	1.19	0.36	Grey MUDSTONE
DSRC301	86.60	D	Y	N		50	105	0.12	105.00	0.01	1.40	0.02	Grey MUDSTONE
DSRC301	88.20	A	X	N	105		40	0.74	73.13	0.14	1.19	0.16	Grey MUDSTONE
DSRC301	88.20	D	Y	N		40	105	0.18	105.00	0.02	1.40	0.02	Grey MUDSTONE
DSRC301	90.70	A	X	N	105		30	3.29	63.33	0.82	1.11	0.91	Grey MUDSTONE
DSRC301	90.70	D	Y	N		40	105	0.10	105.00	0.01	1.40	0.01	Grey MUDSTONE
DSRC301	95.30	A	X	N	105		45	2.20	77.56	0.37	1.22	0.45	Grey MUDSTONE
DSRC301	95.30	D	Y	N		50	105	0.05	105.00	0.00	1.40	0.01	Grey MUDSTONE
DSRC301	98.30	A	X	N	105		50	0.92	81.76	0.14	1.25	0.17	Grey MUDSTONE
DSRC301	98.30	D	Y	N		50	105	0.55	105.00	0.05	1.40	0.07	Grey MUDSTONE
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02													
test type		test orientation relative to discontinuities				moisture condition				CONTRACT	CHECKED		
A - axial		X - perpendicular		U - unknown		N - natural moisture content				<b>35560/02</b>	<b>TB</b>		
D - diametral		Y - parallel		P - partially air dried									
I - irregular lump		Z - oblique		S - soaked									



**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)

borehole /trial pit no.	sample depth (m)	test type	test orientation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
DSRC301	102.97	A	X	P	100		40	0.41	71.36	0.08	1.17	0.09	Grey MUDSTONE
DSRC301	102.97	D	Y	P		40	100	0.29	100.00	0.03	1.37	0.04	Grey MUDSTONE
RC507	2.00	I	X	N	80	90	50	2.67	71.36	0.52	1.17	0.61	Yellowish brown LIMESTONE
RC507	4.20	A	X	N	105		40	1.45	73.13	0.27	1.19	0.32	Yellowish brown LIMESTONE
RC507	4.20	D	Y	N		40	105	1.67	105.00	0.15	1.40	0.21	Yellowish brown LIMESTONE
RC507	7.35	A	X	N	105		40	1.27	73.13	0.24	1.19	0.28	Yellowish brown LIMESTONE
RC507	7.35	D	Y	N		30	105	0.10	105.00	0.01	1.40	0.01	Yellowish brown LIMESTONE
RC507	8.20	A	X	N	100		60	0.25	87.40	0.03	1.29	0.04	Yellowish brown MUDSTONE
RC507	8.20	D	Y	N		70	100	0.13	100.00	0.01	1.37	0.02	Yellowish brown MUDSTONE
RC507	10.35	A	X	N	105		30	0.89	63.33	0.22	1.11	0.25	Yellowish brown LIMESTONE
RC507	10.35	D	Y	N		30	105	1.45	105.00	0.13	1.40	0.18	Yellowish brown LIMESTONE
RC507	13.05	A	X	N	105		60	19.10	89.56	2.38	1.30	3.10	Yellowish brown LIMESTONE
RC507	13.05	D	Y	N		70	105	20.22	105.00	1.83	1.40	2.56	Yellowish brown LIMESTONE
RC507	17.80	A	X	N	105		60	3.64	89.56	0.45	1.30	0.59	Grey LIMESTONE
RC507	17.80	D	Y	N		70	105	1.83	105.00	0.17	1.40	0.23	Grey LIMESTONE
RC507	21.65	A	X	N	105		50	3.60	81.76	0.54	1.25	0.67	Orangish brown LIMESTONE
RC507	21.65	D	Y	N		60	105	2.64	105.00	0.24	1.40	0.33	Orangish brown LIMESTONE
RC507	27.40	A	X	N	105		50	2.69	81.76	0.40	1.25	0.50	Yellowish brown LIMESTONE
RC507	27.40	D	Y	N		60	105	9.06	105.00	0.82	1.40	1.15	Yellowish brown LIMESTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35560/02</b>	<b>EC</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1106)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
RC507	29.50	A	X	N	105		60	8.84	89.56	1.10	1.30	1.43	Yellowish brown LIMESTONE
RC507	29.50	D	Y	N		70	105	13.04	105.00	1.18	1.40	1.65	Yellowish brown LIMESTONE
RC507	35.65	A	X	N	105		50	4.17	81.76	0.62	1.25	0.78	Grey LIMESTONE
RC507	35.65	D	Y	N		60	105	6.11	105.00	0.55	1.40	0.77	Grey LIMESTONE
RC507	39.75	A	X	N	100		60	0.05	87.40	0.01	1.29	0.01	Yellowish brown SILTSTONE
RC507	39.75	D	Y	N		70	100	0.10	100.00	0.01	1.37	0.01	Yellowish brown SILTSTONE
RC507	43.75	A	X	N	100		30	0.20	61.80	0.05	1.10	0.06	Grey MUDSTONE
RC507	43.75	D	Y	N		50	100	0.12	100.00	0.01	1.37	0.02	Grey MUDSTONE
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02													
test type		test orientation relative to discontinuities				moisture condition				CONTRACT	CHECKED		
A - axial		X - perpendicular		U - unknown		N - natural moisture content				<b>35560/02</b>	<b>TB</b>		
D - diametral		Y - parallel		P - partially air dried									
I - irregular lump		Z - oblique		S - soaked									

Geotechnical Engineering Limited  
Centurion House  
Olympus Park, Quedgeley  
Gloucester  
GL2 4NF

Date: 25 March 2020  
Test Report Ref: TR 722657

Order No: 35560-02/TB 35560-03/TB

Page 1 of 1

Contract: A417 Missing Link.

**LABORATORY TEST REPORT**

**TEST REQUIREMENTS:**

To determine the Fragmentation of Aggregate - Los Angeles  
Test Method in accordance with **BS EN 1097-2: 2010**

**SAMPLE DETAILS:**

Certificate of sampling received:	<b>No</b>
Laboratory Ref. No:	<b>S86353</b>
Client Ref. No:	<b>DSRC109 - 10C - 5.2 - 6.5m</b>
Date and Time of Sampling:	<b>Unknown</b>
Date of Receipt at Lab:	<b>18/02/2020</b>
Date of Start of Test:	<b>25/03/2020</b>
Sampling Location:	<b>5.2 - 6.5m</b>
Name of Source:	<b>A417 Missing Link.</b>
Method of Sampling:	<b>Unknown</b>
Sampled By:	<b>Client</b>
Tested By:	<b>DW</b>
Material Description:	<b>Cores</b>
Target Specification:	<b>N/A</b>

**RESULTS:**

<b>Size fraction from which the test portion was obtained:</b>	<b>14mm to 12.5mm</b> <b>12.5mm to 10.0mm</b>
<b>Los Angeles Coefficient (LA) =</b>	<b>43</b>

This test report shall not be reproduced, except in full, without the written approval of Celtest Company Limited.

These results relate only to the items tested.

<b>Comments:</b> None	Report checked and approved by:
	 Neil Hughes Aggregate Team Coordinator

Geotechnical Engineering Limited  
Centurion House  
Olympus Park, Quedgeley  
Gloucester  
GL2 4NF

Date: 25 March 2020  
Test Report Ref: TR 722658

Order No: 35560-02/TB 35560-03/TB

Page 1 of 1

Contract: A417 Missing Link.

**LABORATORY TEST REPORT**

**TEST REQUIREMENTS:**

To determine the Fragmentation of Aggregate - Los Angeles  
Test Method in accordance with **BS EN 1097-2: 2010**

**SAMPLE DETAILS:**

Certificate of sampling received:	No
Laboratory Ref. No:	S86353
Client Ref. No:	DSRC109 - 15C - 11.0 - 12.5m
Date and Time of Sampling:	Unknown
Date of Receipt at Lab:	18/02/2020
Date of Start of Test:	25/03/2020
Sampling Location:	11.0 - 12.5m
Name of Source:	A417 Missing Link.
Method of Sampling:	Unknown
Sampled By:	Client
Tested By:	DW
Material Description:	Cores
Target Specification:	N/A

**RESULTS:**

Size fraction from which the test portion was obtained:	14mm to 12.5mm 12.5mm to 10.0mm
Los Angeles Coefficient (LA) =	49

This test report shall not be reproduced, except in full, without the written approval of Celtest Company Limited.

These results relate only to the items tested.

<p><b>Comments:</b> None</p>	<p>Revised by:</p> 
	<p>Aggregate Team Coordinator</p>

Geotechnical Engineering Limited  
Centurion House  
Olympus Park, Quedgeley  
Gloucester  
GL2 4NF

Date: 25 March 2020  
Test Report Ref: TR 722659

Order No: 35560-02/TB 35560-03/TB

Page 1 of 1

Contract: A417 Missing Link.

**LABORATORY TEST REPORT**

**TEST REQUIREMENTS:**

To determine the Fragmentation of Aggregate - Los Angeles  
Test Method in accordance with **BS EN 1097-2: 2010**

**SAMPLE DETAILS:**

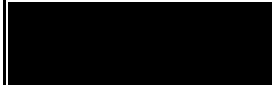
Certificate of sampling received:	<b>No</b>
Laboratory Ref. No:	<b>S86353</b>
Client Ref. No:	<b>DSRC301 - 12C - 8.2 - 9.7m</b>
Date and Time of Sampling:	<b>Unknown</b>
Date of Receipt at Lab:	<b>18/02/2020</b>
Date of Start of Test:	<b>25/03/2020</b>
Sampling Location:	<b>8.2 - 9.7m</b>
Name of Source:	<b>A417 Missing Link.</b>
Method of Sampling:	<b>Unknown</b>
Sampled By:	<b>Client</b>
Tested By:	<b>DW</b>
Material Description:	<b>Cores</b>
Target Specification:	<b>N/A</b>

**RESULTS:**

<b>Size fraction from which the test portion was obtained:</b>	<b>14mm to 12.5mm</b> <b>12.5mm to 10.0mm</b>
<b>Los Angeles Coefficient (LA) =</b>	<b>53</b>

This test report shall not be reproduced, except in full, without the written approval of Celtest Company Limited.

These results relate only to the items tested.

<p><b><u>Comments:</u></b> None</p>	<p>Report checked and approved by:  Neil Hughes Aggregate Team Coordinator</p>
---	---

Geotechnical Engineering Limited  
Centurion House  
Olympus Park, Quedgeley  
Gloucester  
GL2 4NF

Date: 25 March 2020  
Test Report Ref: TR 722660

Order No: 35560-02/TB 35560-03/TB

Page 1 of 1

Contract: A417 Missing Link.

**LABORATORY TEST REPORT**

**TEST REQUIREMENTS:**

To determine the Fragmentation of Aggregate - Los Angeles  
Test Method in accordance with **BS EN 1097-2: 2010**

**SAMPLE DETAILS:**

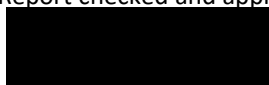
Certificate of sampling received:	<b>No</b>
Laboratory Ref. No:	<b>S86353</b>
Client Ref. No:	<b>DSRC301 - 18C - 12.7 - 14.2m</b>
Date and Time of Sampling:	<b>Unknown</b>
Date of Receipt at Lab:	<b>18/02/2020</b>
Date of Start of Test:	<b>25/03/2020</b>
Sampling Location:	<b>12.7 - 14.2m</b>
Name of Source:	<b>A417 Missing Link.</b>
Method of Sampling:	<b>Unknown</b>
Sampled By:	<b>Client</b>
Tested By:	<b>DW</b>
Material Description:	<b>Cores</b>
Target Specification:	<b>N/A</b>

**RESULTS:**

<b>Size fraction from which the test portion was obtained:</b>	<b>14mm to 12.5mm</b> <b>12.5mm to 10.0mm</b>
<b>Los Angeles Coefficient (LA) =</b>	<b>47</b>

This test report shall not be reproduced, except in full, without the written approval of Celtest Company Limited.

These results relate only to the items tested.

<p><b><u>Comments:</u></b> None</p>	<p>Report checked and approved by:  Neil Hughes Aggregate Team Coordinator</p>
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## Final Report

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**Report No.:** 20-02782-1  
**Initial Date of Issue:** 03-Feb-2020  
**Client** Geotechnical Engineering Ltd  
**Client Address:** Centurion House  
Olympus Park  
Quedgeley  
Gloucester  
Gloucestershire  
GL2 4NF  
**Contact(s):** GEL  
Tom Best  
**Project** 35560/02 A417 Missing Link Ground  
Investigation

<b>Quotation No.:</b>		<b>Date Received:</b>	29-Jan-2020
<b>Order No.:</b>	35560/02 LAB	<b>Date Instructed:</b>	29-Jan-2020
<b>No. of Samples:</b>	2		
<b>Turnaround (Wkdays):</b>	5	<b>Results Due:</b>	04-Feb-2020
<b>Date Approved:</b>	03-Feb-2020		

**Approved By:**



**Details:** Darrell Hall, Director

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**Project: 35560/02 A417 Missing Link Ground Investigation**

<b>Client: Geotechnical Engineering Ltd</b>	<b>Chemtest Job No.:</b>		20-02782	20-02782		
Quotation No.:	<b>Chemtest Sample ID.:</b>		960682	960683		
	Client Sample ID.:		46C	50Cs		
	Sample Location:		DSRC109	DCRC301		
	Sample Type:		SOIL	SOIL		
	Top Depth (m):		40.10	43.60		
	Bottom Depth (m):		41.60	43.95		
	Date Sampled:		27-Jan-2020	27-Jan-2020		
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>		
Moisture	N	2030	%	0.020	18	12
pH	U	2010		4.0	8.2	8.2
Sulphate (2:1 Water Soluble) as SO <sub>4</sub>	U	2120	g/l	0.010	0.54	0.41
Total Sulphur	U	2175	%	0.010	1.3	0.66
Sulphate (Acid Soluble)	U	2430	%	0.010	0.11	0.084



SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

## **Report Information**

### **Key**

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- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

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- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



2718

GEOTECHNICAL ENGINEERING LIMITED



For the attention of David Owen

Version No. 4
Page No. 1 of 91
Date of Issue 15/01/2021

TEST REPORT

Table with 4 columns: PROJECT/SITE, GEL REPORT NUMBER, Your ref/PO, Test report refers to, Samples received, Schedule received, Testing commenced, Status. Values include A417 MISSING LINK, 35560/03, Phase 2 A (1118), and Final.

SUMMARY OF RESULTS ATTACHED

Table with 3 columns: TEST METHOD & DESCRIPTION, QUANTITY, ACCREDITED TEST. Lists various testing methods like BS EN ISO 17892-1, BS1377, ISRM, etc., with quantities and accreditation status.

Table with 2 columns: Remarks, Approved Signatories. Remarks include 'This report may not be partially reproduced...' and 'The results reported relate to samples received...'. Signatories listed are T Best, E Crimp, J Hanson, and N Parry.

Doc TR01 Rev No. 22 Revision date 02/01/20 DC:JH

Geotechnical Engineering Ltd

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Gloucester GL2 4NF

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Payments: Geotechnical Engineering Limited
Sort code: 16-22-11 Bank account: 11125135

**LIQUID AND PLASTIC LIMITS**

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
DSRC218	12Cs	6.67	6.67	15.4	BXE	19	42	21	21	Greyish brown slightly sandy slightly gravelly silty CLAY
DSRC220	9Cs	4.00	4.00	11.2	BXE	48	50	18	32	Grey slightly sandy gravelly CLAY
DSRC220	13Cs	7.20	7.20	20.6	E					Grey slightly sandy SILT
DSRC220	19Cs	12.00	12.05	16.4	BXE	21	57	21	36	Grey slightly sandy slightly gravelly CLAY
DSRC317	9Cs	4.95	5.00	10.9	BXE	24	41	17	24	Grey slightly sandy slightly gravelly CLAY
DSRC317	24C	17.50	18.00	22.8	E					Greyish brown clayey sandy GRAVEL/MUDSTONE
DSRC326	6Cs	2.15	2.15	25.1	BXE	1	54	19	35	Grey mottled brown and orange slightly sandy CLAY
DSRC327	13C	5.40	5.40	11.5	E					Yellowish brown clayey sandy GRAVEL/MUDSTONE
DSRC327	15C	6.90	6.90	7.8	E					Greyish brown clayey sandy GRAVEL/MUDSTONE
DSRC327	28Cs	17.44	17.44	13.3	E					Greyish brown clayey sandy GRAVEL/MUDSTONE
DSRC329	7Ls	1.30	1.30	28.1	BXE	0	65	19	46	Brown mottled grey and orange slightly sandy CLAY
DSRC329	9Cs	2.80	2.80	21.0	BXE	3	57	21	36	Greyish brown mottled orange slightly sandy CLAY
DSRC329	11Cs	3.65	3.65	20.2	BXE	7	62	24	38	Greyish brown slightly gravelly slightly sandy CLAY
DSRC420	10Cs	4.25	4.25	17.3	BXE	18	53	21	32	Greyish brown slightly sandy slightly gravelly CLAY
DSRCOH400	7Cs	1.85	1.85	25.3	BXE	1	56	19	37	Yellowish orangish brown slightly sandy CLAY
DSRCOH400	10UT	3.20	3.20	26.6	BXE	4	58	21	37	Yellowish brown slightly sandy CLAY
DSRCOH400	14Cs	4.84	5.04	32.7	BXE	1	71	25	46	Yellowish brown mottled orangish brown slightly sandy silty CLAY
DSRCOH400	19Cs	7.49	7.49	29.9	BXE	3	65	23	42	Light brown mottled orange slightly sandy CLAY
DSRCOH400	28Cs	12.48	12.48	16.4	BXE	5	46	19	27	Greyish brown slightly gravelly slightly sandy CLAY

## general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

## specimen preparation

A - as received

B - washed on 0.425mm sieve

C - air dried

D - oven dried (60°C)

E - oven dried (105°C)

F - not known

## test method

X - cone penetrometer (test 4.3)

Y - cone penetrometer (test 4.4)

Z - casagrande apparatus (test 4.5)

CONTRACT

**35560/03**

CHECKED

**TB**

**LIQUID AND PLASTIC LIMITS**

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
DSRCOH400	94Cs	78.92	78.92	11.3	BXE	0	42	20	22	Dark grey slightly sandy silty CLAY
DSRCOH412	9D	2.30	2.30	12.5	BXE	77	37	22	15	Light brown slightly sandy clayey GRAVEL
DSRCOH412	14UT	5.00	5.05	34.7	BXE	16	64	21	43	Yellowish brown slightly sandy slightly gravelly CLAY
DSRCOH412	20D	6.50	6.50	30.4	BXE	2	67	25	42	Grey and brown slightly sandy CLAY
DSRCOH412	23D	7.60	7.60	17.5	BXE	18	48	18	30	Light brown slightly gravelly slightly sandy CLAY
DSRCOH412	27Cs	9.15	9.20	19.3	BXE	18	60	26	34	Grey slightly sandy slightly gravelly silty CLAY
DSRCOH414	71Cs	60.97	60.97	11.7	BXE	0	47	21	26	Grey slightly sandy CLAY
DSRCOH414	76Cs	67.26	67.26	15.5	BXE	0	34	20	14	Grey slightly sandy silty CLAY
DSRCOH414	81Cs	71.61	71.61	13.5	BXE	0	33	21	12	Grey slightly sandy silty CLAY
DSRCOH414	85Cs	76.00	76.00	13.9	BXE	1	33	22	11	Grey slightly sandy silty CLAY
DSRCOH414	90Cs	79.90	79.90	12.6	BXE	1	35	21	14	Grey slightly sandy silty CLAY
DSRCOH414	96Cs	86.06	86.06	12.7	BXE	0	34	19	15	Grey slightly sandy silty CLAY
OH413	48Cs	36.80	36.80	12.6	BXE	20	55	19	36	Grey slightly gravelly slightly sandy CLAY/MUDSTONE
OH417	7Ls	2.33	2.33	32.9	BXE	0	70	22	48	Light brown slightly sandy CLAY
OH417	10Cs	4.74	4.80	19.3	BXE	3	54	23	31	Grey slightly sandy CLAY
OH417	80Cs	73.10	73.10	16.8	BXE	0	46	23	23	Grey slightly sandy silty CLAY
OH417	87Cs	79.60	79.60	20.6	BXE	1	35	20	15	Grey slightly sandy silty CLAY
OH417	92Cs	84.55	84.55	14.9	BXE	0	33	22	11	Grey slightly sandy silty CLAY
OH417	97Cs	89.00	89.00	12.7	BXE	0	36	24	12	Grey slightly sandy silty CLAY

## general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

## specimen preparation

A - as received

B - washed on 0.425mm sieve

C - air dried

D - oven dried (60°C)

E - oven dried (105°C)

F - not known

## test method

X - cone penetrometer (test 4.3)

Y - cone penetrometer (test 4.4)

Z - casagrande apparatus (test 4.5)

CONTRACT

**35560/03**

CHECKED

**TB**

**LIQUID AND PLASTIC LIMITS**

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
TP612	3B	0.40	0.40	18.1	BXE	66	52	27	25	Orangish brown sandy very clayey GRAVEL
TP612	7B	1.20	1.20	34.2	BXE	0	86	26	60	Greyish brown slightly sandy CLAY
TP613	3LB	0.20	0.20	23.4	BXE	45	74	45	29	Orangish brown slightly sandy gravelly clayey SILT
TP614	1B	0.20	0.20	30.7	BXE	40	73	40	33	Orangish brown slightly sandy gravelly clayey SILT
TP614	3LB	0.50	0.50	17.7	BXE	55	47	25	22	Orangish brown slightly sandy gravelly silty CLAY
TP620	1LB	0.30	0.30	38.6	BXE	4	77	28	49	Orangish brown slightly gravelly slightly sandy CLAY
TP622A	3B	1.00	1.00	24.9	BXE	15	66	23	43	Greyish brown slightly sandy slightly gravelly CLAY
TP622A	7B	2.60	2.60	17.0	BXE	9	55	23	32	Greyish brown orange slightly gravelly slightly sandy CLAY
TP628	1LB	0.40	0.40	55.1	BXE	0	100	34	66	Orangish brown slightly sandy organic CLAY
TP628	3B	1.00	1.00	53.6	BXE	0	104	33	71	Orangish brown slightly sandy organic CLAY
TP628	5B	2.20	2.20	58.2	BXE	0	74	24	50	Orangish brown slightly sandy silty organic CLAY
TP628	7B	2.80	2.80	31.2	BXE	7	53	19	34	Orangish brown slightly gravelly slightly sandy silty CLAY

## general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

## specimen preparation

A - as received

B - washed on 0.425mm sieve

C - air dried

D - oven dried (60°C)

E - oven dried (105°C)

F - not known

## test method

X - cone penetrometer (test 4.3)

Y - cone penetrometer (test 4.4)

Z - casagrande apparatus (test 4.5)

CONTRACT

**35560/03**

CHECKED

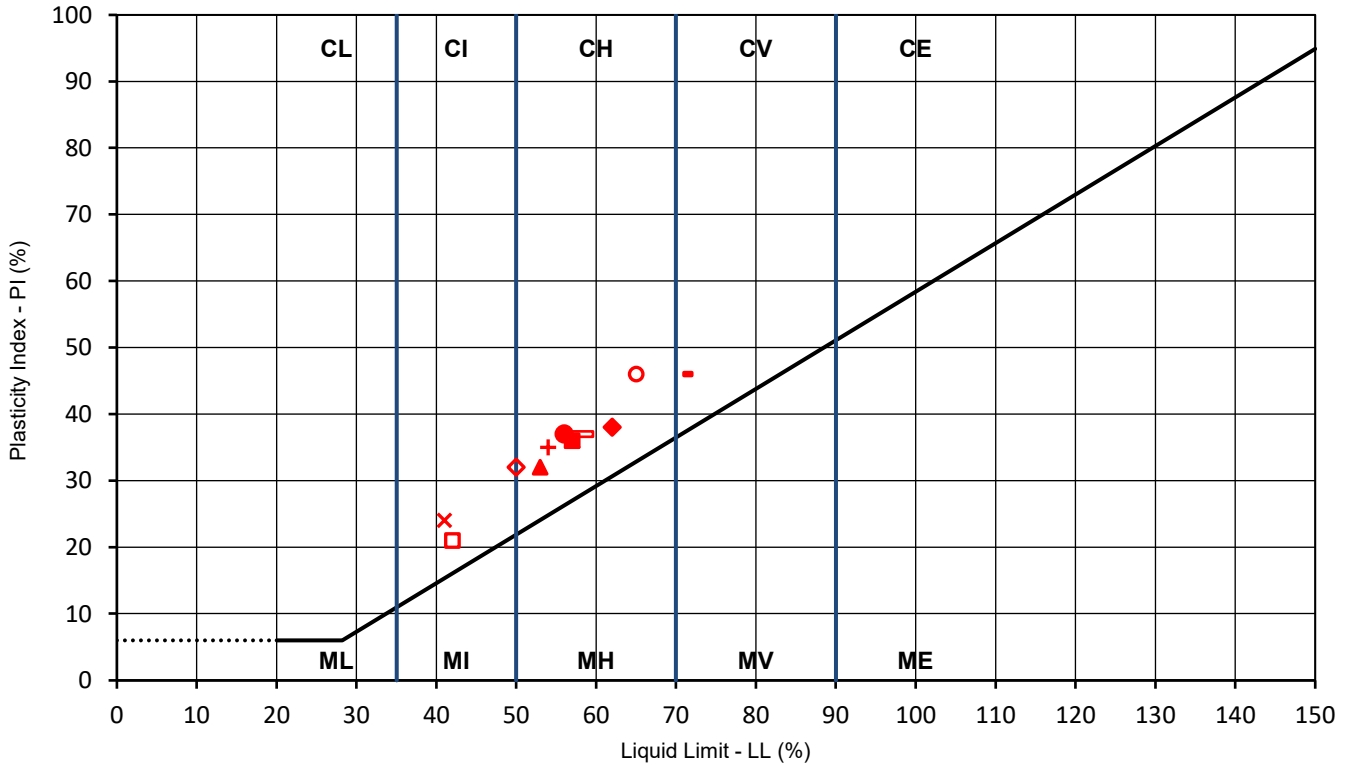
**TB**

Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)



BH/TP No.	depth (m)	LL	PL	PI	remarks
□ DSRC218	6.67	42	21	21	
◇ DSRC220	4.00	50	18	32	
△ DSRC220	12.05	57	21	36	
× DSRC317	5.00	41	17	24	
+ DSRC326	2.15	54	19	35	
○ DSRC329	1.30	65	19	46	
■ DSRC329	2.80	57	21	36	
◆ DSRC329	3.65	62	24	38	
▲ DSRC420	4.25	53	21	32	
● DSRCOH400	1.85	56	19	37	
▢ DSRCOH400	3.20	58	21	37	
▪ DSRCOH400	5.04	71	25	46	

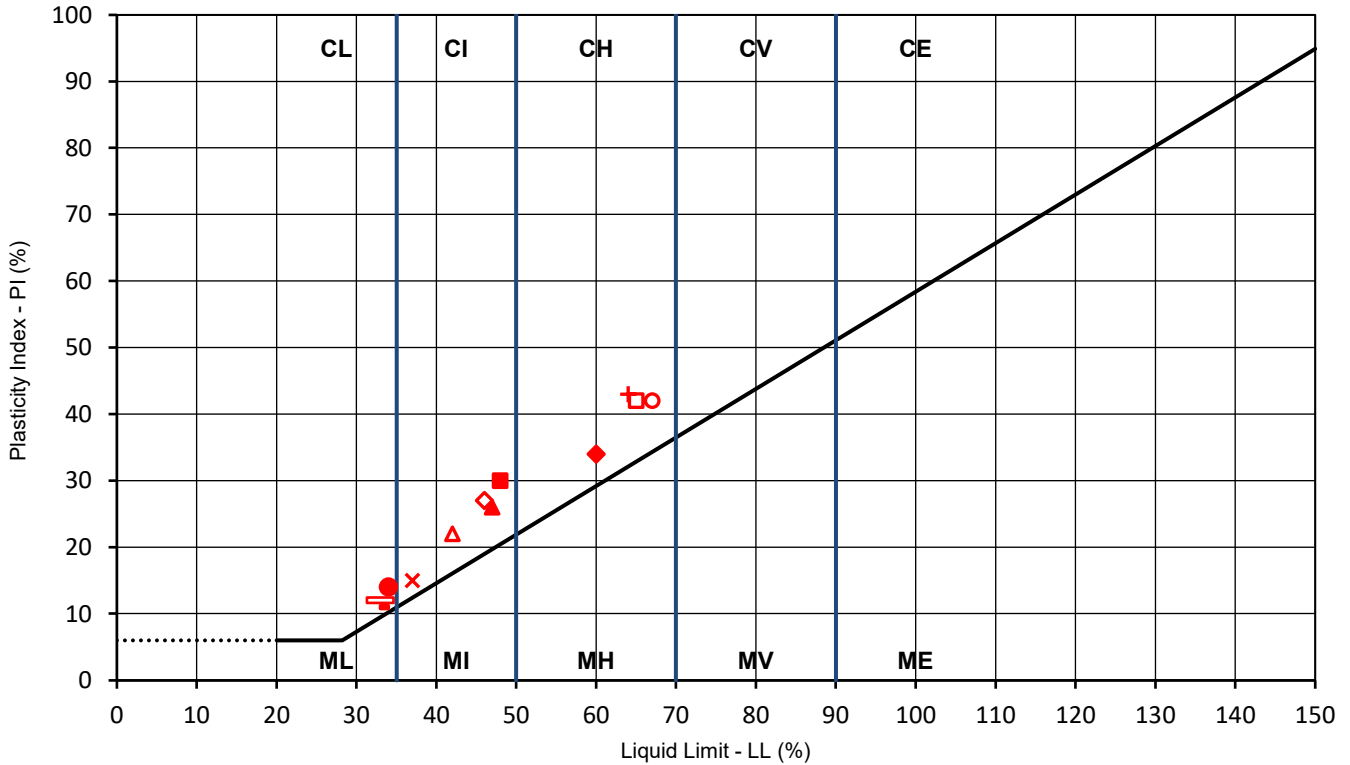
CONTRACT	CHECKED
<b>35560/03</b>	<b>TB</b>

Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	DSRCOH400	7.49	65	23	42	
◇	DSRCOH400	12.48	46	19	27	
△	DSRCOH400	78.92	42	20	22	
×	DSRCOH412	2.30	37	22	15	
+	DSRCOH412	5.05	64	21	43	
○	DSRCOH412	6.50	67	25	42	
■	DSRCOH412	7.60	48	18	30	
◆	DSRCOH412	9.20	60	26	34	
▲	DSRCOH414	60.97	47	21	26	
●	DSRCOH414	67.26	34	20	14	
◻	DSRCOH414	71.61	33	21	12	
▪	DSRCOH414	76.00	33	22	11	

CONTRACT	CHECKED
<b>35560/03</b>	<b>TB</b>

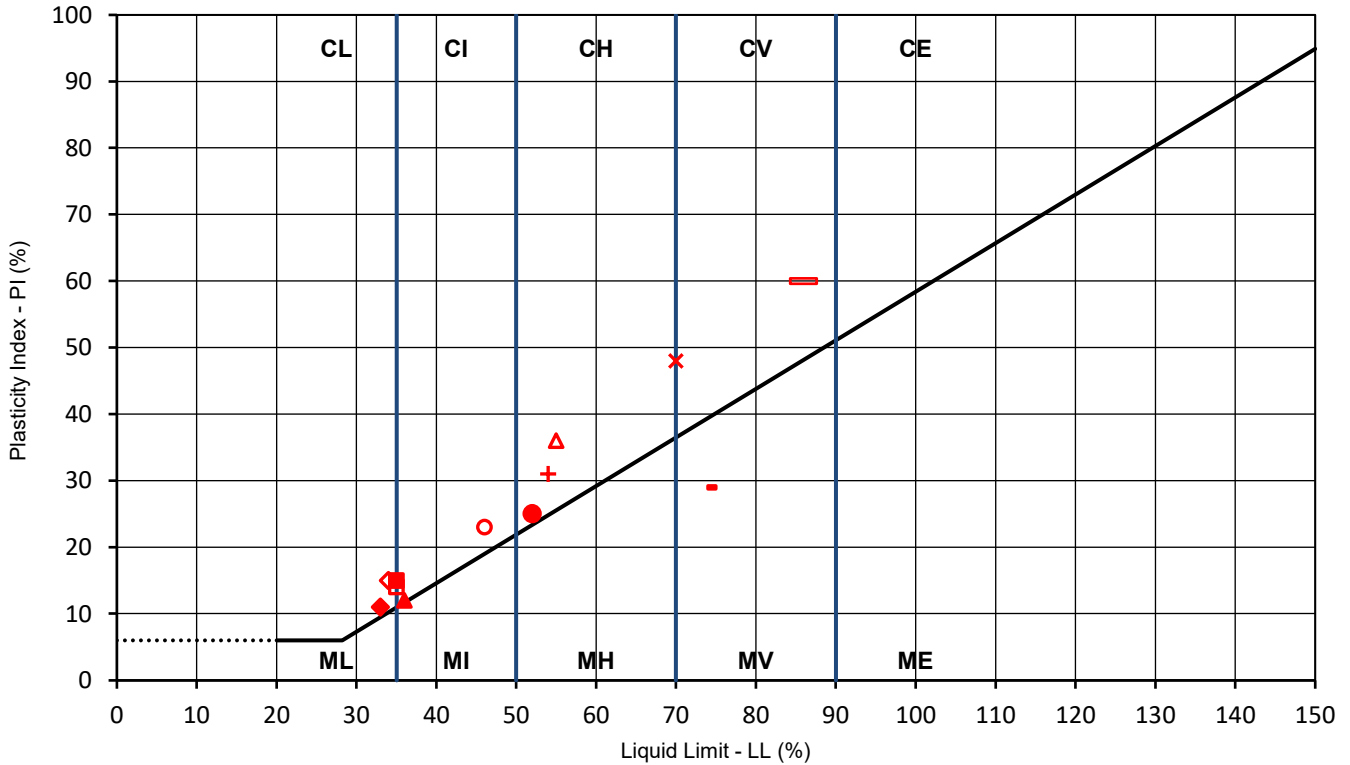


Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)



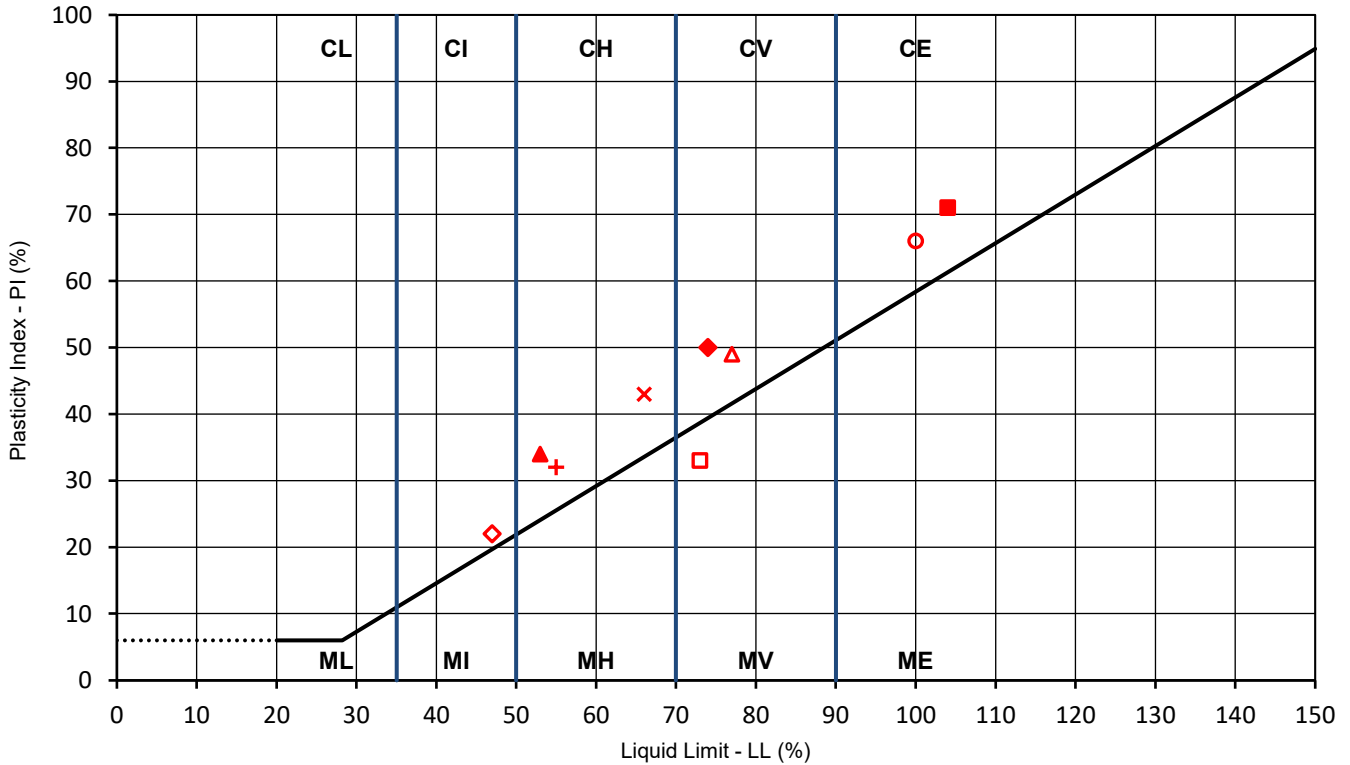
	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	DSRCOH414	79.90	35	21	14	
◇	DSRCOH414	86.06	34	19	15	
△	OH413	36.80	55	19	36	
×	OH417	2.33	70	22	48	
+	OH417	4.80	54	23	31	
○	OH417	73.10	46	23	23	
■	OH417	79.60	35	20	15	
◆	OH417	84.55	33	22	11	
▲	OH417	89.00	36	24	12	
●	TP612	0.40	52	27	25	
▢	TP612	1.20	86	26	60	
▪	TP613	0.20	74	45	29	

CONTRACT	CHECKED
<b>35560/03</b>	<b>TB</b>



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)



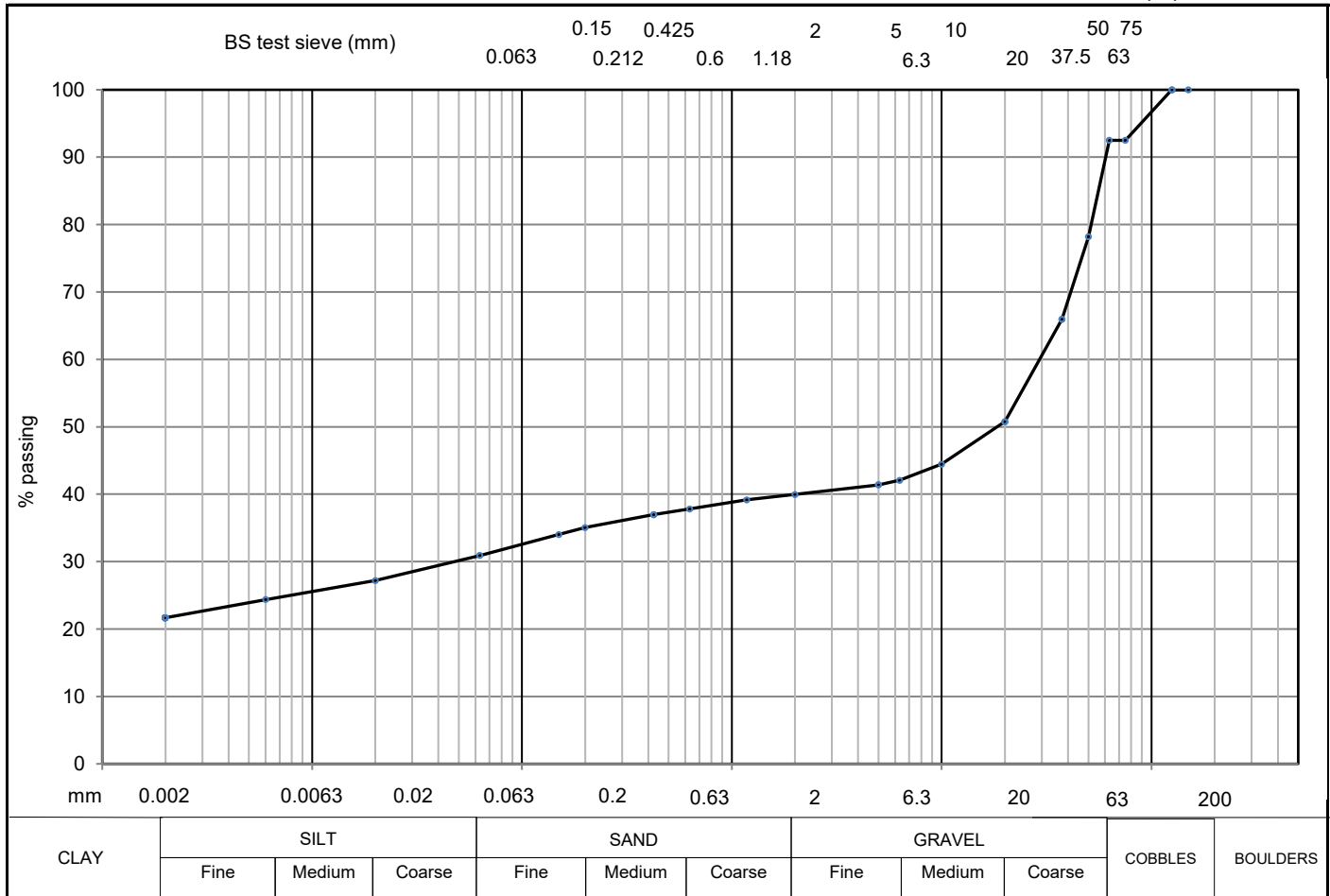
BH/TP No.	depth (m)	LL	PL	PI	remarks	
□ TP614	0.20	73	40	33		
◇ TP614	0.50	47	25	22		
△ TP620	0.30	77	28	49		
×	TP622A	1.00	66	23	43	
+	TP622A	2.60	55	23	32	
○	TP628	0.40	100	34	66	
■	TP628	1.00	104	33	71	
◆	TP628	2.20	74	24	50	
▲	TP628	2.80	53	19	34	

CONTRACT	CHECKED
<b>35560/03</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC220
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	3B
DESCRIPTION	Yellowish brown sandy very clayey GRAVEL with medium cobble content	SAMPLE DEPTH (m)	0.60
		SPECIMEN TOP (m)	0.60
		SPECIMEN BASE (m)	1.00



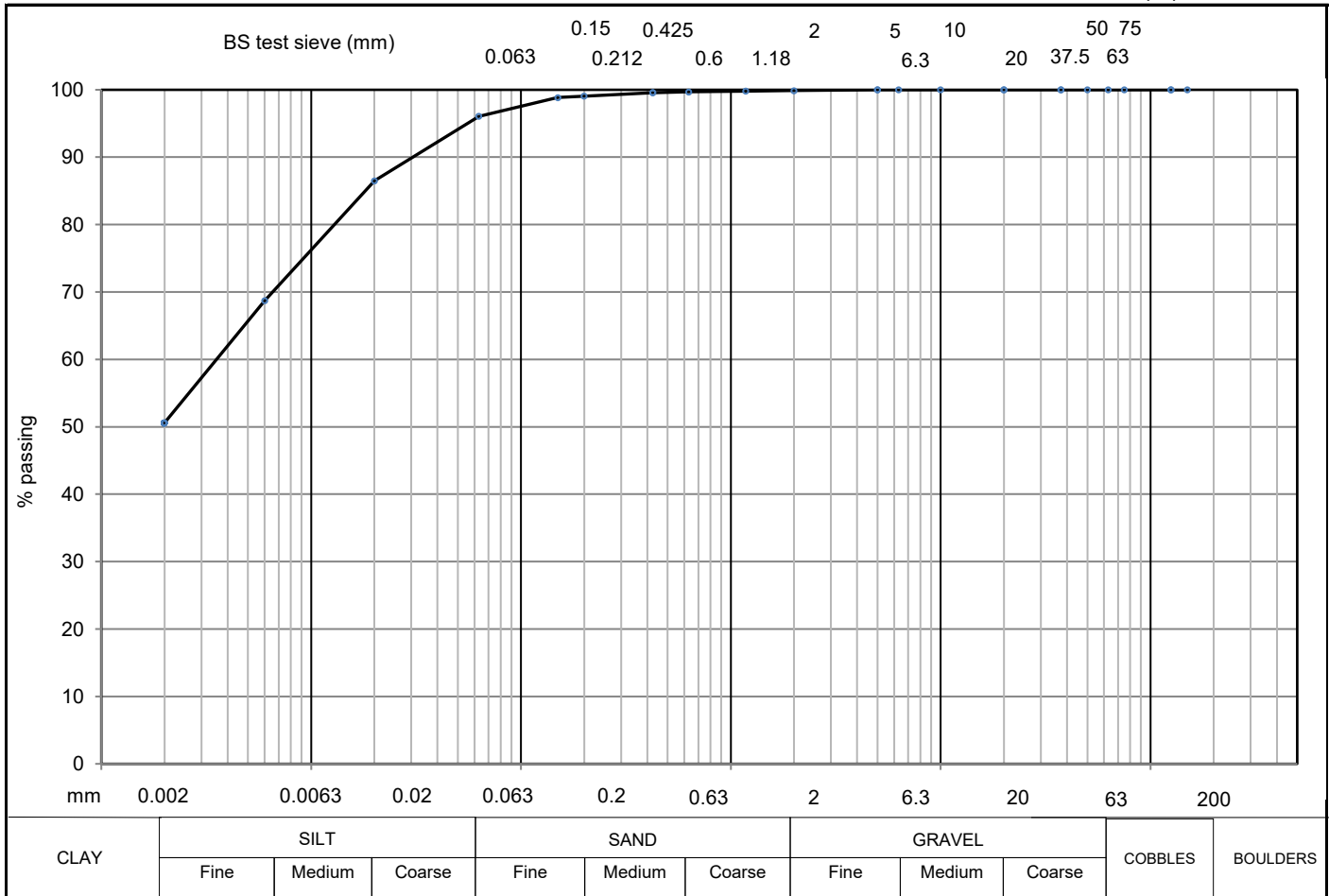
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	22		100	5	41	20	27
SILT	9	150	100	5	41	20	27
SILT & CLAY	31						
SAND	9	75	93	2	40	6	24
GRAVEL	53						
COBBLE & BOULDER	7	63	93	1.18	39	2	22
test method(s)	5.2# & 5.4	50	78	0.63	38		
test method		37.5	66	0.425	37		
5.2 - sieving		20	51	0.2	35		
5.3 - sedimentation by hydrometer		10	44	0.15	34		
5.4 - sedimentation by pipette		6.3	42	0.063	31		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35560/03</b>	<b>CHECKED</b> <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRCOH400
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	9L
DESCRIPTION	Yellowish brown mottled orange slightly sandy silty CLAY	SAMPLE DEPTH (m)	2.20
		SPECIMEN TOP (m)	2.40
		SPECIMEN BASE (m)	2.70



CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		

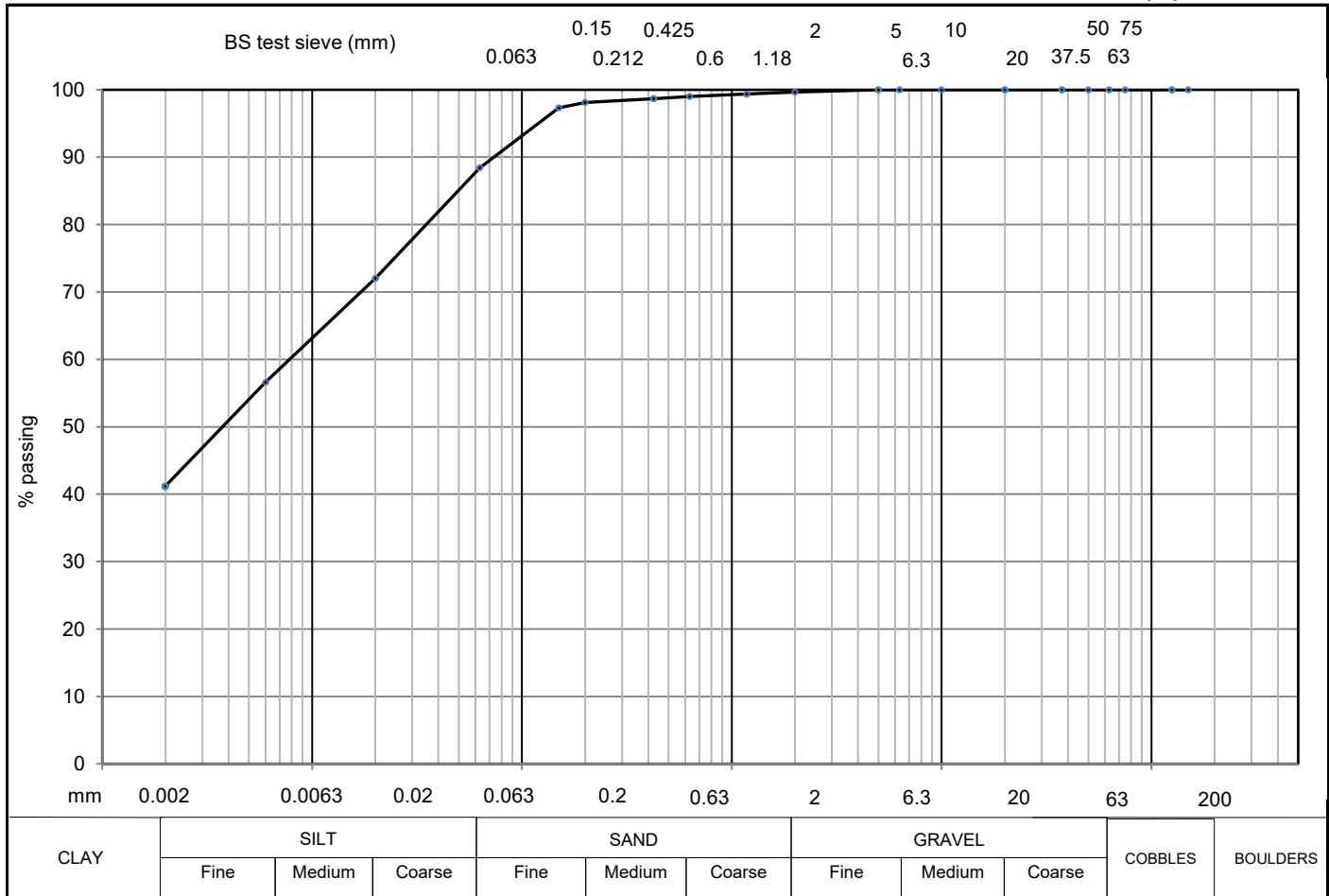
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	51						
SILT	46	150		5	100	20	86
SILT & CLAY	96						
SAND	4	75		2	100	6	69
GRAVEL	0						
COBBLE & BOULDER	0	63		1.18	100	2	51
test method(s)	5.2 & 5.4	50		0.63	100		
test method		37.5		0.425	100		
5.2 - sieving		20		0.2	99		
5.3 - sedimentation by hydrometer		10		0.15	99		
5.4 - sedimentation by pipette		6.3		0.063	96		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	CONTRACT <b>35560/03</b>	CHECKED <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRCOH400
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	18C
DESCRIPTION	Yellowish brown slightly sandy silty CLAY	SAMPLE DEPTH (m)	6.50
		SPECIMEN TOP (m)	6.75
		SPECIMEN BASE (m)	7.00



CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		

soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	41						
SILT	47	150		5	100	20	72
SILT & CLAY	88						
SAND	11	75		2	100	6	57
GRAVEL	0						
COBBLE & BOULDER	0	63		1.18	99	2	41
test method(s)	5.2 & 5.4	50		0.63	99		
test method		37.5		0.425	99		
5.2 - sieving		20		0.2	98		
5.3 - sedimentation by hydrometer		10		0.15	97		
5.4 - sedimentation by pipette		6.3		0.063	88		

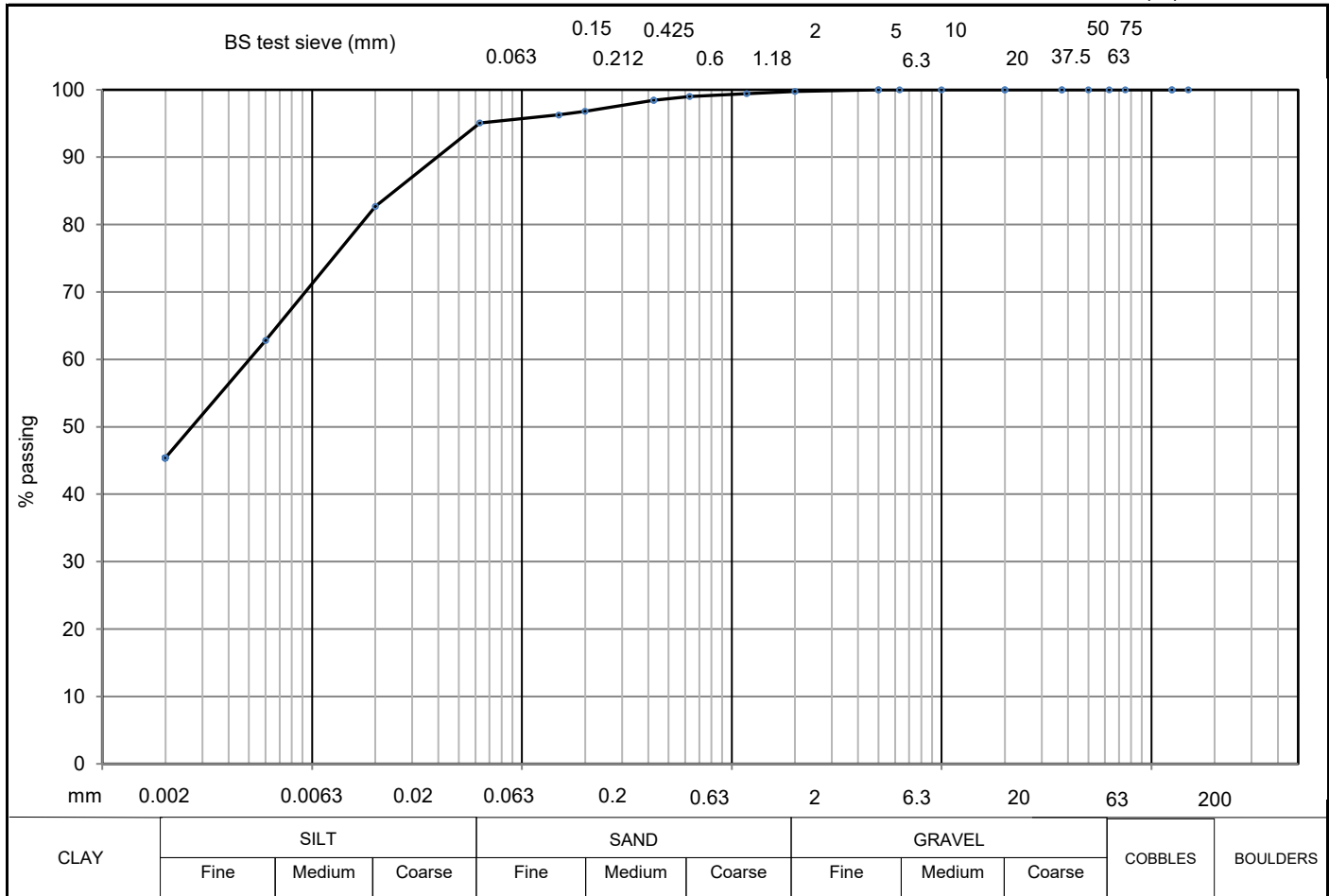
remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35560/03</b>	<b>CHECKED</b> <b>TB</b>
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# PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRCOH400
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	26C
DESCRIPTION	Greyish brown slightly sandy silty CLAY	SAMPLE DEPTH (m)	10.80
		SPECIMEN TOP (m)	11.30
		SPECIMEN BASE (m)	11.55



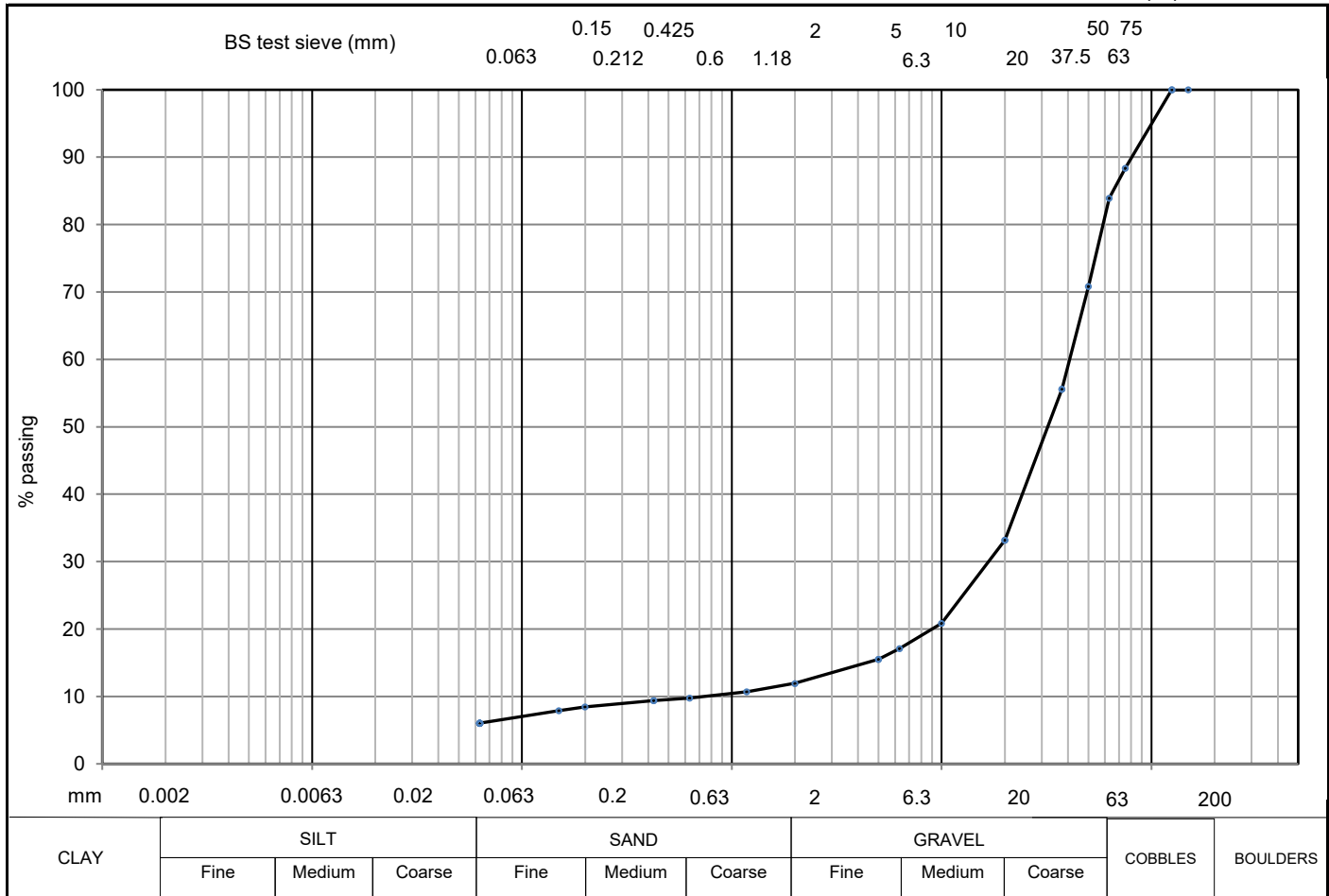
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	45			5	100	20	83
SILT	50	150		2	100	6	63
SILT & CLAY	95			1.18	99	2	45
SAND	5	75					
GRAVEL	0						
COBBLE & BOULDER	0	63					
test method(s)	5.2 & 5.4	50		0.63	99		
test method		37.5		0.425	98		
5.2 - sieving		20		0.2	97		
5.3 - sedimentation by hydrometer		10		0.15	96		
5.4 - sedimentation by pipette		6.3		0.063	95		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	CONTRACT <b>35560/03</b>	CHECKED <b>TB</b>
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**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRCOH412
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	6L
DESCRIPTION	Light brown clayey sandy GRAVEL with medium cobble content	SAMPLE DEPTH (m)	1.20
		SPECIMEN TOP (m)	1.20
		SPECIMEN BASE (m)	2.00



CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		

soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY							
SILT		150	100	5	16	20	
SILT & CLAY	6						
SAND	6	75	88	2	12	6	
GRAVEL	72						
COBBLE & BOULDER	16	63	84	1.18	11	2	
test method(s)	5.2#	50	71	0.63	10		
test method		37.5	56	0.425	9		
5.2 - sieving		20	33	0.2	8		
5.3 - sedimentation by hydrometer		10	21	0.15	8		
5.4 - sedimentation by pipette		6.3	17	0.063	6		

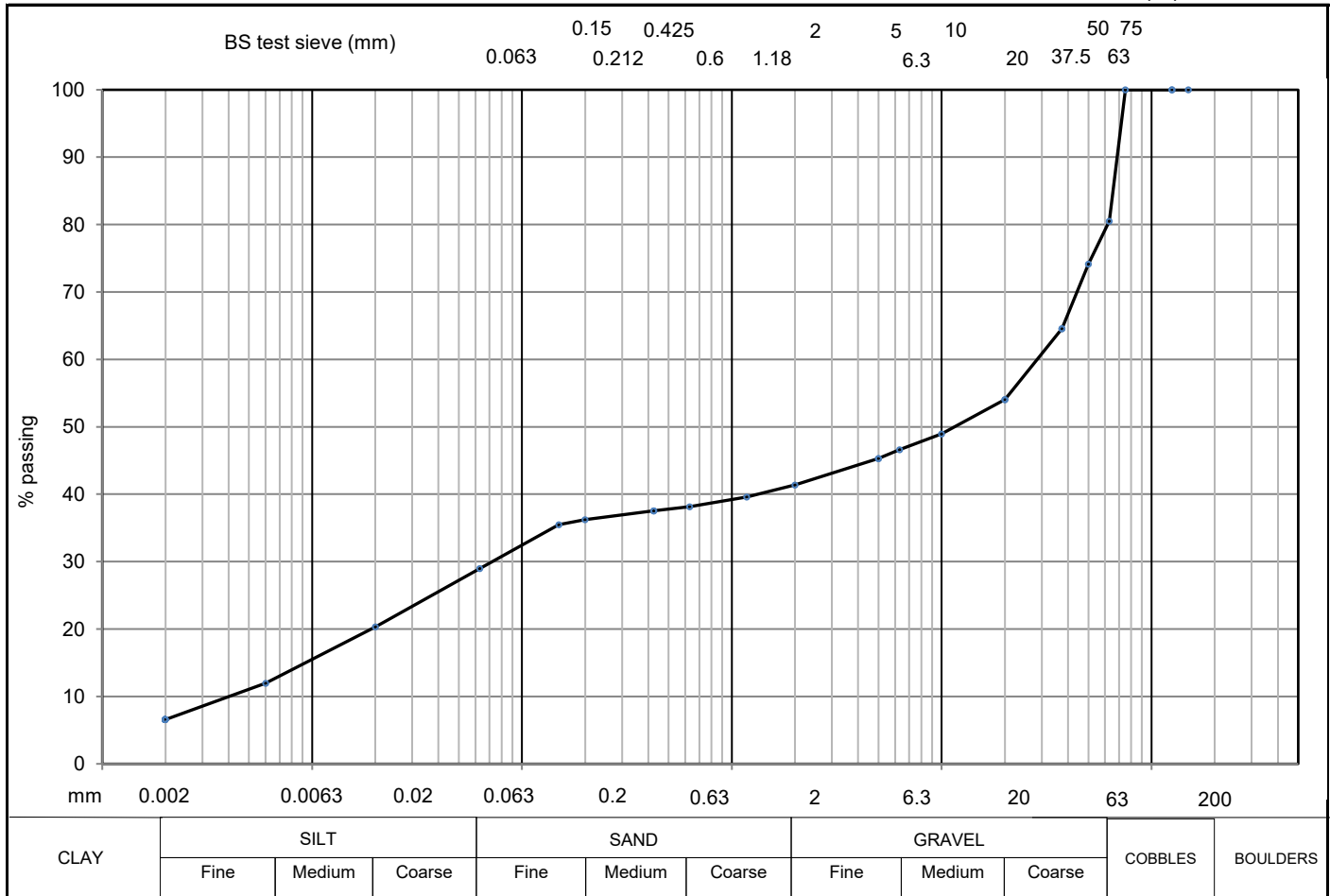
remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35560/03</b>	<b>CHECKED</b> <b>TB</b>
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# PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRCOH412
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	10C
DESCRIPTION	Yellowish brown sandy very silty GRAVEL with medium cobble content	SAMPLE DEPTH (m)	3.00
		SPECIMEN TOP (m)	3.10
		SPECIMEN BASE (m)	3.40



soil type	% fraction	SAND		GRAVEL			COBBLES	BOULDERS
		Fine	Coarse	Fine	Medium	Coarse		
CLAY	7							
SILT	22							
SILT & CLAY	29							
SAND	12							
GRAVEL	39							
COBBLE & BOULDER	19							
test method(s)	5.2# & 5.4							
test method								
5.2 - sieving								
5.3 - sedimentation by hydrometer								
5.4 - sedimentation by pipette								

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>35560/03</b>	<b>TB</b>



# PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5



CLIENT OSBORNE

BH/TP No.

DSRCOH412

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

SAMPLE No./TYPE

12L

SAMPLE DEPTH (m)

4.00

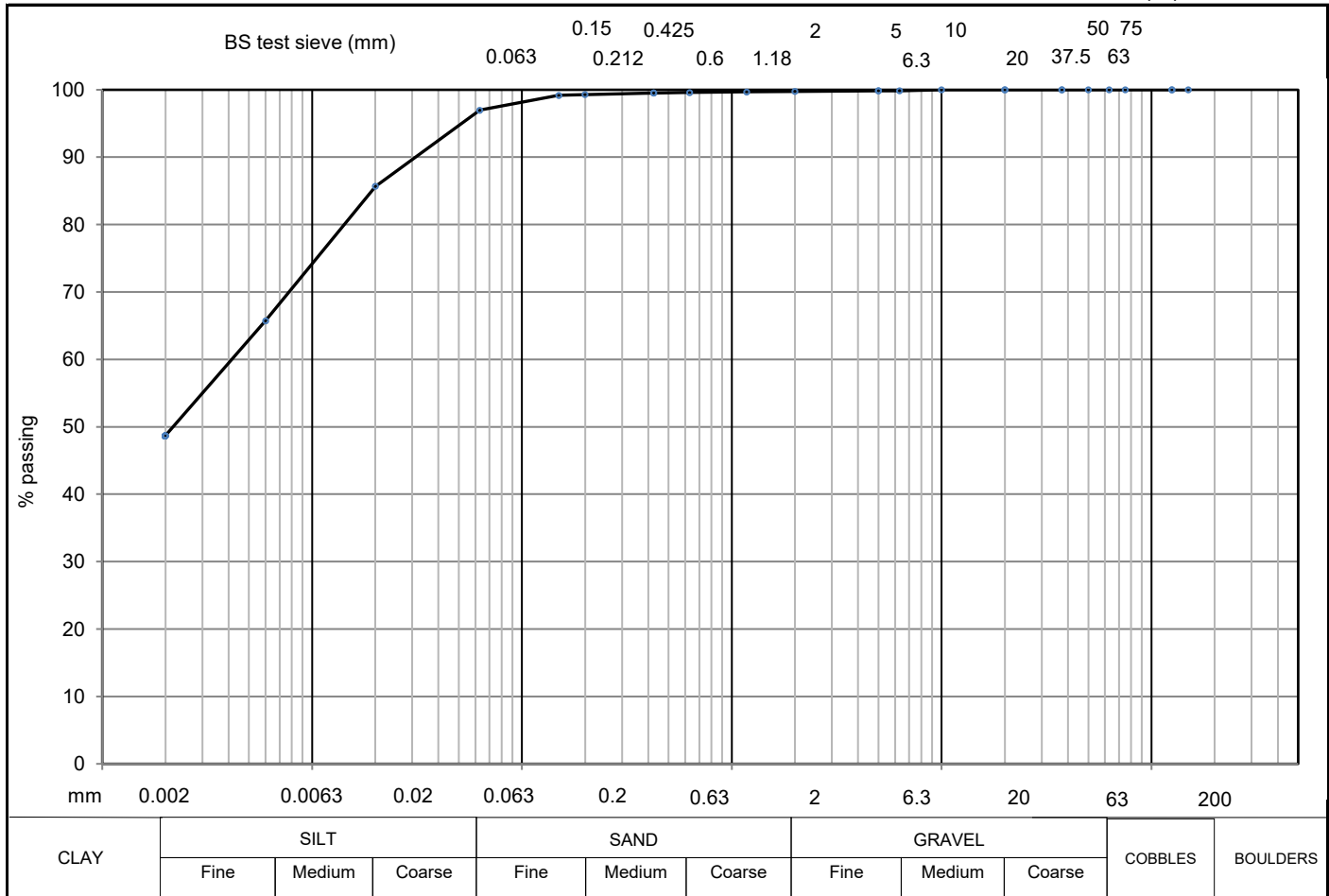
DESCRIPTION Light brown mottled orange slightly sandy silty CLAY

SPECIMEN TOP (m)

4.20

SPECIMEN BASE (m)

4.50



CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		
	49	48	3	0	0	0	0	0	0	0	0

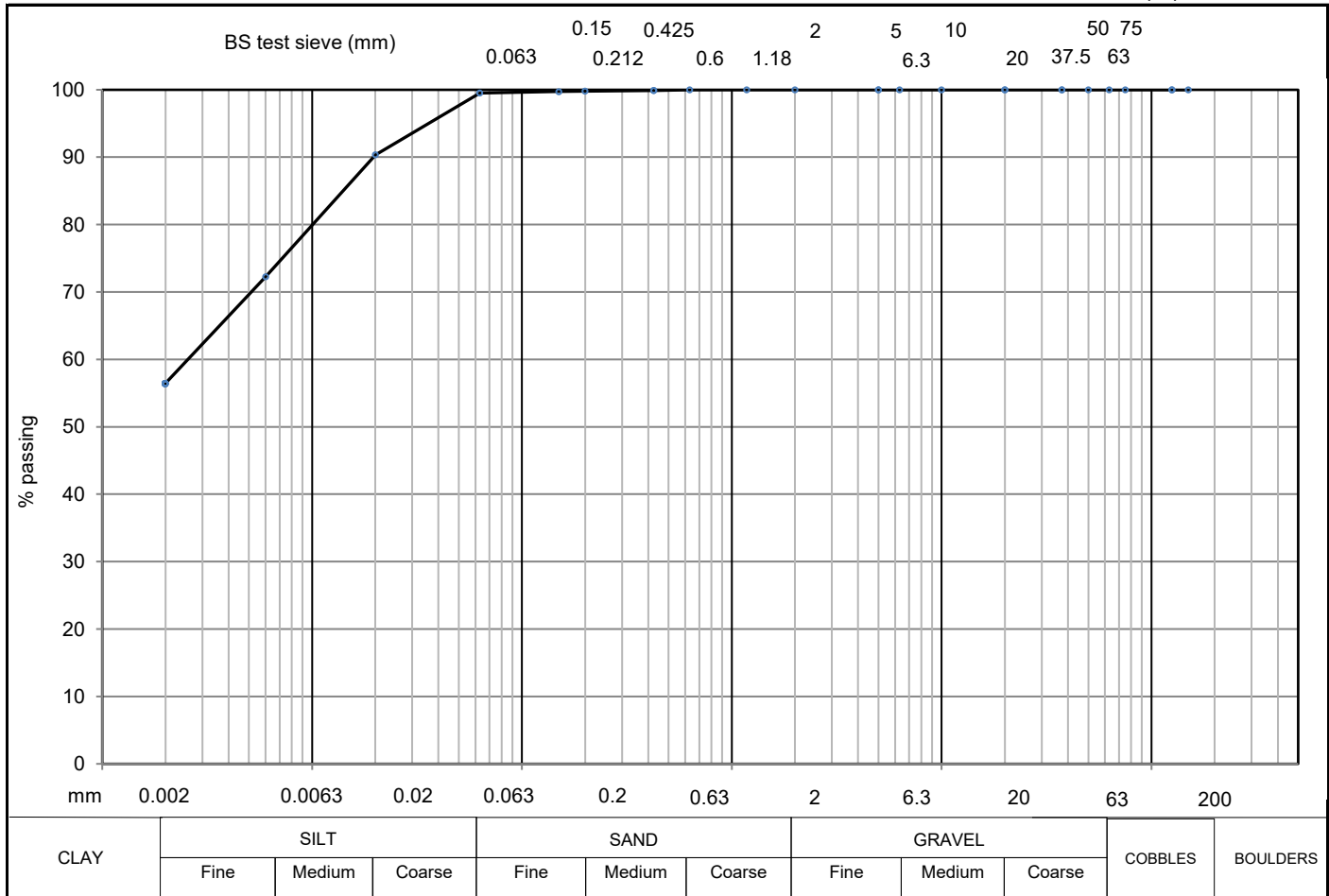
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	49			5	100	20	86
SILT	48	150		2	100	6	66
SILT & CLAY	97			1.18	100	2	49
SAND	3	75					
GRAVEL	0						
COBBLE & BOULDER	0	63					
test method(s)	5.2 & 5.4	50		0.63	100		
test method		37.5		0.425	100		
5.2 - sieving		20		0.2	99		
5.3 - sedimentation by hydrometer		10	100	0.15	99		
5.4 - sedimentation by pipette		6.3	100	0.063	97		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	CONTRACT <b>35560/03</b>	CHECKED <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	OH417
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	6L
DESCRIPTION	Yellowish brown mottled orange silty CLAY	SAMPLE DEPTH (m)	2.00
		SPECIMEN TOP (m)	2.20
		SPECIMEN BASE (m)	2.40

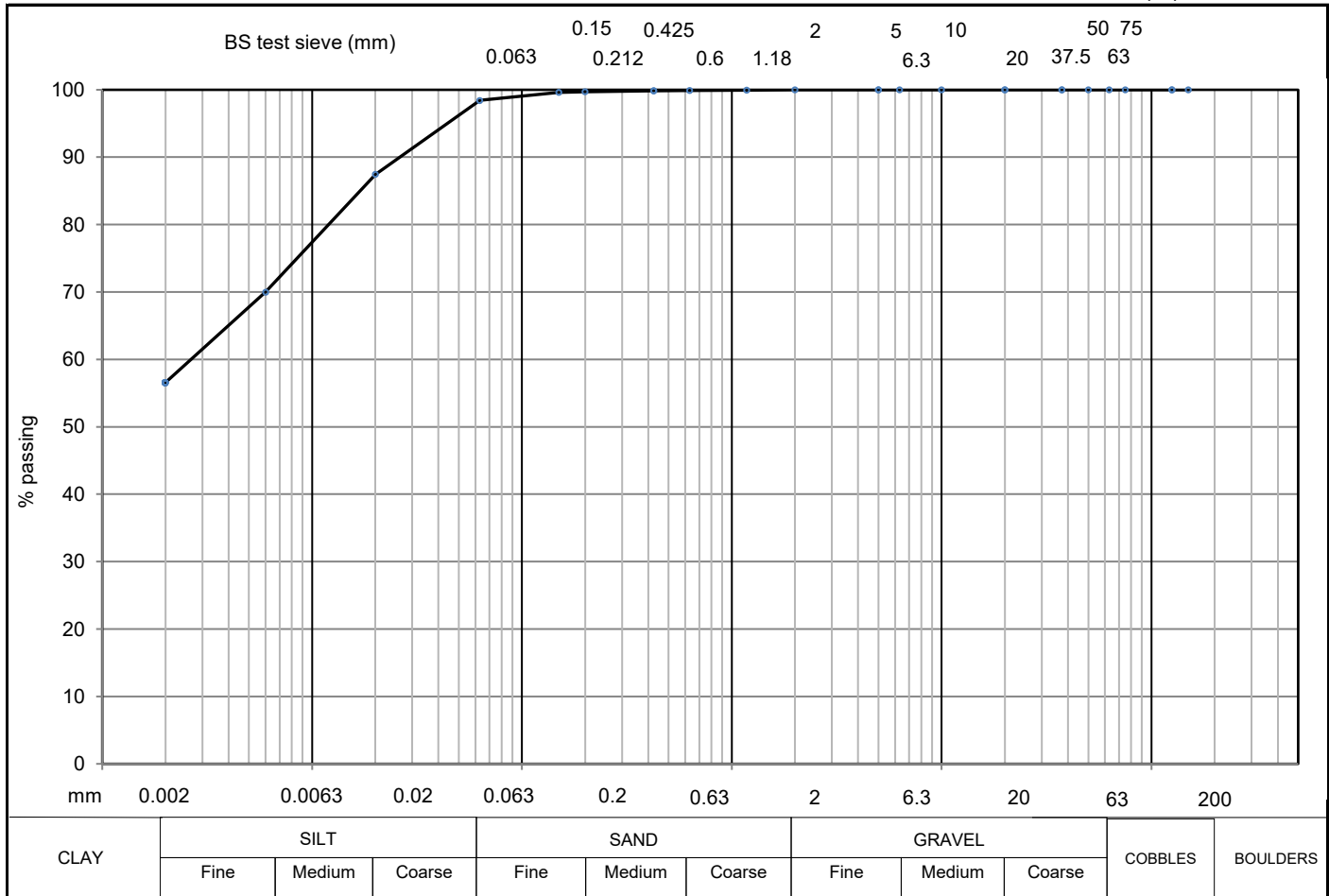


soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	56						
SILT	43	150		5		20	90
SILT & CLAY	100						
SAND	0	75		2		6	72
GRAVEL	0						
COBBLE & BOULDER	0	63		1.18		2	56
test method(s)	5.2 & 5.4	50		0.63	100		
test method		37.5		0.425	100		
5.2 - sieving		20		0.2	100		
5.3 - sedimentation by hydrometer		10		0.15	100		
5.4 - sedimentation by pipette		6.3		0.063	100		
remarks	# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>					CONTRACT	CHECKED
						<b>35560/03</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP612
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	5B
DESCRIPTION	Yellowish brown mottled orange slightly sandy silty CLAY	SAMPLE DEPTH (m)	0.75
		SPECIMEN TOP (m)	0.75
		SPECIMEN BASE (m)	0.95



CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		

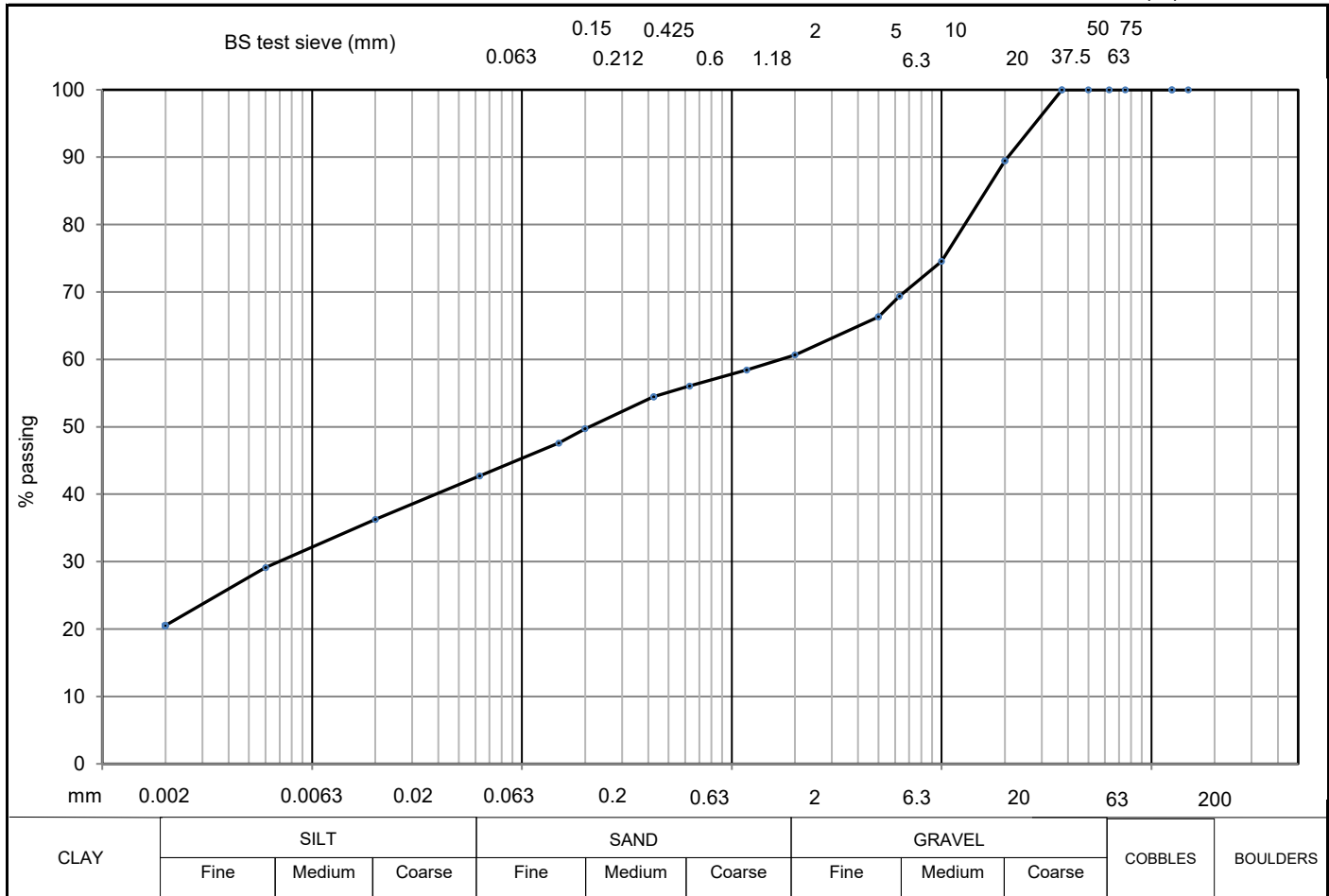
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	57						
SILT	42	150		5		20	87
SILT & CLAY	98						
SAND	2	75		2	100	6	70
GRAVEL	0						
COBBLE & BOULDER	0	63		1.18	100	2	57
test method(s)	5.2 & 5.4	50		0.63	100		
test method		37.5		0.425	100		
5.2 - sieving		20		0.2	100		
5.3 - sedimentation by hydrometer		10		0.15	100		
5.4 - sedimentation by pipette		6.3		0.063	98		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35560/03</b>	<b>CHECKED</b> <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP613
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	3LB
DESCRIPTION	Orangish brown slightly sandy gravelly silty CLAY	SAMPLE DEPTH (m)	0.20
		SPECIMEN TOP (m)	0.20
		SPECIMEN BASE (m)	0.40



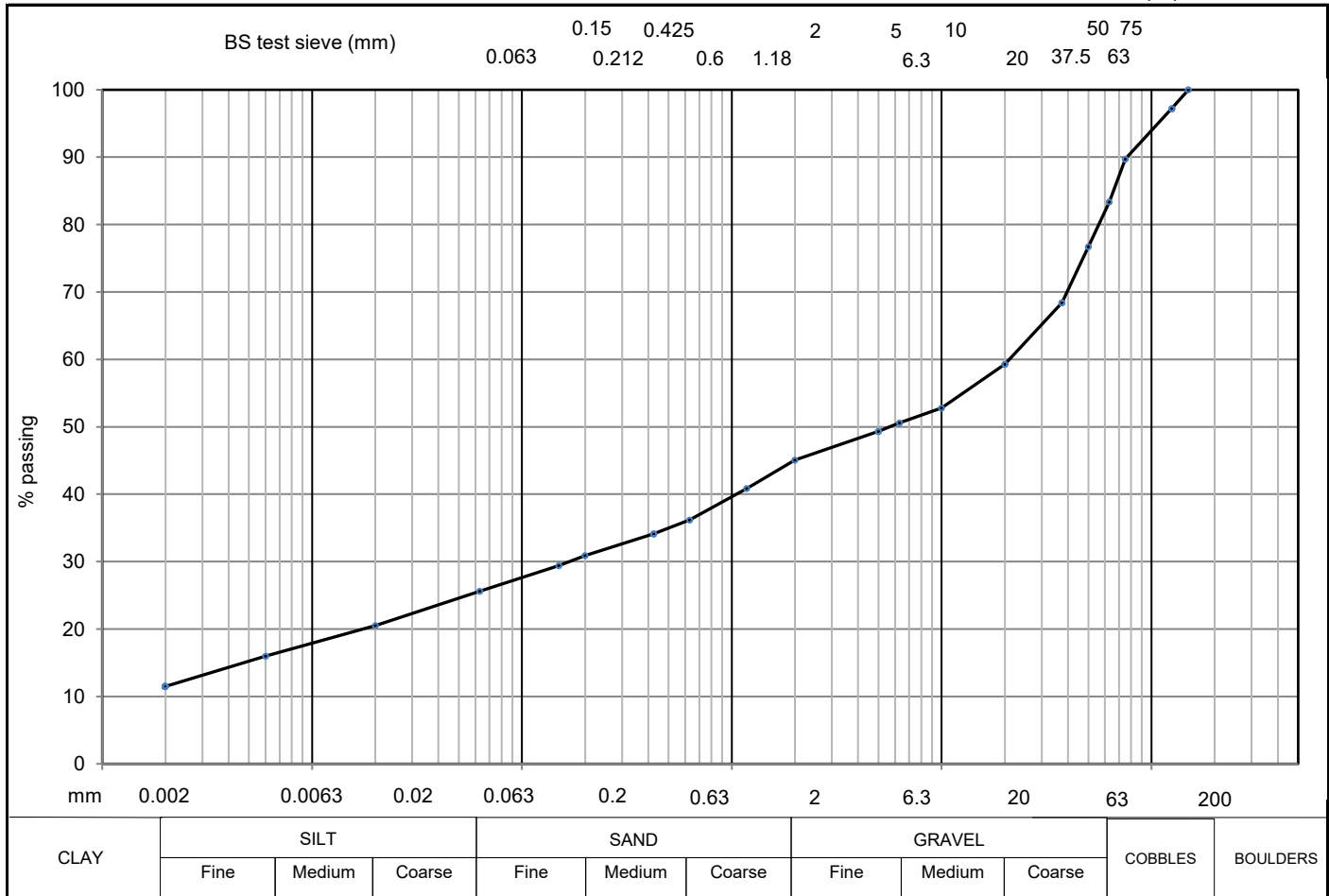
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	21			5	66	20	36
SILT	22	150		2	61	6	29
SILT & CLAY	43			1.18	58	2	21
SAND	18	75		0.63	56		
GRAVEL	39			0.425	54		
COBBLE & BOULDER	0	63		0.2	50		
test method(s)	5.2 & 5.4	50		0.15	48		
test method		37.5	100	0.063	43		
5.2 - sieving		20	89				
5.3 - sedimentation by hydrometer		10	75				
5.4 - sedimentation by pipette		6.3	69				

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35560/03</b>	<b>CHECKED</b> <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP614
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	3LB
DESCRIPTION	Orangish brown slightly sandy gravelly silty CLAY with medium cobble content	SAMPLE DEPTH (m)	0.50
		SPECIMEN TOP (m)	0.50
		SPECIMEN BASE (m)	0.70



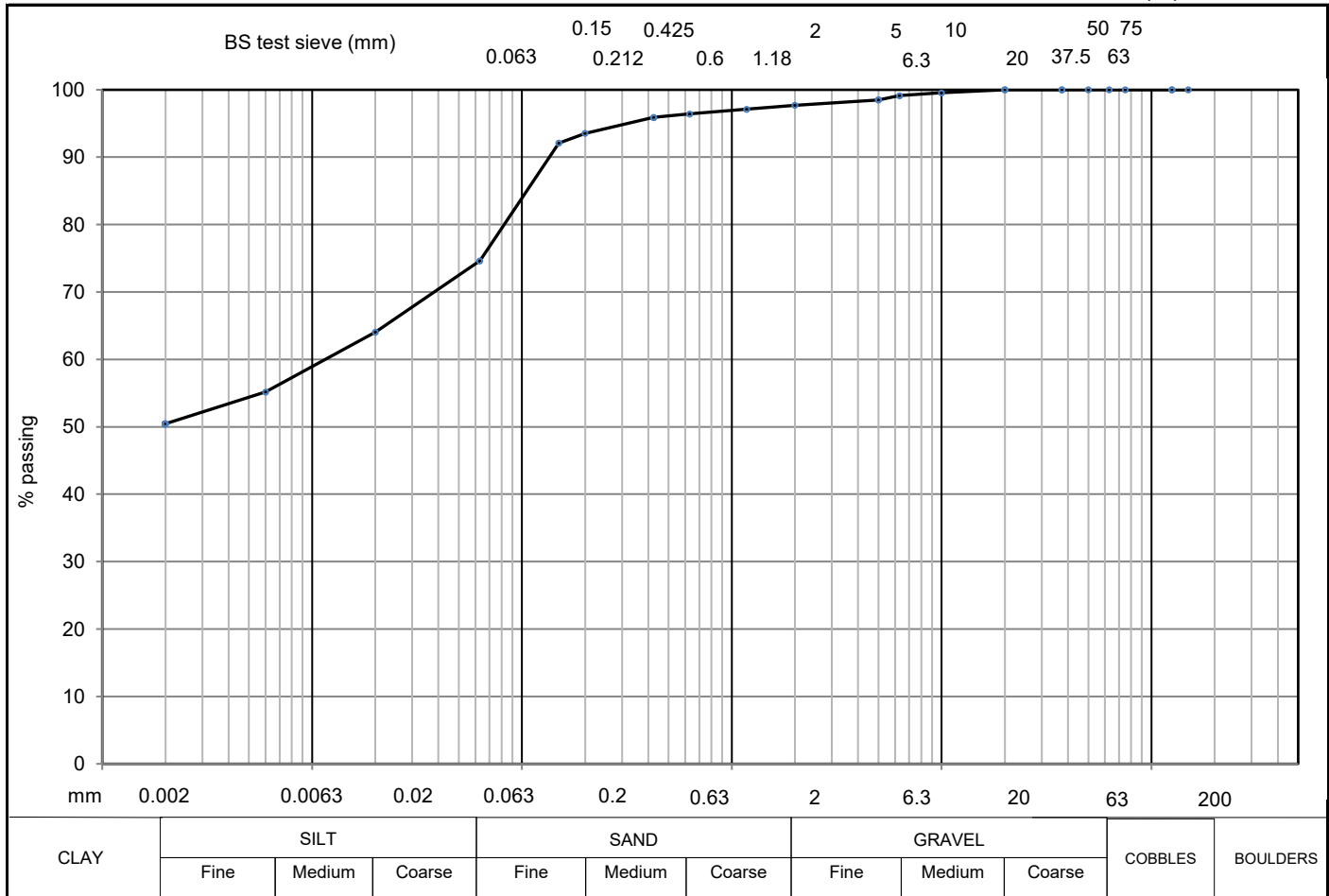
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	12						
SILT	14	150	100	5	49	20	20
SILT & CLAY	26						
SAND	19	75	90	2	45	6	16
GRAVEL	38						
COBBLE & BOULDER	17	63	83	1.18	41	2	11
test method(s)	5.2# & 5.4	50	77	0.63	36		
test method		37.5	68	0.425	34		
5.2 - sieving		20	59	0.2	31		
5.3 - sedimentation by hydrometer		10	53	0.15	29		
5.4 - sedimentation by pipette		6.3	51	0.063	26		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	CONTRACT <b>35560/03</b>	CHECKED <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP620
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	1LB
DESCRIPTION	Orangish brown slightly sandy CLAY	SAMPLE DEPTH (m)	0.30
		SPECIMEN TOP (m)	0.30
		SPECIMEN BASE (m)	0.50



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	50			5	99	20	64
SILT	24	150		2	98	6	55
SILT & CLAY	75			1.18	97	2	50
SAND	23	75					
GRAVEL	2						
COBBLE & BOULDER	0	63					
test method(s)	5.2 & 5.4	50		0.63	96		
test method		37.5		0.425	96		
5.2 - sieving		20	100	0.2	94		
5.3 - sedimentation by hydrometer		10	100	0.15	92		
5.4 - sedimentation by pipette		6.3	99	0.063	75		

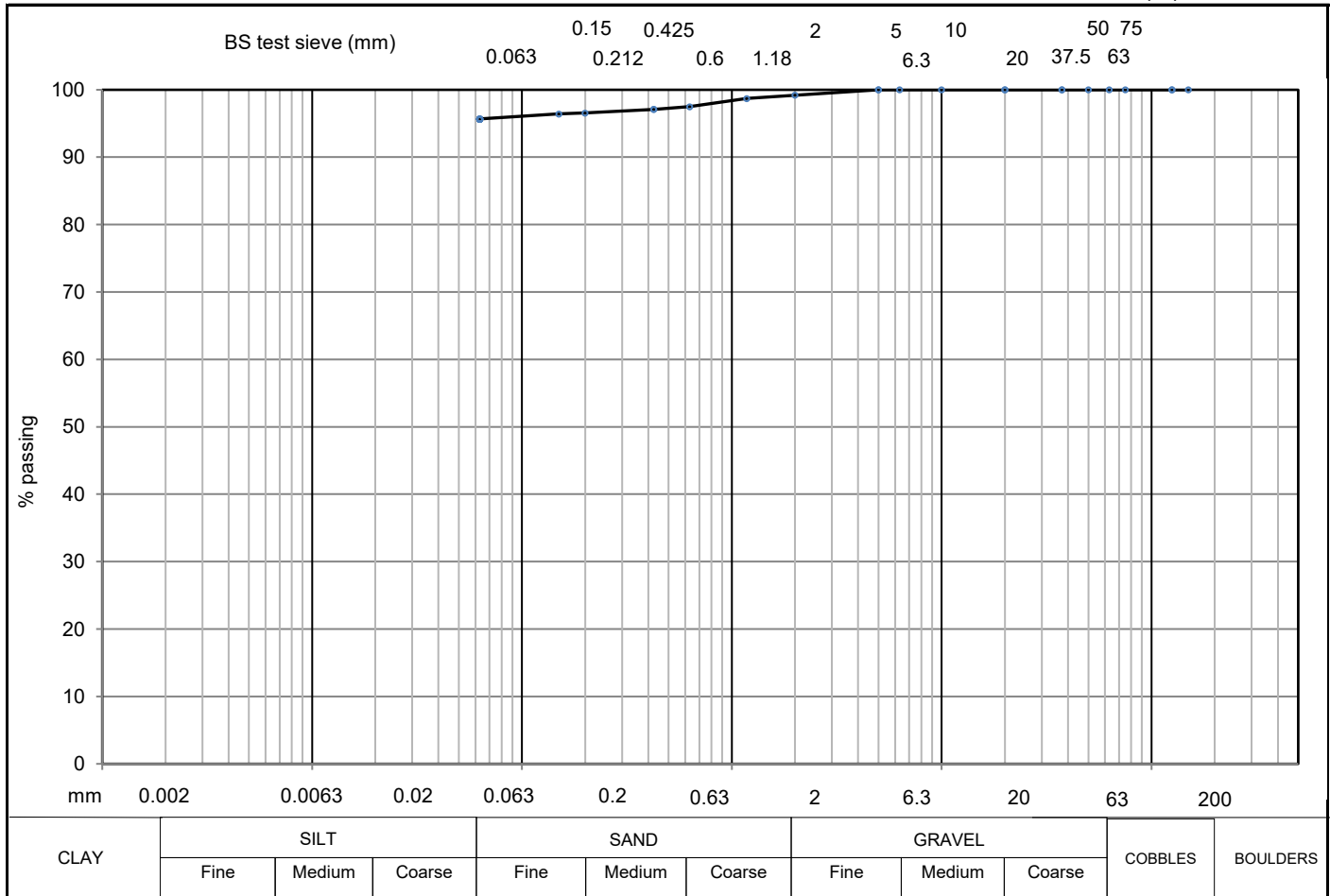
remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	CONTRACT <b>35560/03</b>	CHECKED <b>TB</b>
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# PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP620
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	5B
DESCRIPTION	Greyish brown slightly sandy silty CLAY	SAMPLE DEPTH (m)	1.60
		SPECIMEN TOP (m)	1.60
		SPECIMEN BASE (m)	1.80



CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		

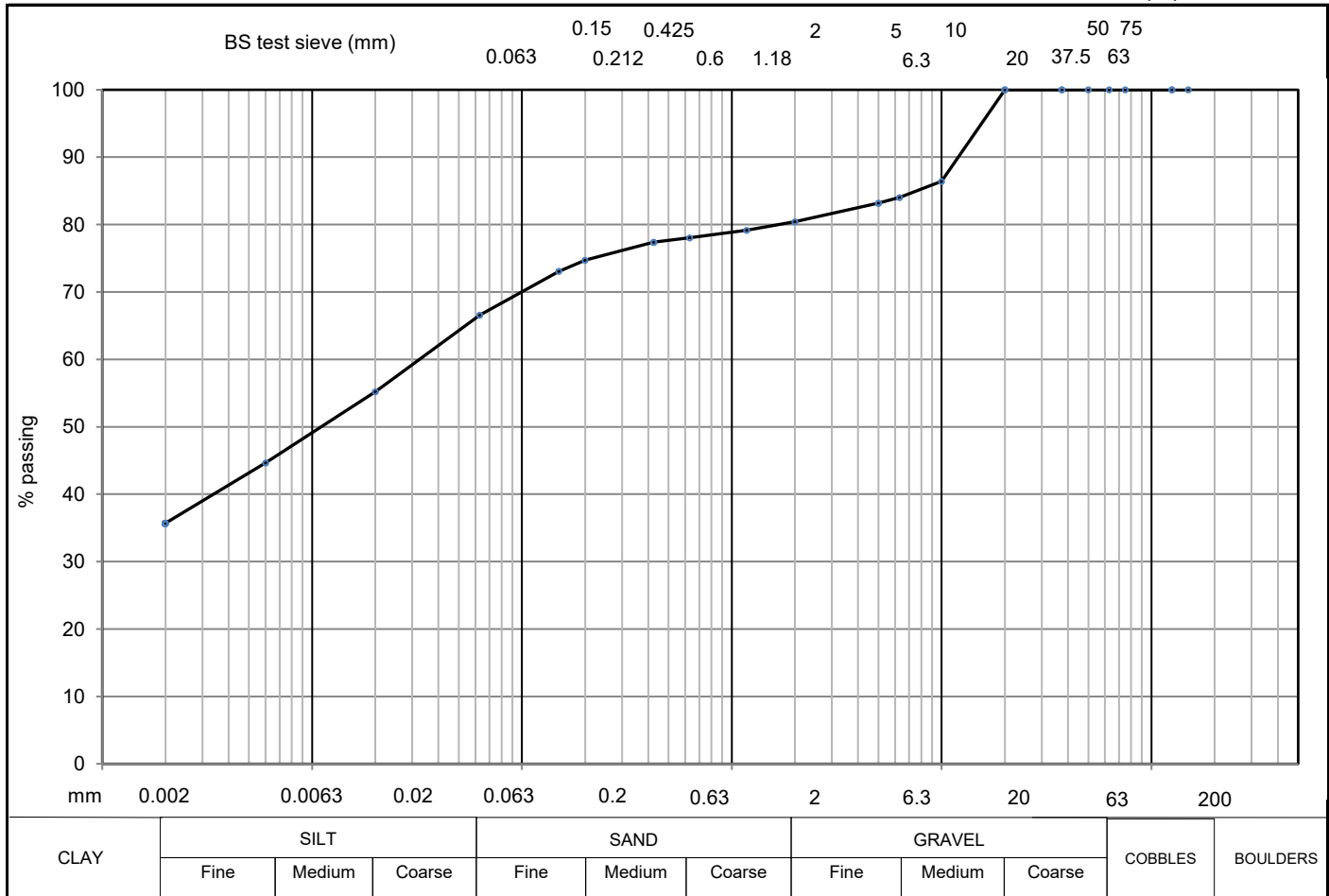
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY							
SILT		150		5	100	20	
SILT & CLAY	96						
SAND	4	75		2	99	6	
GRAVEL	1						
COBBLE & BOULDER	0	63		1.18	99	2	
test method(s)	5.2						
		50		0.63	97		
test method		37.5		0.425	97		
5.2 - sieving		20		0.2	97		
5.3 - sedimentation by hydrometer		10		0.15	96		
5.4 - sedimentation by pipette		6.3		0.063	96		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>35560/03</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP622A
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	3B
DESCRIPTION	Greyish brown slightly sandy slightly gravelly silty CLAY	SAMPLE DEPTH (m)	1.00
		SPECIMEN TOP (m)	1.00
		SPECIMEN BASE (m)	1.20



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	36						
SILT	31	150		5	83	20	55
SILT & CLAY	67						
SAND	14	75		2	80	6	45
GRAVEL	20						
COBBLE & BOULDER	0	63		1.18	79	2	36
test method(s)	5.2 & 5.4						
test method		50		0.63	78		
5.2 - sieving		37.5		0.425	77		
5.3 - sedimentation by hydrometer		20	100	0.2	75		
5.4 - sedimentation by pipette		10	86	0.15	73		
		6.3	84	0.063	67		

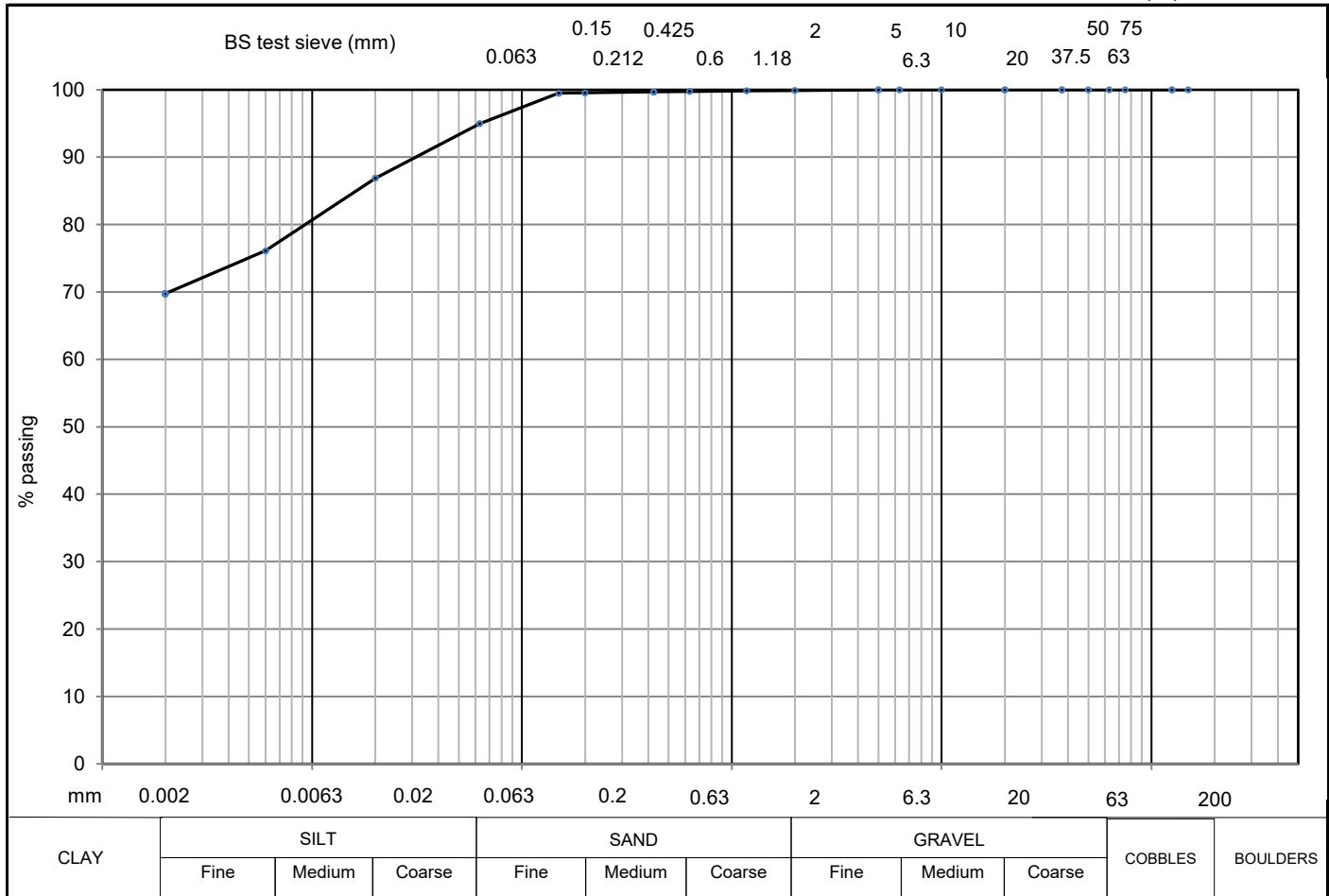
remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35560/03</b>	<b>CHECKED</b> <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP628
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	1LB
DESCRIPTION	Orangish brown slightly sandy CLAY	SAMPLE DEPTH (m)	0.40
		SPECIMEN TOP (m)	0.40
		SPECIMEN BASE (m)	0.60



CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		

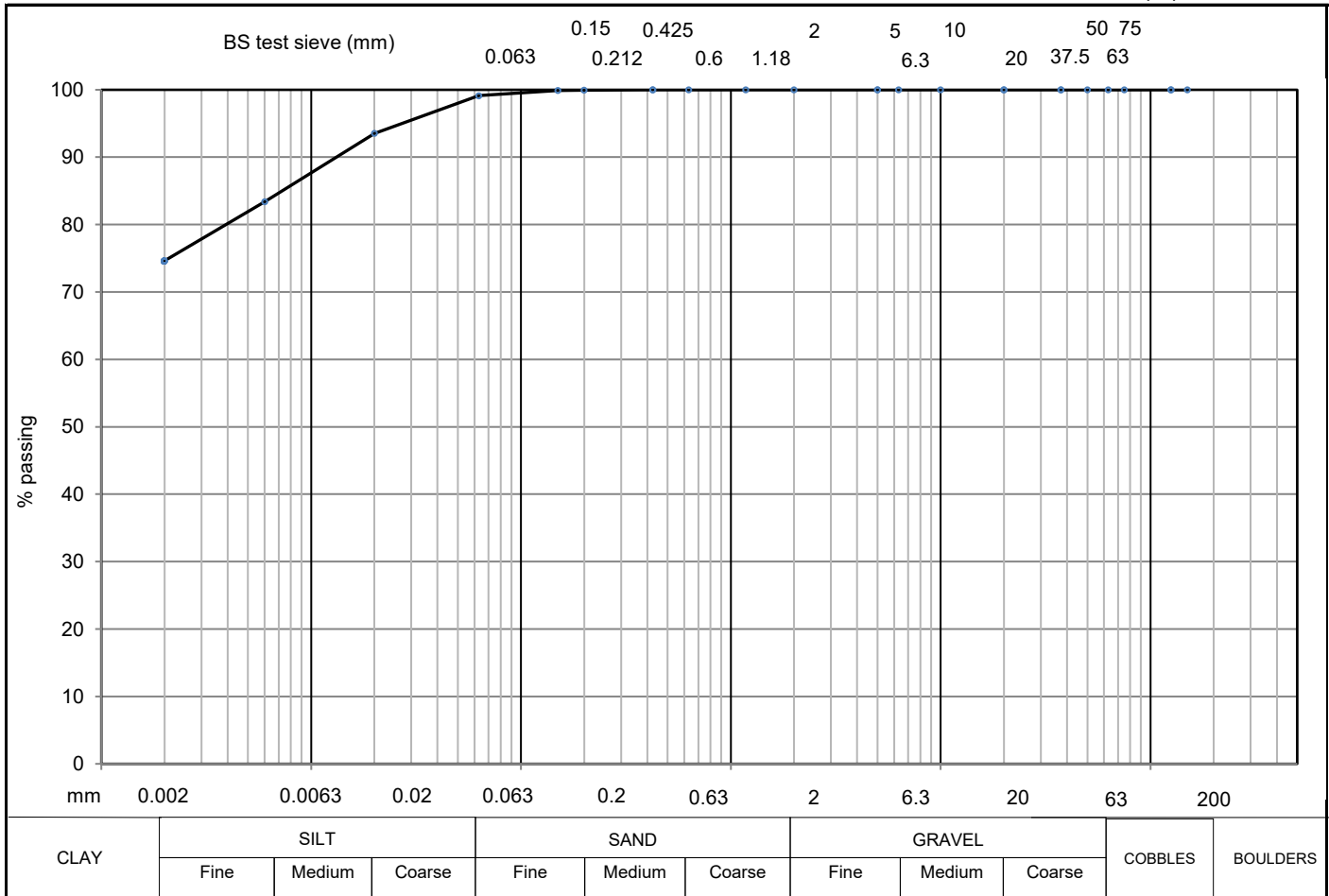
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	70			5	100	20	87
SILT	25	150		2	100	6	76
SILT & CLAY	95			1.18	100	2	70
SAND	5	75					
GRAVEL	0						
COBBLE & BOULDER	0	63					
test method(s)	5.2 & 5.4	50		0.63	100		
test method		37.5		0.425	100		
5.2 - sieving		20		0.2	100		
5.3 - sedimentation by hydrometer		10		0.15	99		
5.4 - sedimentation by pipette		6.3		0.063	95		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35560/03</b>	<b>CHECKED</b> <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP628
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	3B
DESCRIPTION	Orangish brown CLAY with rare rootlets	SAMPLE DEPTH (m)	1.00
		SPECIMEN TOP (m)	1.00
		SPECIMEN BASE (m)	1.10



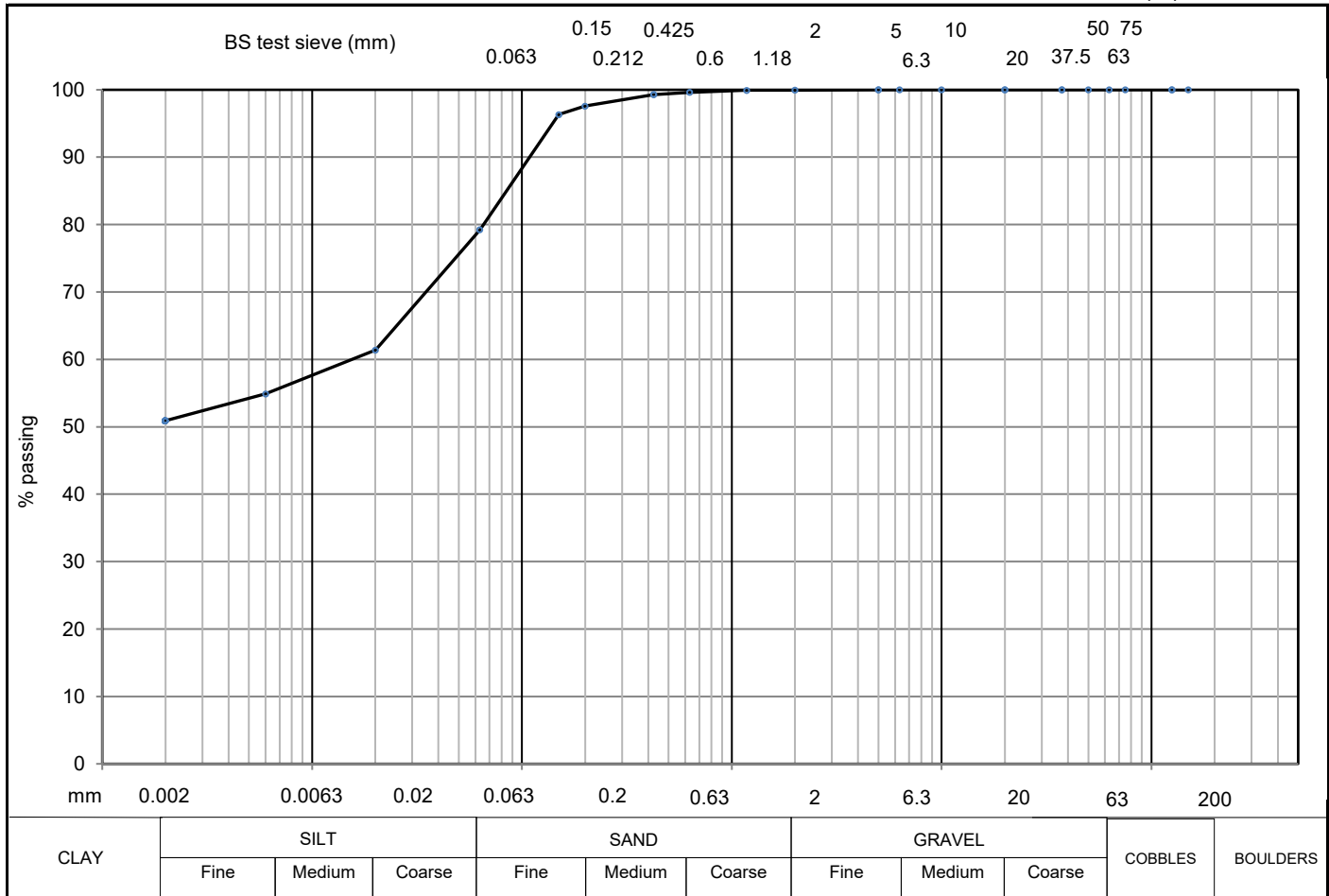
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	75						
SILT	25	150		5		20	94
SILT & CLAY	99						
SAND	1	75		2		6	83
GRAVEL	0						
COBBLE & BOULDER	0	63		1.18		2	75
test method(s)	5.2 & 5.4						
test method		50		0.63			
5.2 - sieving		37.5		0.425	100		
5.3 - sedimentation by hydrometer		20		0.2	100		
5.4 - sedimentation by pipette		10		0.15	100		
		6.3		0.063	99		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35560/03</b>	<b>CHECKED</b> <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP628
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	5B
DESCRIPTION	Orangish brown slightly sandy CLAY	SAMPLE DEPTH (m)	2.20
		SPECIMEN TOP (m)	2.20
		SPECIMEN BASE (m)	2.30



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	51						
SILT	28	150		5	100	20	61
SILT & CLAY	79						
SAND	21	75		2	100	6	55
GRAVEL	0						
COBBLE & BOULDER	0	63		1.18	100	2	51
test method(s)	5.2 & 5.4	50		0.63	100		
test method		37.5		0.425	99		
5.2 - sieving		20		0.2	98		
5.3 - sedimentation by hydrometer		10		0.15	96		
5.4 - sedimentation by pipette		6.3		0.063	79		

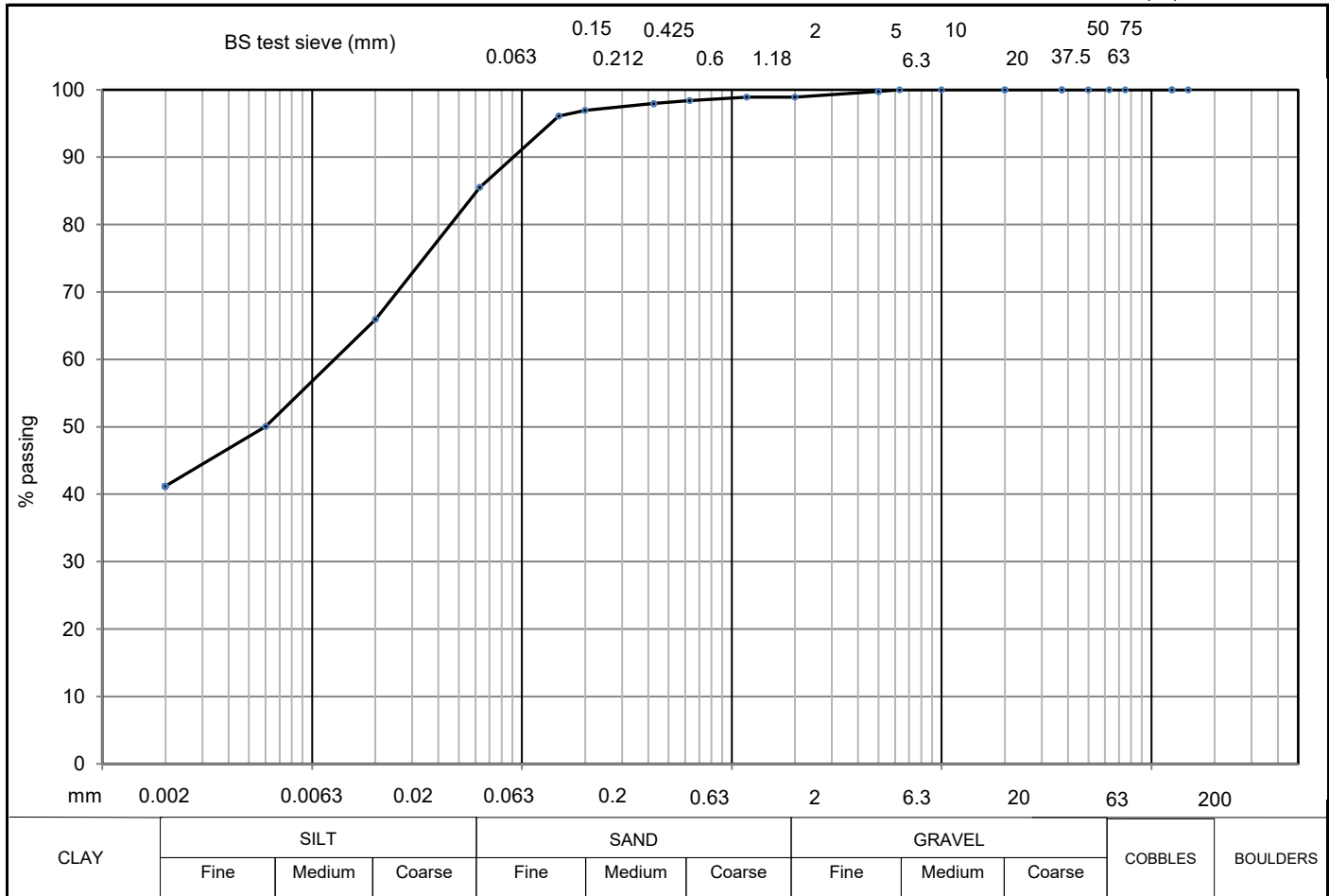
remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	CONTRACT <b>35560/03</b>	CHECKED <b>TB</b>
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# PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP628
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	7B
DESCRIPTION	Orangish brown slightly sandy silty CLAY	SAMPLE DEPTH (m)	2.80
		SPECIMEN TOP (m)	2.80
		SPECIMEN BASE (m)	2.90



CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		

soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	41						
SILT	44	150		5	100	20	66
SILT & CLAY	86						
SAND	13	75		2	99	6	50
GRAVEL	1						
COBBLE & BOULDER	0	63		1.18	99	2	41
test method(s)	5.2 & 5.4						
test method		50		0.63	98		
5.2 - sieving		37.5		0.425	98		
5.3 - sedimentation by hydrometer		20		0.2	97		
5.4 - sedimentation by pipette		10		0.15	96		
		6.3	100	0.063	86		

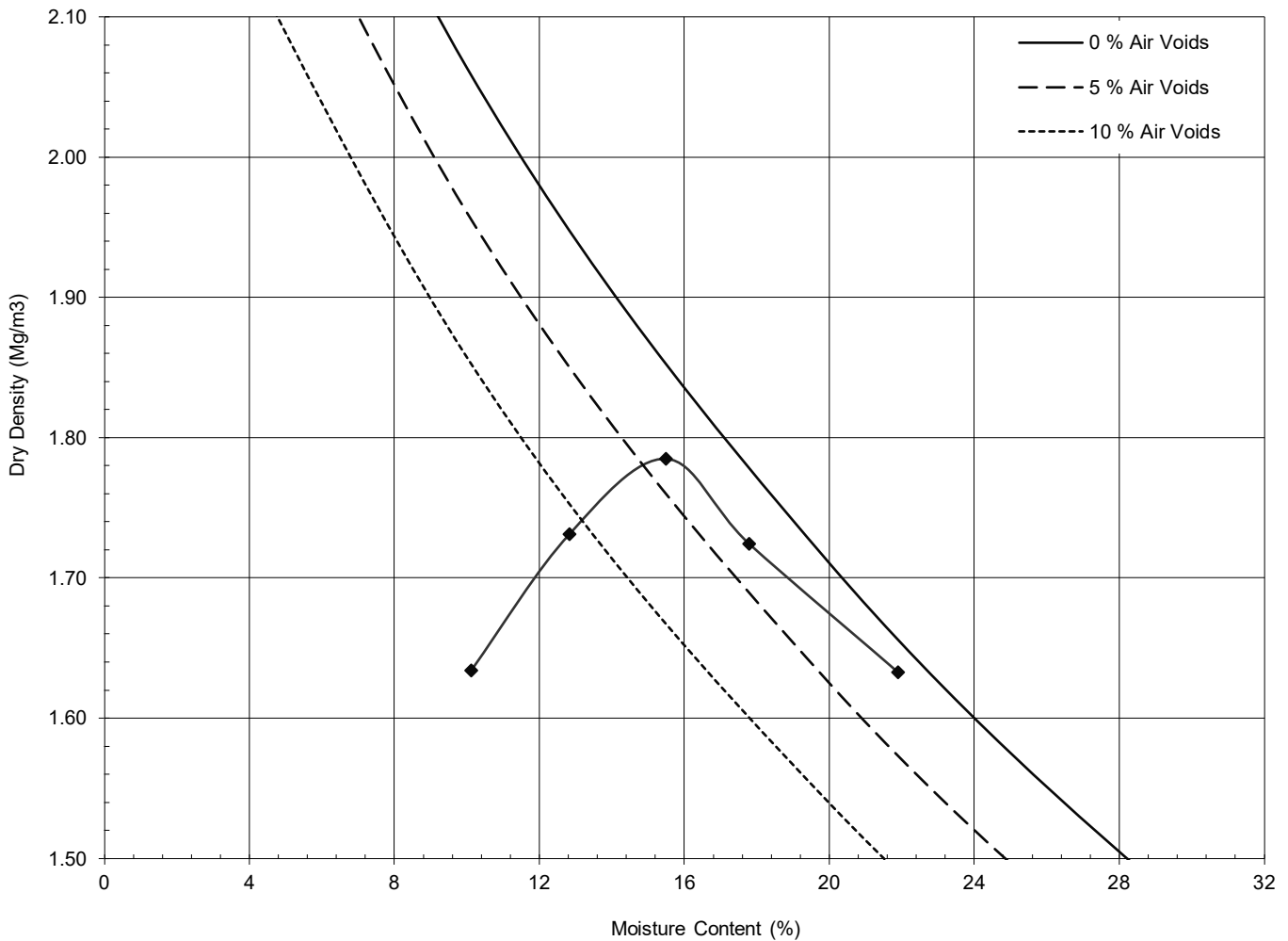
remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	CONTRACT <b>35560/03</b>	CHECKED <b>TB</b>
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# DRY DENSITY/MOISTURE CONTENT RELATIONSHIP



BS. 1377 : Part 4 : 1990 : 3

CLIENT	OSBORNE	BH/TP No.	TP612
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	7B
DESCRIPTION	Greyish brown slightly gravelly slightly sandy CLAY	SAMPLE DEPTH (m)	1.20
		SPECIMEN DEPTH (m)	1.20



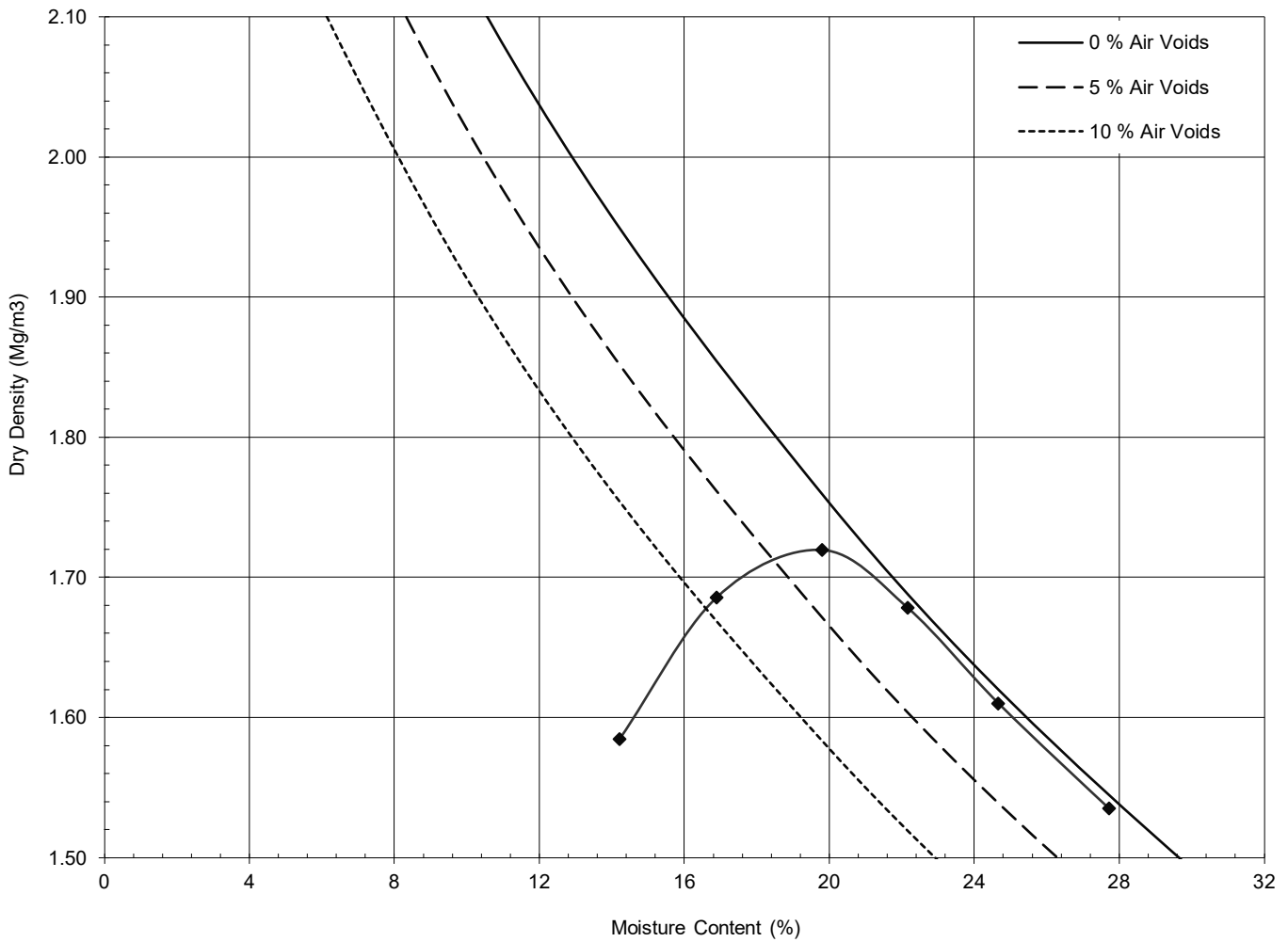
test method	3.5.4.1 4.5kg dynamic compaction - 1L mould				
preparation procedure	3.2.4.1 (grading zone 1)				
sample preparation	C R				
proportion retained on 37.5mm sieve	%	0	initial moisture content	%	34
proportion retained on 20mm sieve	%	0	maximum dry density	(Mg/m <sup>3</sup> )	1.78
particle density	(Mg/m <sup>3</sup> )	#2.60	optimum moisture content	%	15
remarks	# denotes particle density has been assigned an assumed value C denotes sample has been chopped to pass 20mm sieve S denotes sample has been shredded to pass 20mm sieve R denotes sample material has been recycled between/for points				
				CONTRACT	CHECKED
				<b>35560/03</b>	<b>TB</b>

# DRY DENSITY/MOISTURE CONTENT RELATIONSHIP



BS. 1377 : Part 4 : 1990 : 3

CLIENT	OSBORNE	BH/TP No.	TP620
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	5B
DESCRIPTION	Greyish brown slightly sandy silty CLAY	SAMPLE DEPTH (m)	1.60
		SPECIMEN DEPTH (m)	1.60



test method	3.5.4.1 4.5kg dynamic compaction - 1L mould				
preparation procedure	3.2.4.1 (grading zone 1)				
sample preparation	C R				
proportion retained on 37.5mm sieve	%	0	initial moisture content	%	38
proportion retained on 20mm sieve	%	0	maximum dry density	(Mg/m <sup>3</sup> )	1.72
particle density	(Mg/m <sup>3</sup> )	#2.70	optimum moisture content	%	20
remarks	# denotes particle density has been assigned an assumed value C denotes sample has been chopped to pass 20mm sieve S denotes sample has been shredded to pass 20mm sieve R denotes sample material has been recycled between/for points				
				CONTRACT	CHECKED
				<b>35560/03</b>	<b>TB</b>

# SHEAR STRENGTH BY DIRECT SHEAR



**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No.

TP620

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

SAMPLE No./TYPE

5B

SAMPLE DEPTH (m)

1.60-1.80

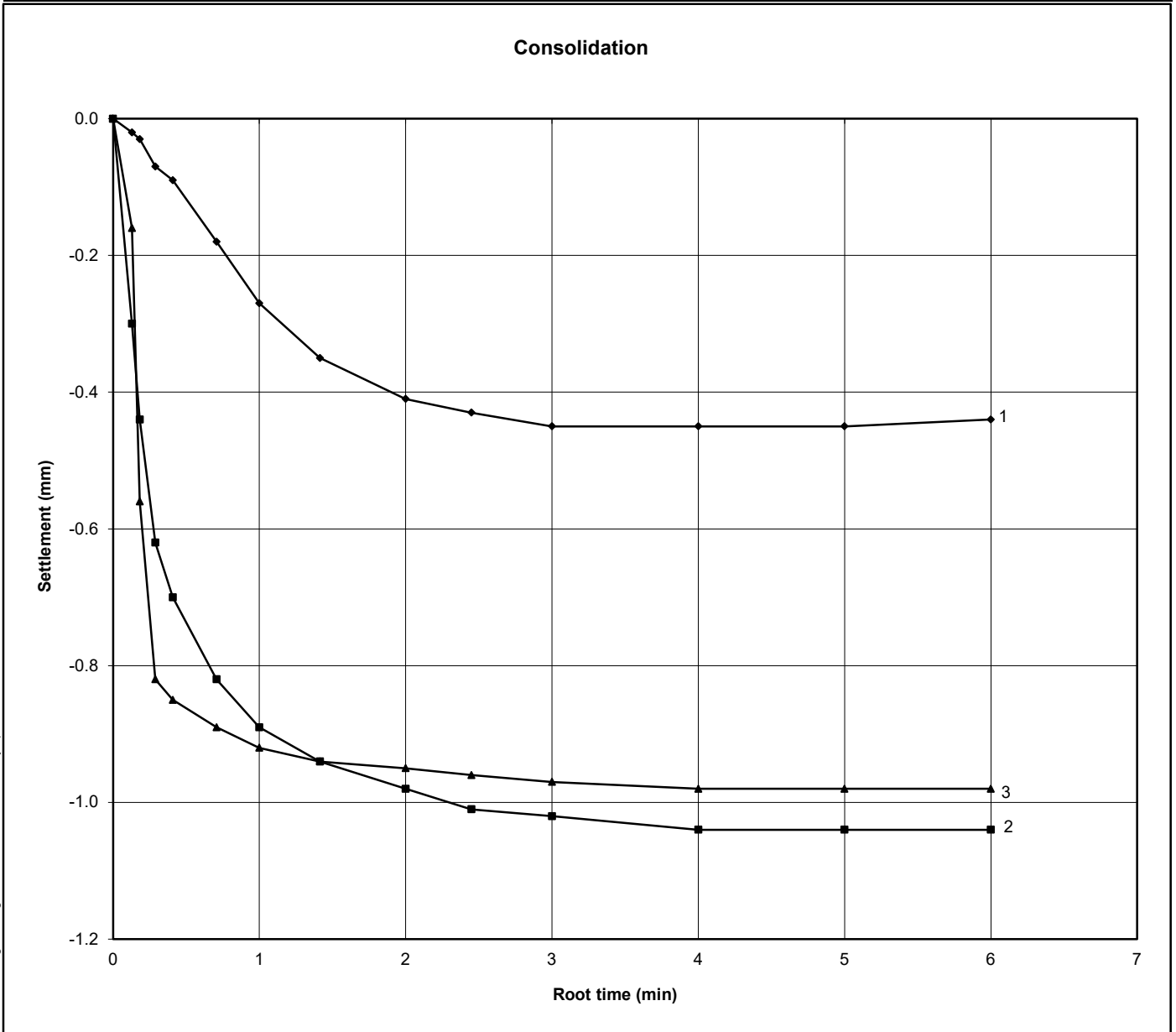
SPECIMEN DEPTH (m)

1.60-1.80

DESCRIPTION Yellowish brown slightly gravelly slightly sandy CLAY with rare shell fragments

PREPARATION DETAILS	Recompacted using a tamping rod - 1% removed (retained on 2mm sieve).		
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CONSOLIDATION STAGE RESULTS			
Specimen	1	2	3
t100 (min)	2.50	1.40	2.00
t <sub>f</sub> (min)	31.75	17.78	25.40
Machine speed (mm/min)	0.0100	0.0100	0.0100
Normal Stress (kPa)	20	50	100
Initial height (mm)	19.96	19.96	19.96
Final height (mm)	19.51	18.92	18.98



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remarks:	CONTRACT	CHECKED
	<b>35560/03</b>	<b>NP</b>



# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

TP620

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

SAMPLE No./TYPE

5B

SAMPLE DEPTH (m)

1.60-1.80

SPECIMEN DEPTH (m)

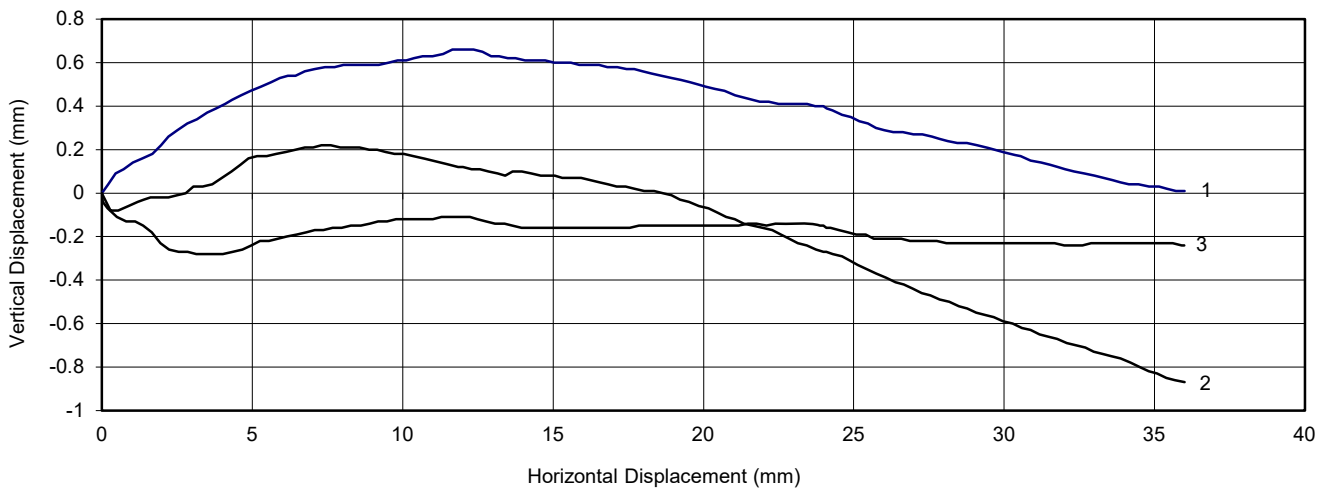
1.60-1.80

DESCRIPTION Yellowish brown slightly gravelly slightly sandy CLAY with rare shell fragments

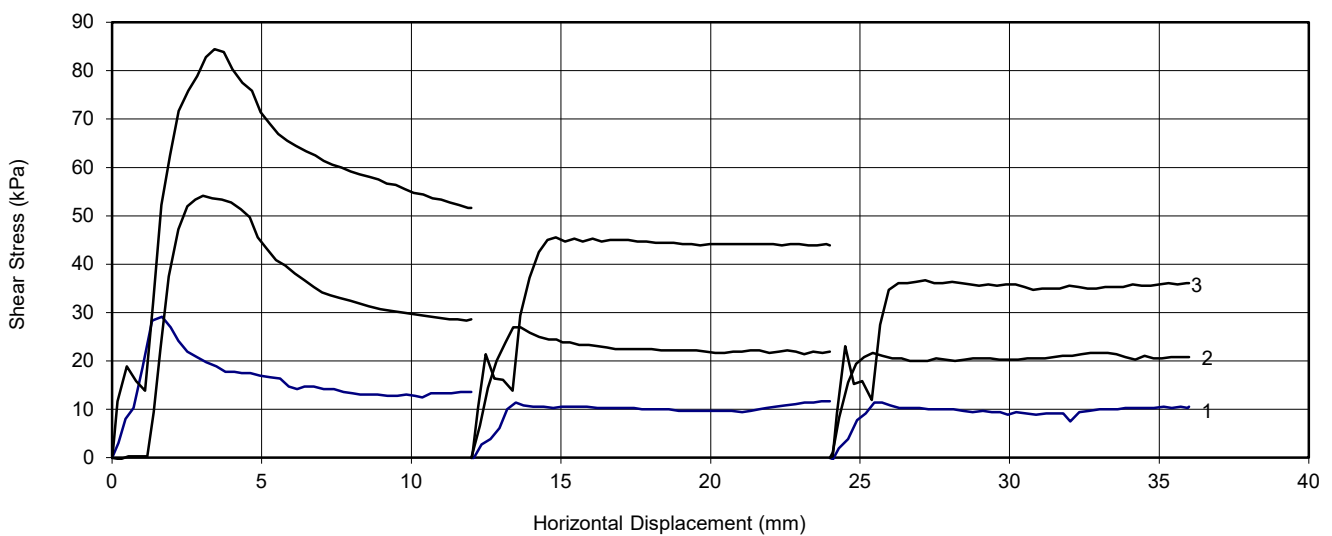
**SHEAR STAGE RESULTS**

Specimen	1	2	3
Peak Shear Strength (kPa)	29.2	54.2	84.4
Residual Shear Strength (kPa)	7.5	20.3	34.7
Cum. Vertical Displ. (mm)	0.010	-0.870	-0.240
Cum. Forward Displ. (mm)	36.000	36.000	35.990
Normal Stress (kPa)	20	50	100

**Vertical Displacement**



**Shear Stress**



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remarks:

slow machine reversal

CONTRACT

**35560/03**

CHECKED

**NP**



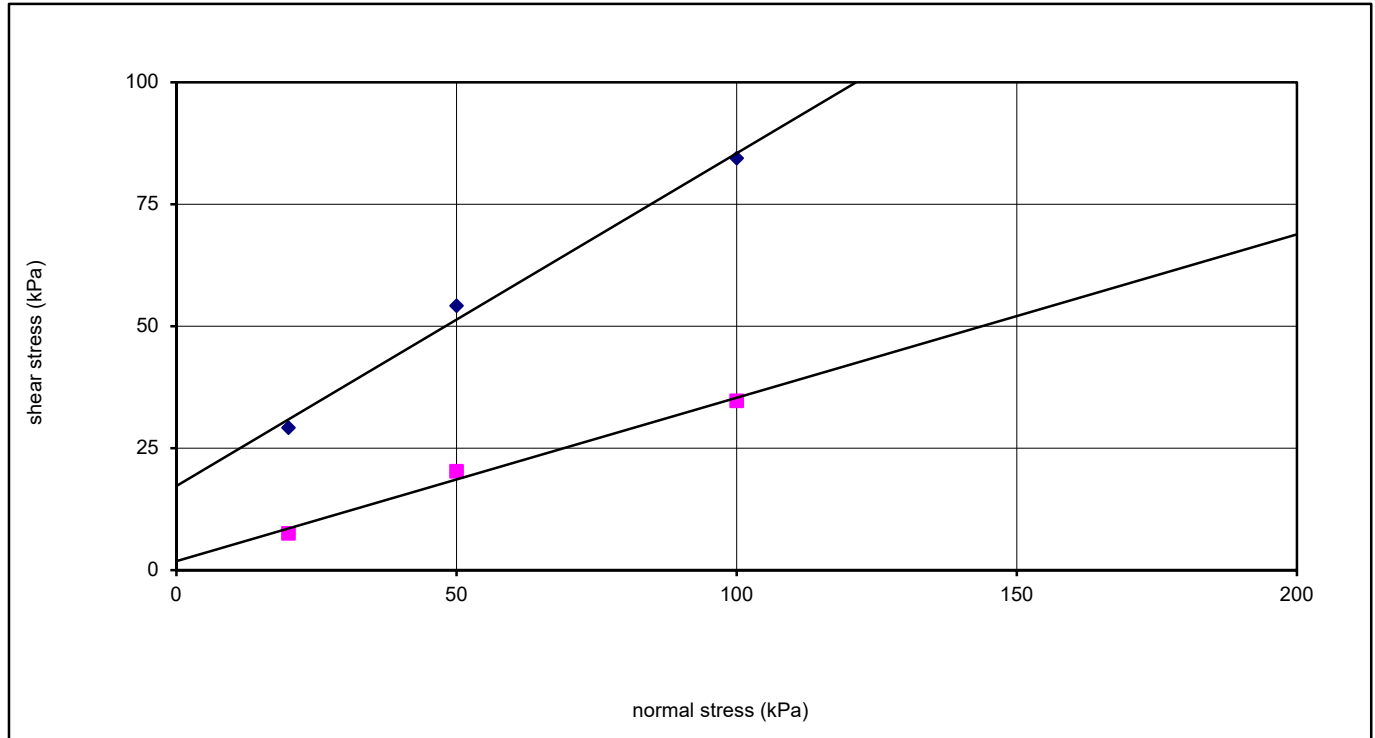


# SHEAR STRENGTH BY DIRECT SHEAR

**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE  
 SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)  
 DESCRIPTION Yellowish brown slightly gravelly slightly sandy CLAY with rare shell fragments

BH/TP No. TP620  
 SAMPLE No./TYPE 5B  
 SAMPLE DEPTH (m) 1.60-1.80  
 SPECIMEN DEPTH (m) 1.60-1.80



INITIAL CONDITIONS						
				specimen 1	specimen 2	specimen 3
specimen size (mm)	60	moisture content (%)		38.8	42.4	46.0
	Square	bulk density Mg/m <sup>3</sup>		1.82	1.83	1.82
specimen height (mm)	19.96	dry density Mg/m <sup>3</sup>		1.31	1.29	1.25
		voids ratio		1.059	1.096	1.160
particle density (Mg/m <sup>3</sup> )	2.70 #	degree of saturation (%)		99	104	107
		strain rate (mm/min)		0.01	0.01	0.01

SHEARING STAGES						
specimen	normal stress (kPa)	peak shear stress (kPa)	horizontal displacement (mm)	residual shear stress (kPa)	traverses (No.)	total forward displacement (mm)
1	20	29.2	1.670	7.5	3	36.000
2	50	54.2	3.040	20.3	3	36.000
3	100	84.4	3.420	34.7	3	35.990

SHEAR STRENGTH PARAMETERS			
peak angle of shearing resistance $\phi'$	34	residual angle of shearing resistance $\phi'_r$	19
peak effective cohesion intercept, $c'$ (kPa)	17	residual effective cohesion intercept, $c'_r$ (kPa)	2

remarks: # denotes particle density has been assigned an assumed value.	CONTRACT	CHECKED
	<b>35560/03</b>	<b>NP</b>

◆ peak ■ residual

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# RESIDUAL STRENGTH BY RING SHEAR



BS.1377 : Part 7 : 1990 : 6

CLIENT OSBORNE

BH/TP No.

DSRCOH412

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

SAMPLE No./TYPE

14UT

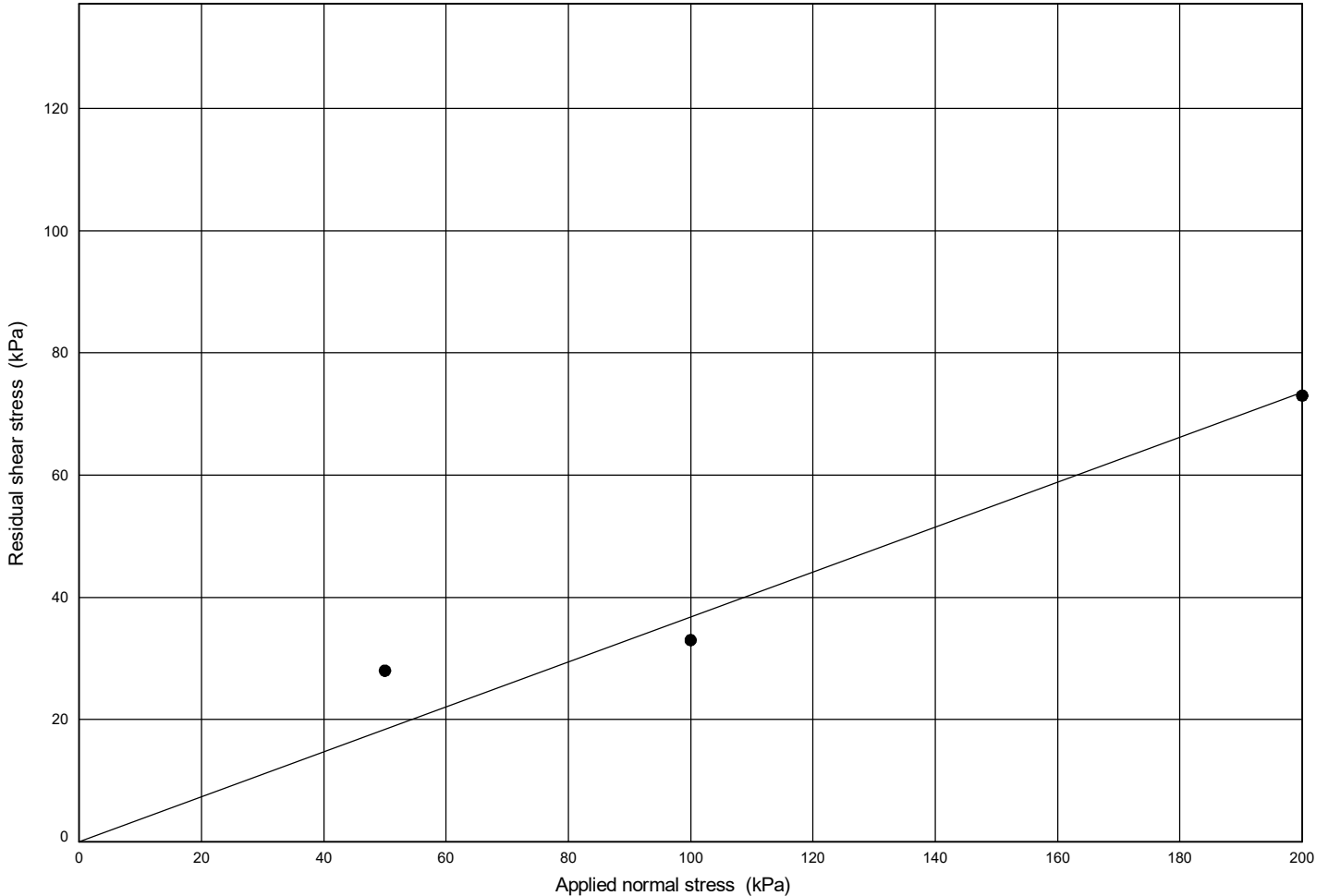
SAMPLE DEPTH (m)

5.00

DESCRIPTION Light brown mottled orange slightly sandy silty CLAY

SPECIMEN DEPTH (m)

5.00



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GENERAL DETAILS			SHEARING STAGES			
inner radius of specimen	(mm)	35	stage	normal stress (kPa)	residual shear stress (kPa)	cumulative angular displacement (degrees)
outer radius of specimen	(mm)	50	1	50	28.0	53
initial thickness of specimen	(mm)	5				
initial moisture content	(%)	27.2				
final moisture content	(%)	19.7				
rate of angular displacement	(mm/min)	0.048	2	100	33.0	112
SHEAR STRENGTH PARAMETERS			3	200	73.0	176
			residual angle of shearing resistance $\phi'_r$ (deg)	20.0		
residual cohesion intercept $c'_r$	(kPa)	0				
remarks:					CONTRACT	CHECKED
					<b>35560/03</b>	<b>EC</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC326
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	6CS
		SAMPLE DEPTH (m)	2.15-2.42
DESCRIPTION	Greenish grey mottled brown and orange slightly sandy CLAY	SPECIMEN DEPTH (m)	2.20-2.41

**TYPE OF SPECIMEN** Undisturbed / Vertical  
**TYPE OF TEST** Single Specimen Single Stage  
**SIDE DRAINS FITTED** Yes  
**DRAINAGE CONDITIONS** One end and radial boundary

		SPECIMEN	1
<b>INITIAL CONDITIONS</b>	Length	mm	206.09
	Diameter	mm	103.91
	Moisture Content	%	20
	Bulk Density	Mg/m <sup>3</sup>	2.06
	Dry Density	Mg/m <sup>3</sup>	1.72
<b>FINAL CONDITIONS</b>	Moisture Content	%	22
	Bulk Density	Mg/m <sup>3</sup>	2.10
	Dry Density	Mg/m <sup>3</sup>	1.73
<b>SATURATION</b> (by cell pressure and back pressure increments)	Initial PWP	kPa	-2
	Saturated PWP	kPa	203
	Final Cell Pressure	kPa	210
	B Value		1
<b>CONSOLIDATION</b>	Cell Pressure	kPa	340
	Back Pressure	kPa	300
	Initial PWP	kPa	332
	Final PWP	kPa	301
<b>COMPRESSION</b>	Cell Pressure	kPa	340
	Back Pressure	kPa	300
	$\sigma_3$	kPa	40
	Rate of Strain	%/hr	2
<b>FAILURE CONDITIONS</b> (based on maximum deviator stress)	Strain ( $\epsilon$ )	%	11.1
	$\delta u$	kPa	-12
	$\sigma_{3f}$	kPa	52
	$(\sigma_1' - \sigma_3')_f$	kPa	150
<p>Membrane correction of 0.1kPa/% strain applied to deviator stress.                      Side drain correction of 3.5kPa applied to deviator stress (100mm diameter)</p>			

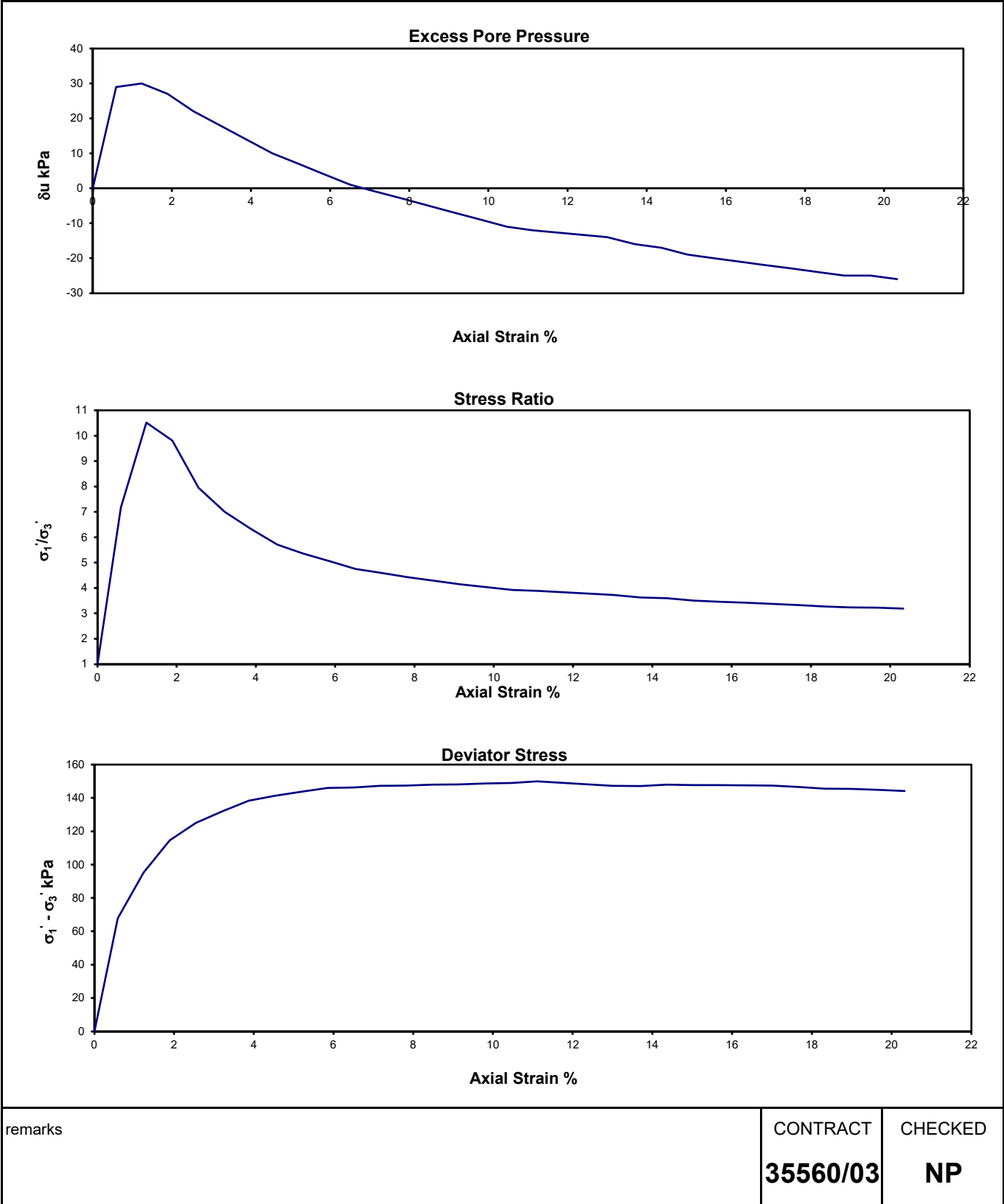
<b>FAILURE MODE</b> (see photo)	SHEAR	<b>EFFECTIVE STRESS PARAMETERS</b>	<b>c' kPa :</b>	<b><math>\phi'</math> deg :</b>
			CONTRACT <b>35560/03</b>	CHECKED <b>NP</b>
remarks				

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC326
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	6CS
		SAMPLE DEPTH (m)	2.15-2.42
		SPECIMEN DEPTH (m)	2.20-2.41



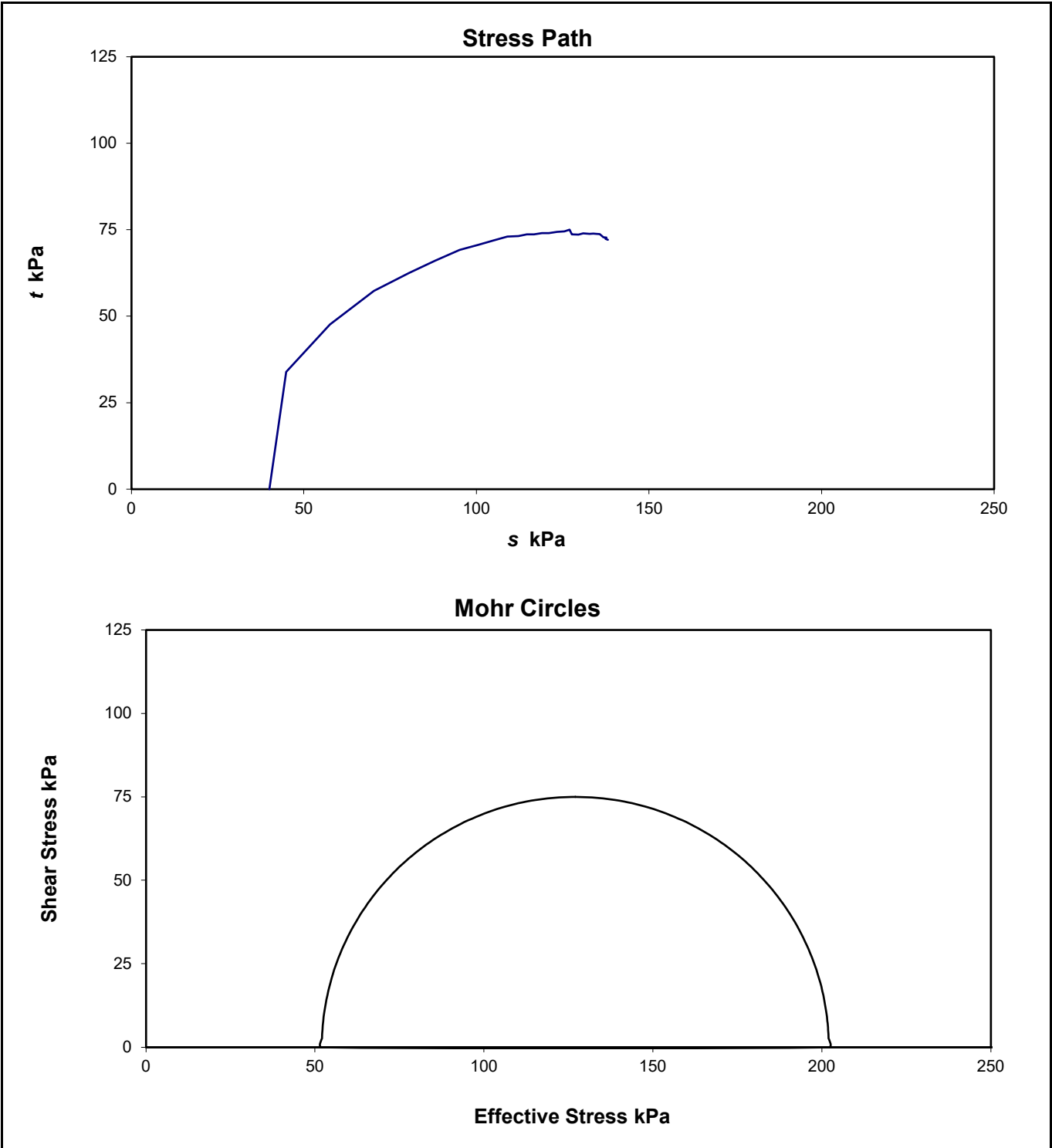
remarks	CONTRACT	CHECKED
	<b>35560/03</b>	<b>NP</b>

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC326
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	6CS
		SAMPLE DEPTH (m)	2.15-2.42
		SPECIMEN DEPTH (m)	2.20-2.41



remarks	CONTRACT	CHECKED
	<b>35560/03</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC326
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	6CS
		SAMPLE DEPTH (m)	2.15-2.42
		SPECIMEN DEPTH (m)	2.20-2.41



Failure Mode SHEAR

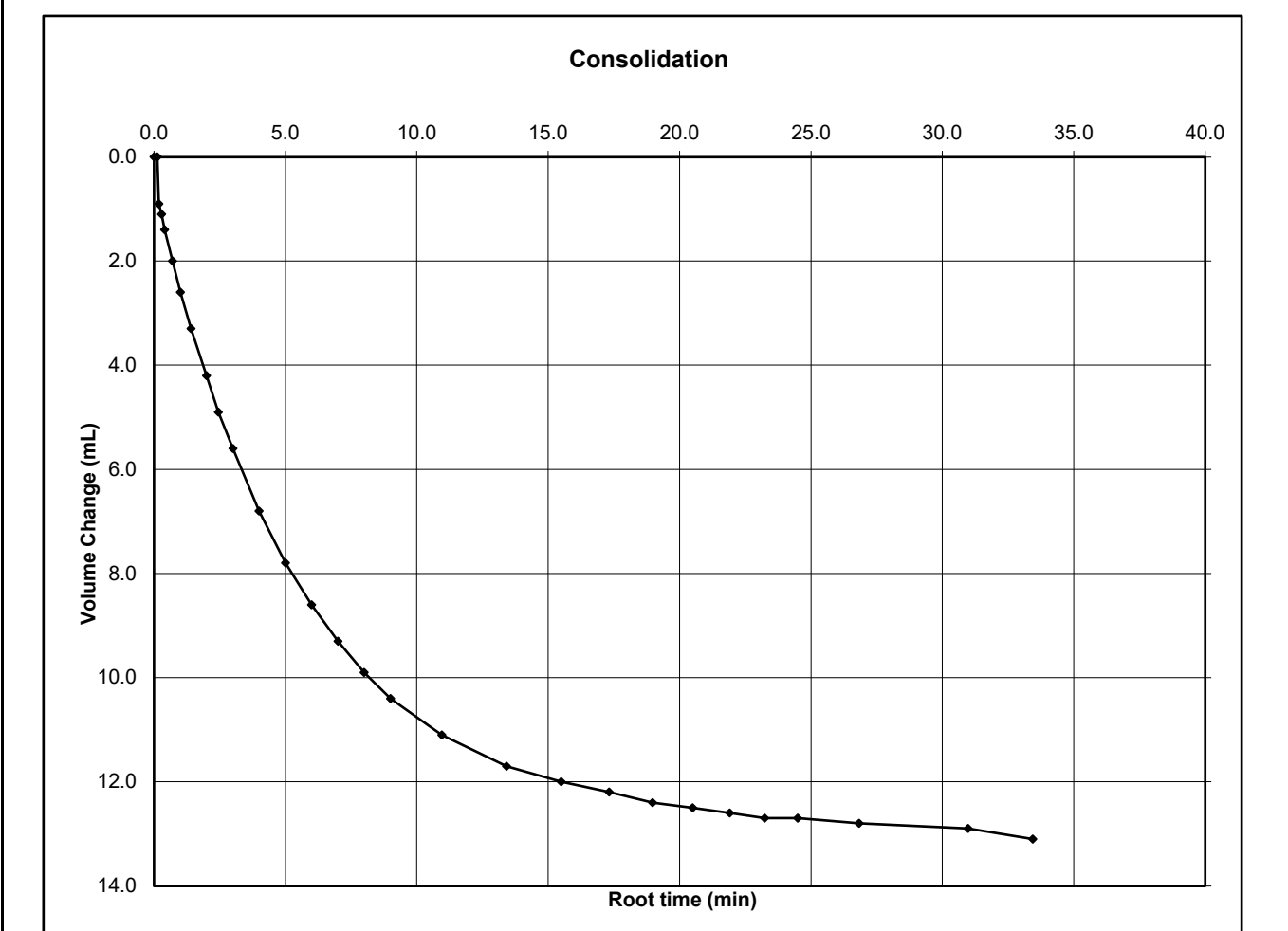
remarks Please note the photos are intended to show the mode of failure only.	CONTRACT	CHECKED
	<b>35560/03</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC326
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION	SAMPLE No./TYPE	6CS
	- PHASE 2A (1118)	SAMPLE DEPTH (m)	2.15-2.42
		SPECIMEN DEPTH (m)	2.20-2.41



Cell pressure	kPa	340
Back pressure	kPa	300
Effective pressure	kPa	40
Initial PWP	kPa	332
Final PWP	kPa	301
PWP Dissipation	%	96.88
Volume change	mL	13.1
	t100	59.47

remarks	CONTRACT	CHECKED
	<b>35560/03</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC329
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	7LS
		SAMPLE DEPTH (m)	1.30-1.65
DESCRIPTION	Brown mottled orange and grey slightly sandy CLAY	SPECIMEN DEPTH (m)	1.40-1.61

**TYPE OF SPECIMEN** Undisturbed / Vertical  
**TYPE OF TEST** Single Specimen Single Stage  
**SIDE DRAINS FITTED** Yes  
**DRAINAGE CONDITIONS** One end and radial boundary

		SPECIMEN	1
<b>INITIAL CONDITIONS</b>	Length	mm	205.75
	Diameter	mm	103.78
	Moisture Content	%	25
	Bulk Density	Mg/m <sup>3</sup>	1.88
	Dry Density	Mg/m <sup>3</sup>	1.50
<b>FINAL CONDITIONS</b>	Moisture Content	%	28
	Bulk Density	Mg/m <sup>3</sup>	1.92
	Dry Density	Mg/m <sup>3</sup>	1.50
<b>SATURATION</b> (by cell pressure and back pressure increments)	Initial PWP	kPa	-5
	Saturated PWP	kPa	109
	Final Cell Pressure	kPa	120
	B Value		1
<b>CONSOLIDATION</b>	Cell Pressure	kPa	320
	Back Pressure	kPa	300
	Initial PWP	kPa	307
	Final PWP	kPa	300
<b>COMPRESSION</b>	Cell Pressure	kPa	320
	Back Pressure	kPa	300
	$\sigma_3$	kPa	20
	Rate of Strain	%/hr	2
<b>FAILURE CONDITIONS</b> (based on maximum deviator stress)	Strain ( $\epsilon$ )	%	6.2
	$\delta u$	kPa	-8
	$\sigma_{3f}$	kPa	28
	$(\sigma_1' - \sigma_3)_f$	kPa	44

Membrane correction of 0.1kPa/% strain applied to deviator stress.

Side drain correction of 3.5kPa applied to deviator stress (100mm diameter)

<b>FAILURE MODE</b> (see photo)	SHEAR	<b>EFFECTIVE STRESS PARAMETERS</b>	<b>c' kPa :</b>	<b><math>\phi'</math> deg :</b>
			CONTRACT <b>35560/03</b>	CHECKED <b>NP</b>
remarks				

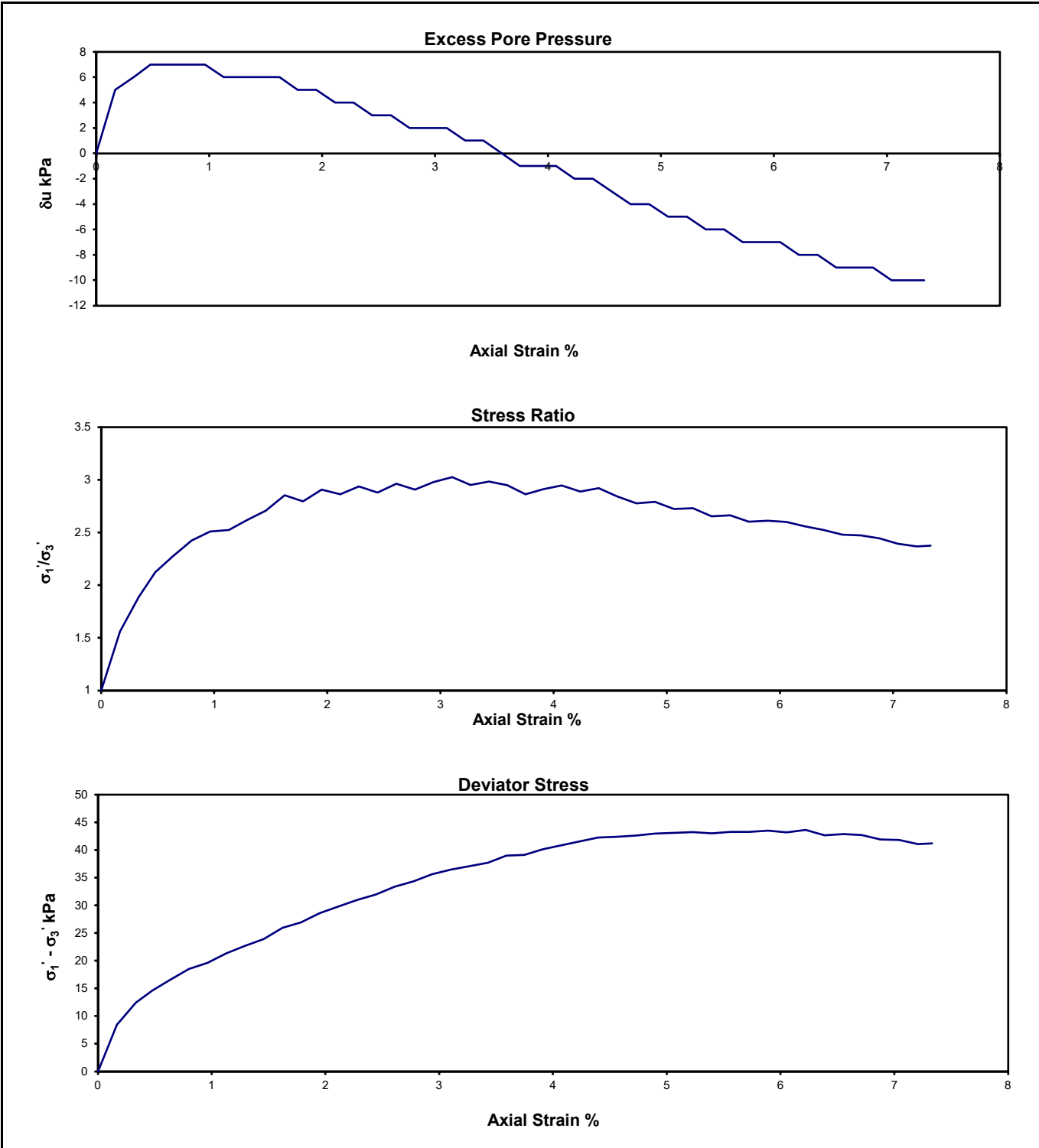


# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC329
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	7LS
		SAMPLE DEPTH (m)	1.30-1.65
		SPECIMEN DEPTH (m)	1.40-1.61



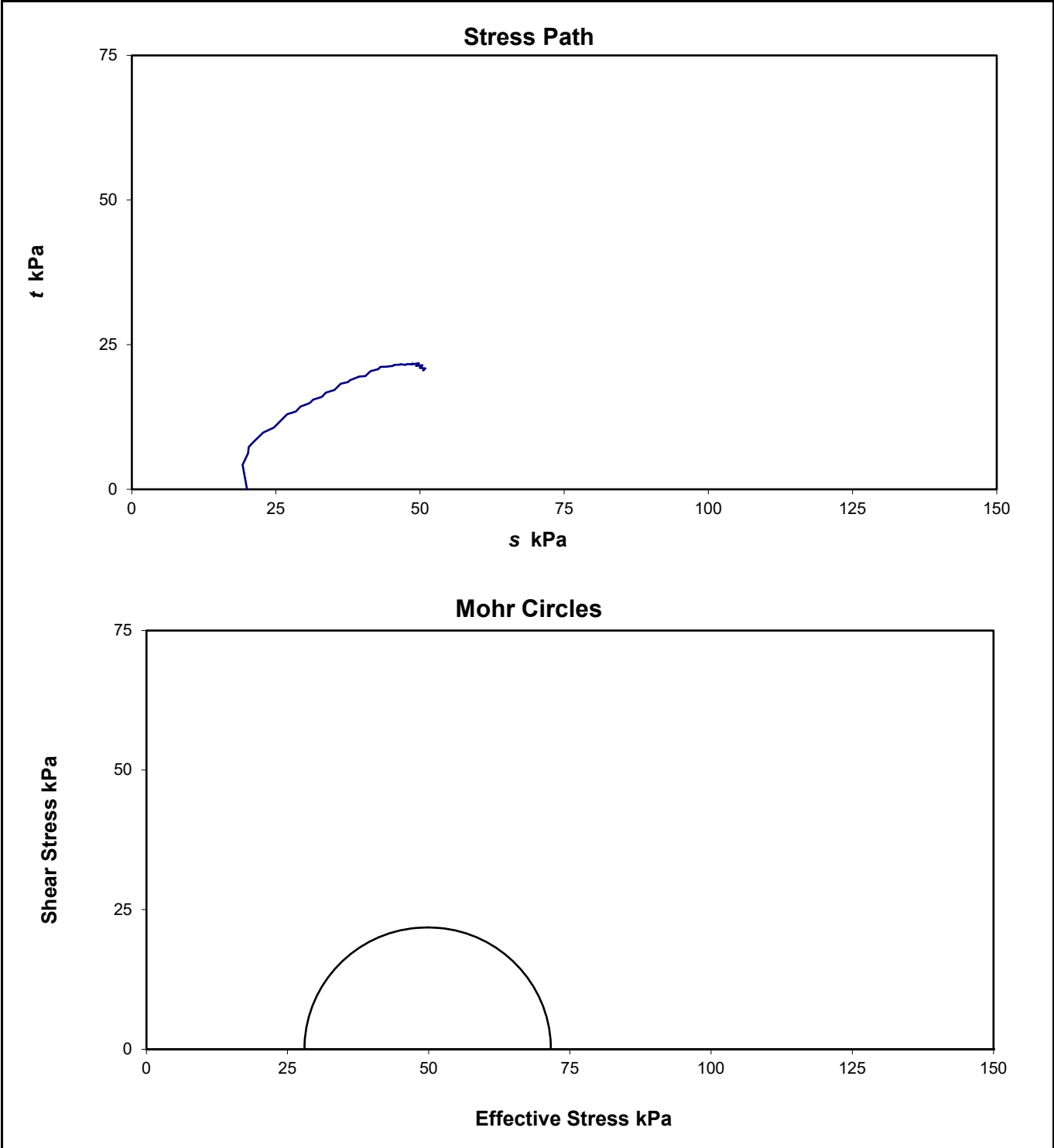
remarks	CONTRACT	CHECKED
	<b>35560/03</b>	<b>NP</b>

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC329
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	7LS
		SAMPLE DEPTH (m)	1.30-1.65
		SPECIMEN DEPTH (m)	1.40-1.61



remarks	CONTRACT	CHECKED
	<b>35560/03</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC329
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	7LS
		SAMPLE DEPTH (m)	1.30-1.65
		SPECIMEN DEPTH (m)	1.40-1.61



Failure Mode SHEAR

remarks

Please note the photos are intended to show the mode of failure only.

CONTRACT

**35560/03**

CHECKED

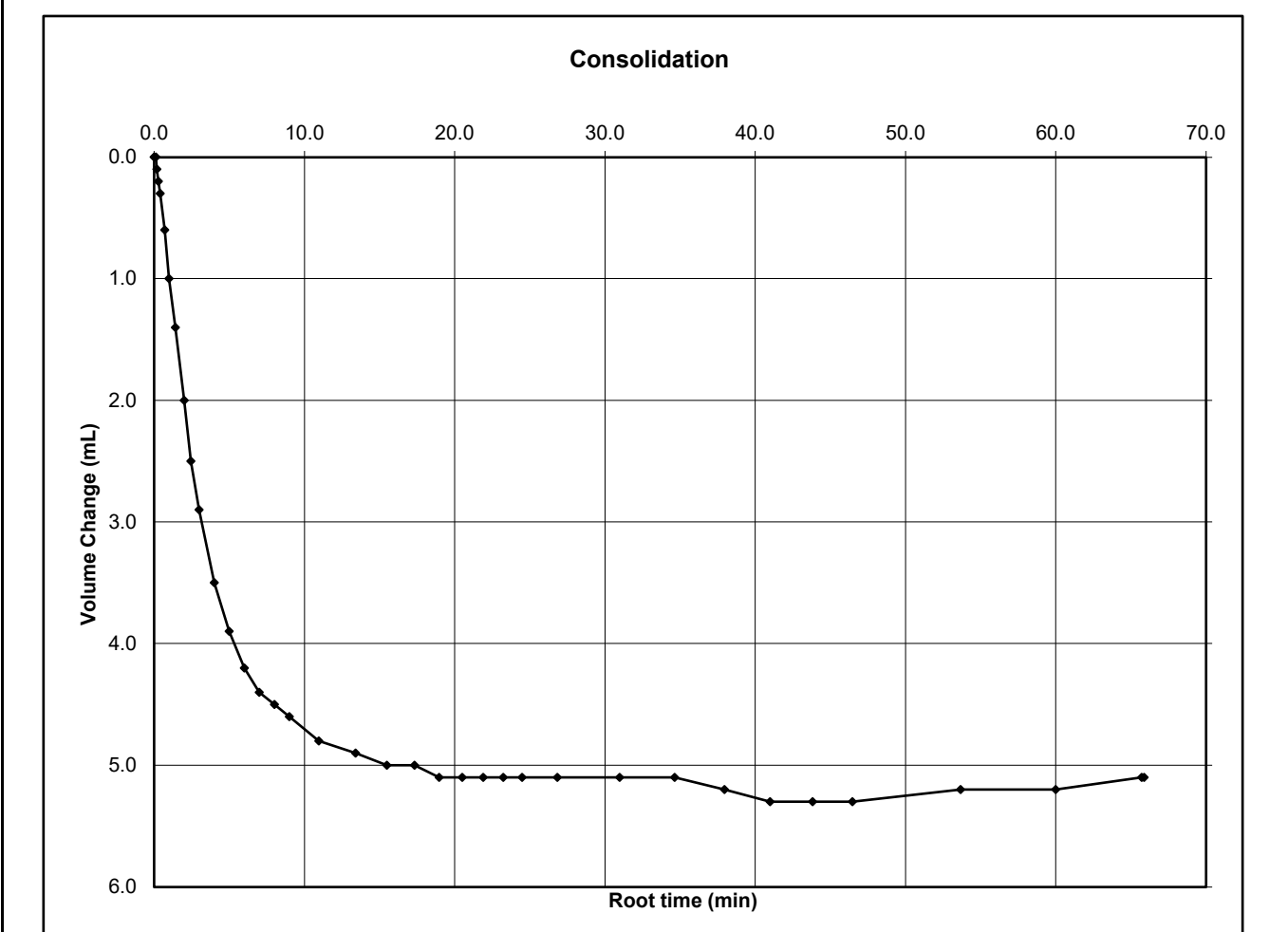
**NP**



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC329
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION	SAMPLE No./TYPE	7LS
	- PHASE 2A (1118)	SAMPLE DEPTH (m)	1.30-1.65
		SPECIMEN DEPTH (m)	1.40-1.61



Cell pressure	kPa	320
Back pressure	kPa	300
Effective pressure	kPa	20
Initial PWP	kPa	307
Final PWP	kPa	300
PWP Dissipation	%	100.00
Volume change	mL	5.3
	t100	26.31

remarks	CONTRACT	CHECKED
	<b>35560/03</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRCOH400
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	10UT
		SAMPLE DEPTH (m)	3.20-3.60
DESCRIPTION	Yellowish brown slightly gravelly slightly sandy CLAY	SPECIMEN DEPTH (m)	3.40

<b>TYPE OF SPECIMEN</b>	<b>Undisturbed / Vertical</b>
<b>TYPE OF TEST</b>	<b>Single Specimen Single Stage</b>
<b>SIDE DRAINS FITTED</b>	<b>Yes</b>
<b>DRAINAGE CONDITIONS</b>	<b>One end and radial boundary</b>

		SPECIMEN	1
<b>INITIAL CONDITIONS</b>	Length	mm	205.64
	Diameter	mm	103.43
	Moisture Content	%	22
	Bulk Density	Mg/m <sup>3</sup>	1.95
	Dry Density	Mg/m <sup>3</sup>	1.60
<b>FINAL CONDITIONS</b>	Moisture Content	%	24
	Bulk Density	Mg/m <sup>3</sup>	2.00
	Dry Density	Mg/m <sup>3</sup>	1.62
<b>SATURATION</b> (by cell pressure and back pressure increments)	Initial PWP	kPa	-2
	Saturated PWP	kPa	349
	Final Cell Pressure	kPa	360
	B Value		0.98
<b>CONSOLIDATION</b>	Cell Pressure	kPa	360
	Back Pressure	kPa	310
	Initial PWP	kPa	349
	Final PWP	kPa	310
<b>COMPRESSION</b>	Cell Pressure	kPa	360
	Back Pressure	kPa	310
	$\sigma_3$	kPa	50
	Rate of Strain	%/hr	2
<b>FAILURE CONDITIONS</b> (based on maximum deviator stress)	Strain ( $\epsilon$ )	%	6.2
	$\delta u$	kPa	11
	$\sigma_{3f}$	kPa	39
	$(\sigma_1' - \sigma_3)_f$	kPa	117

Membrane correction of 0.1kPa/% strain applied to deviator stress.  
Side drain correction of 3.5kPa applied to deviator stress (100mm diameter)

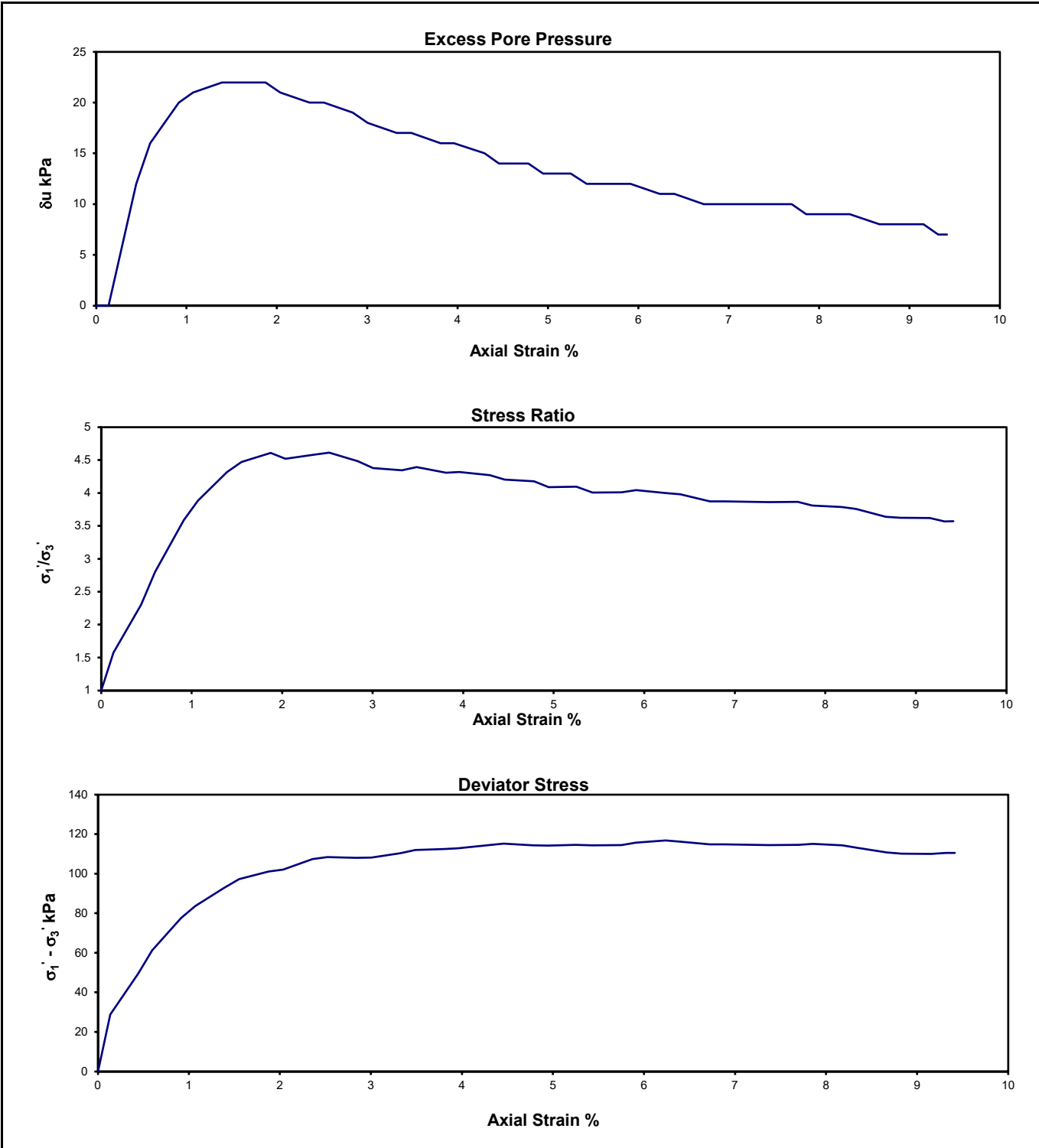
<b>FAILURE MODE</b> (see photo)	<b>SHEAR</b>	<b>EFFECTIVE STRESS PARAMETERS</b>	<b>c' kPa :</b>	<b><math>\phi'</math> deg :</b>
			<b>35560/03</b>	<b>NP</b>
remarks			CONTRACT	CHECKED

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRCOH400
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	10UT
		SAMPLE DEPTH (m)	3.20-3.60
		SPECIMEN DEPTH (m)	3.40



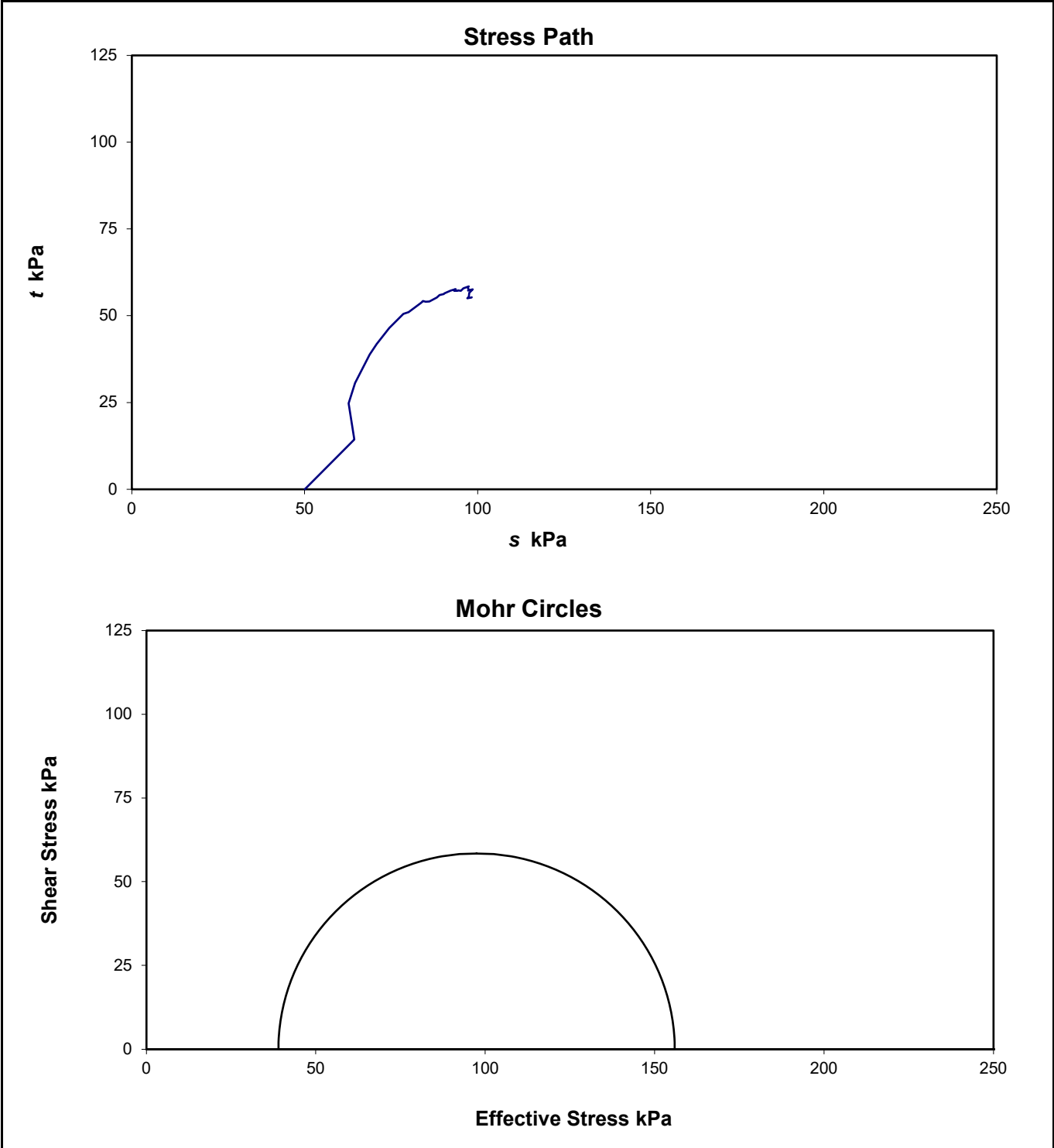
remarks	CONTRACT	CHECKED
	<b>35560/03</b>	<b>NP</b>

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRCOH400
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	10UT
		SAMPLE DEPTH (m)	3.20-3.60
		SPECIMEN DEPTH (m)	3.40



remarks	CONTRACT	CHECKED
	<b>35560/03</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRCOH400
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	10UT
		SAMPLE DEPTH (m)	3.20-3.60
		SPECIMEN DEPTH (m)	3.40



Failure Mode SHEAR

remarks

Please note the photos are intended to show the mode of failure only.

CONTRACT

**35560/03**

CHECKED

**NP**

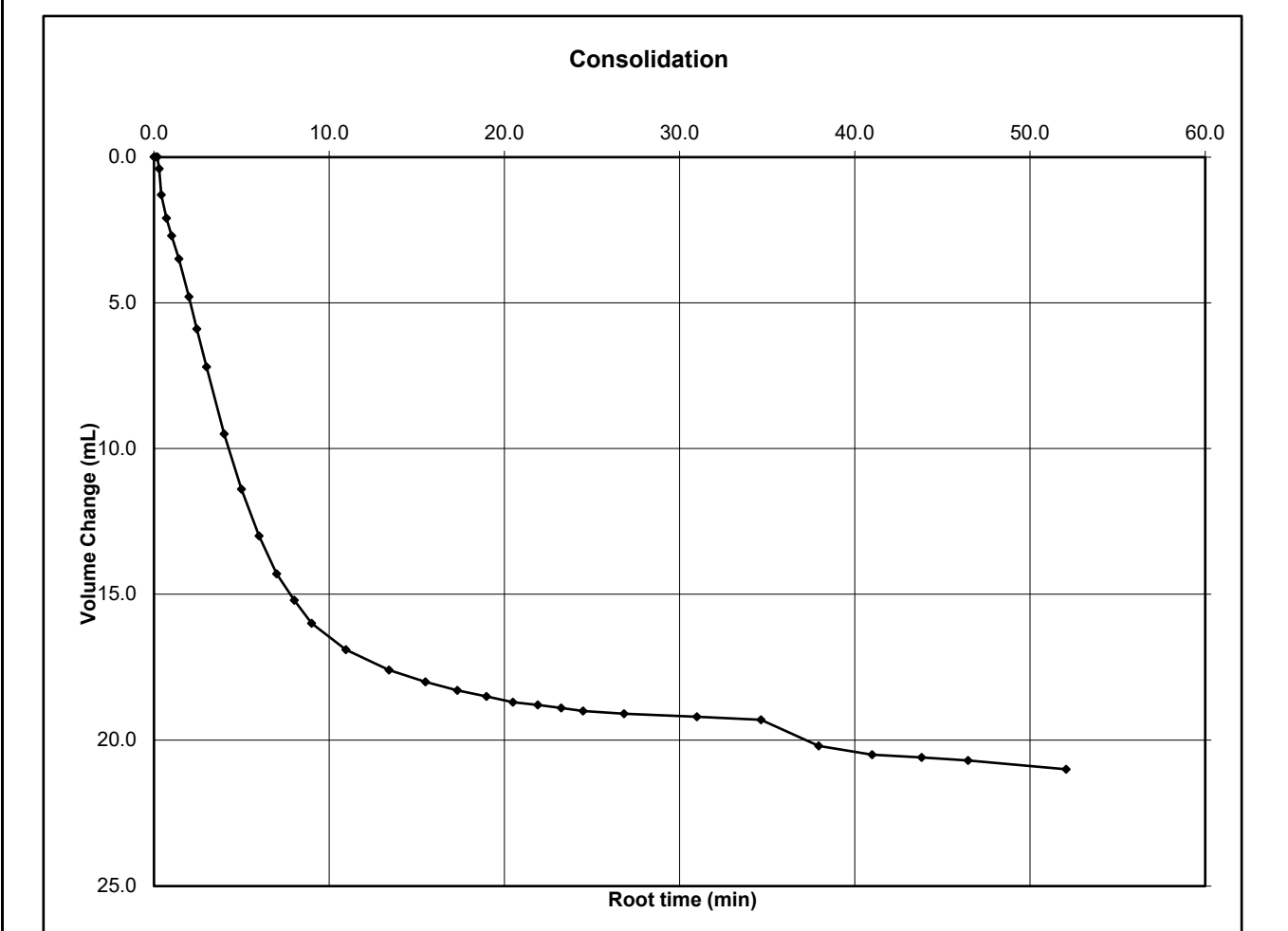




# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRCOH400
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION	SAMPLE No./TYPE	10UT
	- PHASE 2A (1118)	SAMPLE DEPTH (m)	3.20-3.60
		SPECIMEN DEPTH (m)	3.40



Cell pressure	kPa	360
Back pressure	kPa	310
Effective pressure	kPa	50
Initial PWP	kPa	349
Final PWP	kPa	310
PWP Dissipation	%	100.00
Volume change	mL	21.0
	t100	77.77

remarks	CONTRACT	CHECKED
	<b>35560/03</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC0H400
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	14CS
		SAMPLE DEPTH (m)	4.84-5.14
DESCRIPTION	Brown mottled orangish brown slightly sandy slightly gravelly clayey SILT	SPECIMEN DEPTH (m)	4.84-5.05

**TYPE OF SPECIMEN** Undisturbed / Vertical  
**TYPE OF TEST** Single Specimen Single Stage  
**SIDE DRAINS FITTED** Yes  
**DRAINAGE CONDITIONS** One end and radial boundary

		SPECIMEN	1
<b>INITIAL CONDITIONS</b>	Length	mm	201.43
	Diameter	mm	97.7
	Moisture Content	%	30
	Bulk Density	Mg/m <sup>3</sup>	1.93
	Dry Density	Mg/m <sup>3</sup>	1.48
<b>FINAL CONDITIONS</b>	Moisture Content	%	31
	Bulk Density	Mg/m <sup>3</sup>	1.99
	Dry Density	Mg/m <sup>3</sup>	1.52
<b>SATURATION</b> (by cell pressure and back pressure increments)	Initial PWP	kPa	0
	Saturated PWP	kPa	388
	Final Cell Pressure	kPa	400
	B Value		0.96
<b>CONSOLIDATION</b>	Cell Pressure	kPa	420
	Back Pressure	kPa	340
	Initial PWP	kPa	407
	Final PWP	kPa	343
<b>COMPRESSION</b>	Cell Pressure	kPa	420
	Back Pressure	kPa	340
	$\sigma_3$	kPa	80
	Rate of Strain	%/hr	0.803
<b>FAILURE CONDITIONS</b> (based on maximum deviator stress)	Strain ( $\epsilon$ )	%	7.0
	$\delta u$	kPa	39
	$\sigma_{3f}$	kPa	41
	$(\sigma_1' - \sigma_3)_f$	kPa	110
<p>Membrane correction of 0.1kPa/% strain applied to deviator stress.                      Side drain correction of 3.5kPa applied to deviator stress (100mm diameter)</p>			

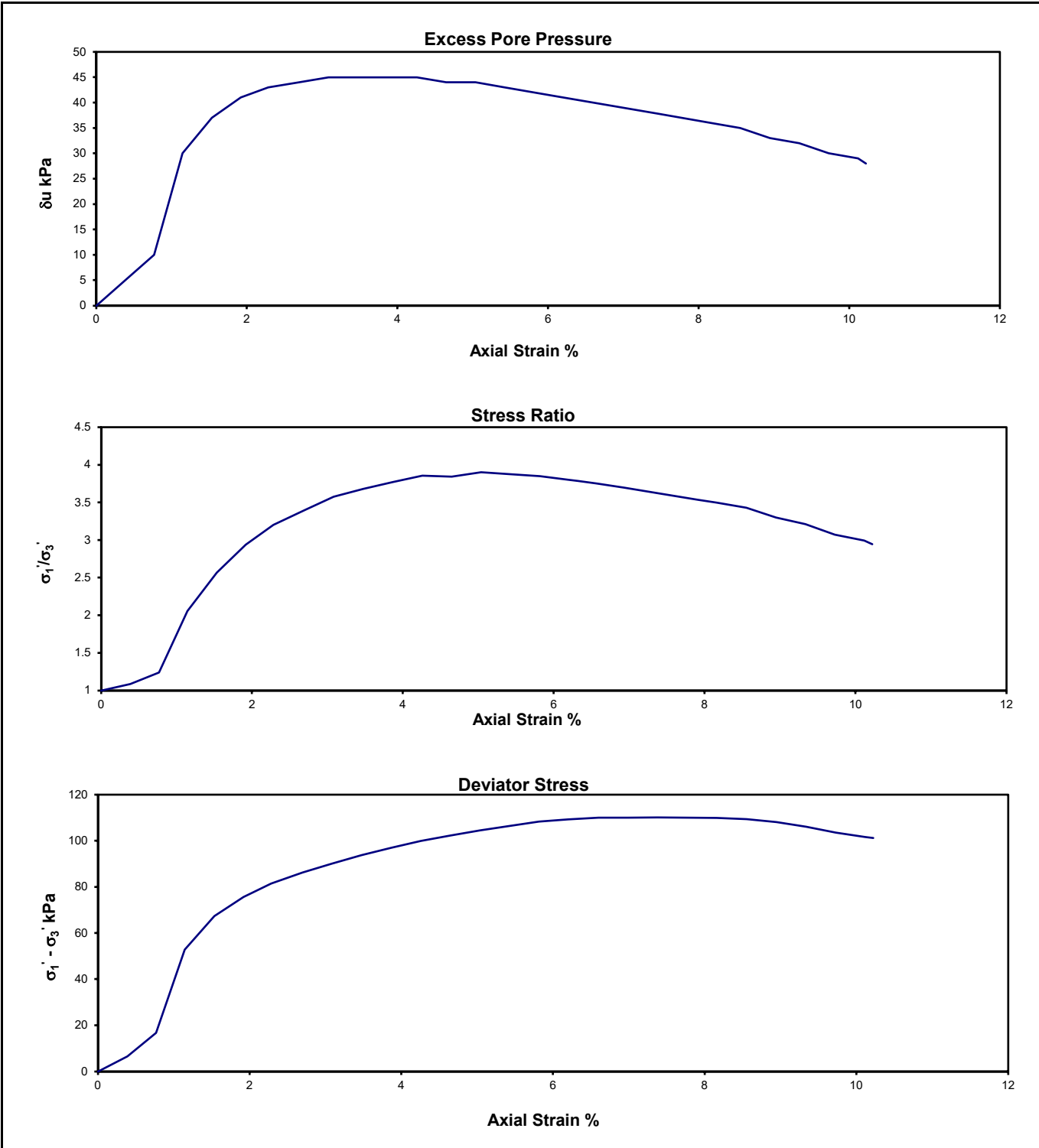
<b>FAILURE MODE</b> (see photo)	SHEAR	<b>EFFECTIVE STRESS PARAMETERS</b>	<b>c' kPa :</b>	<b><math>\phi'</math> deg :</b>
			CONTRACT <b>35560/03</b>	CHECKED <b>NP</b>
remarks				

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC0H400
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	14CS
		SAMPLE DEPTH (m)	4.84-5.14
		SPECIMEN DEPTH (m)	4.84-5.05



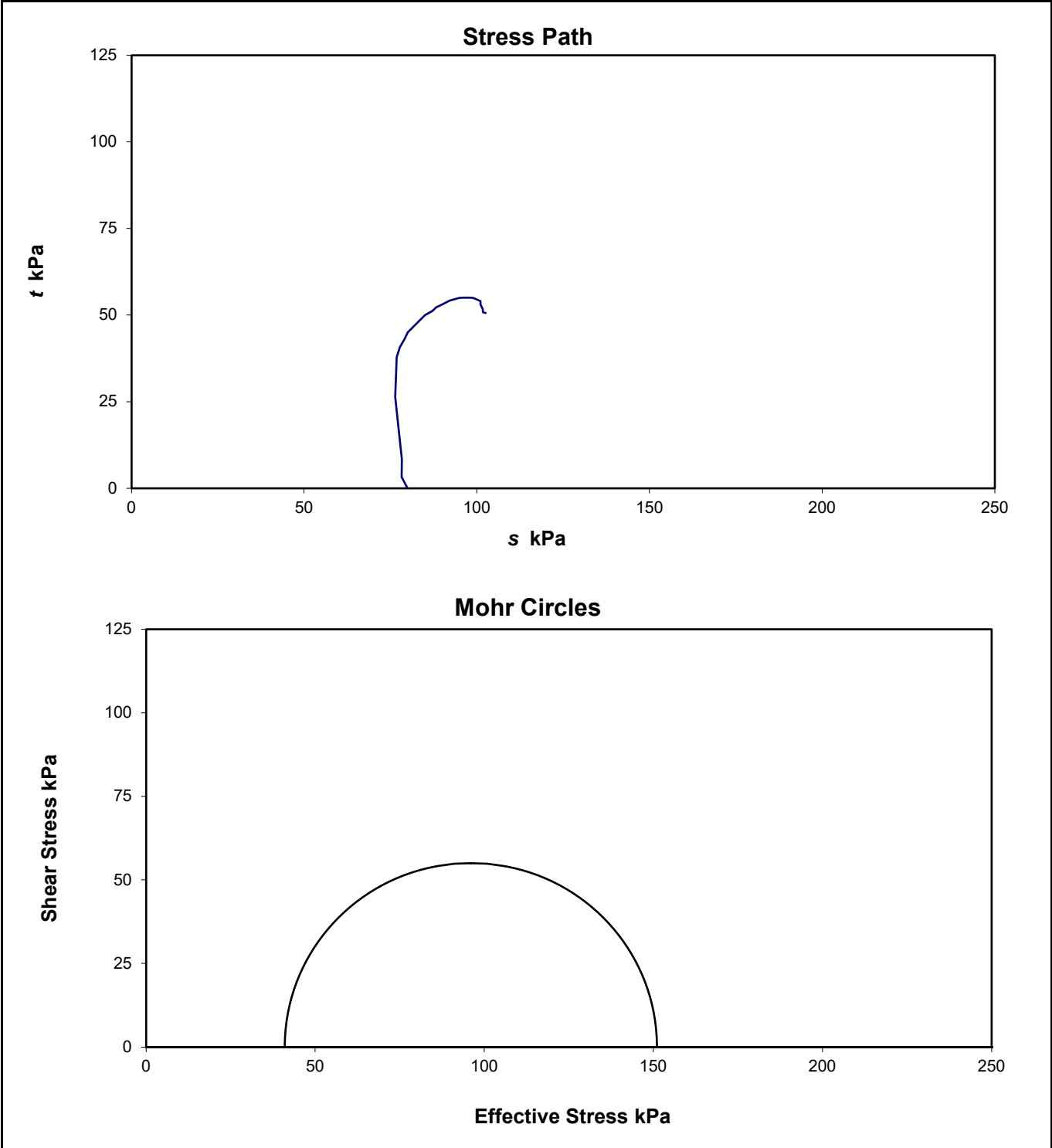
remarks	CONTRACT	CHECKED
	<b>35560/03</b>	<b>NP</b>

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC0H400
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	14CS
		SAMPLE DEPTH (m)	4.84-5.14
		SPECIMEN DEPTH (m)	4.84-5.05



remarks	CONTRACT	CHECKED
	<b>35560/03</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC0H400
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	14CS
		SAMPLE DEPTH (m)	4.84-5.14
		SPECIMEN DEPTH (m)	4.84-5.05



Failure Mode SHEAR

remarks

Please note the photos are intended to show the mode of failure only.

CONTRACT

**35560/03**

CHECKED

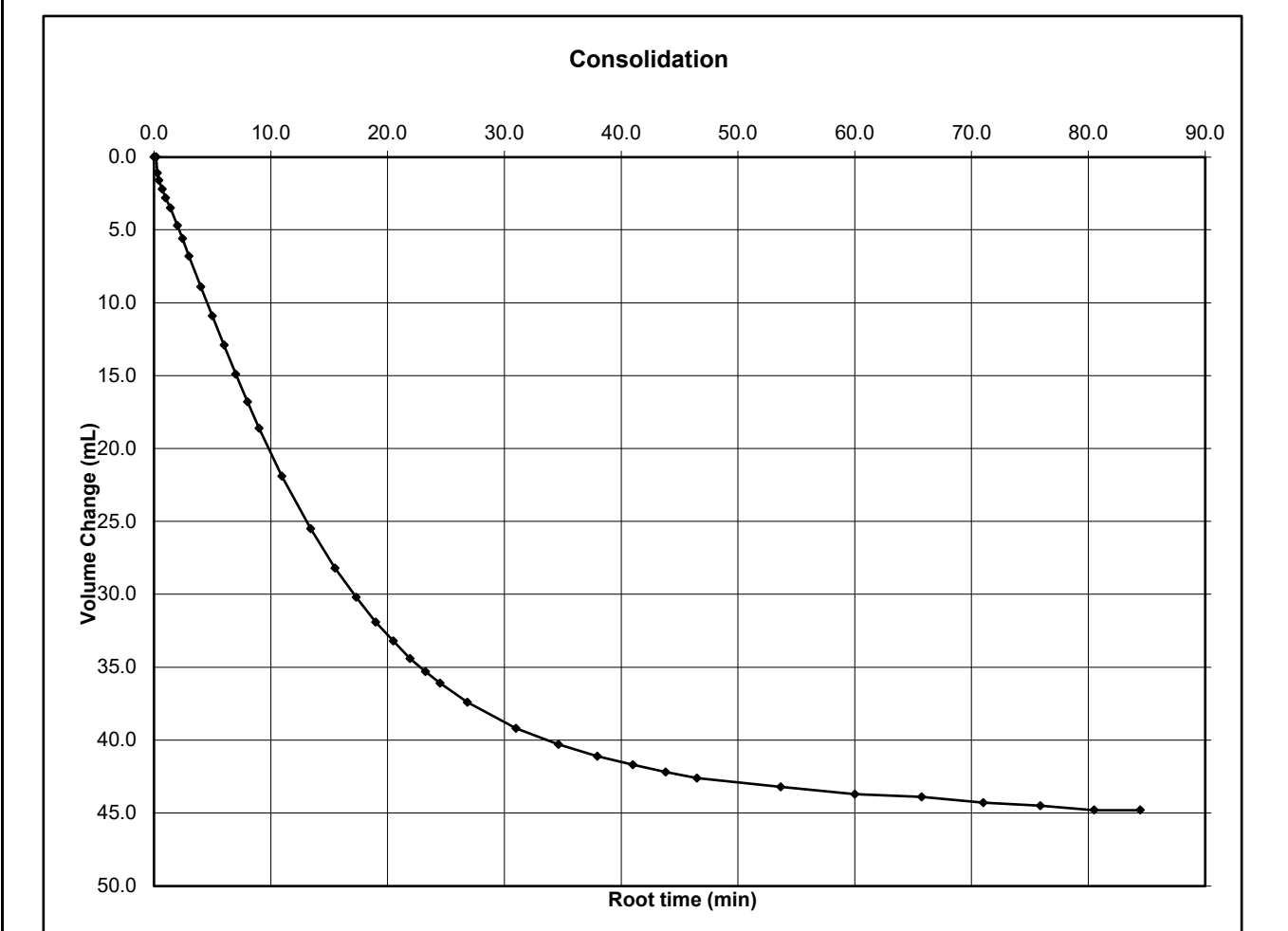
**NP**



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC0H400
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION	SAMPLE No./TYPE	14CS
	- PHASE 2A (1118)	SAMPLE DEPTH (m)	4.84-5.14
		SPECIMEN DEPTH (m)	4.84-5.05



Cell pressure	kPa	420
Back pressure	kPa	340
Effective pressure	kPa	80
Initial PWP	kPa	407
Final PWP	kPa	343
PWP Dissipation	%	95.52
Volume change	mL	44.8
	t100	497.83

remarks	CONTRACT	CHECKED
	<b>35560/03</b>	<b>NP</b>

**ROCK WATER CONTENT**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	description and remarks
	no./type	depth (m)			
DSRC218	7C	3.00	3.10	8.4	Grey MUDSTONE
DSRC218	20Cs	12.62	12.70	12	Grey MUDSTONE
DSRC218	25Cs	16.95	16.70	7.3	Greyish brown SILTSTONE
DSRC218	31Cs	22.25	22.30	11	Greyish brown SILTSTONE
DSRC220	11Cs	5.40	5.45	7.3	Grey LIMESTONE
DSRC220	23Cs	14.30	14.35	13	Greyish brown MUDSTONE
DSRC220	29Cs	19.50	19.55	18	Grey MUDSTONE
DSRC315	67Cs	55.71	55.71	9.8	Greyish brown SILTSTONE
DSRC315	69Cs	56.83	56.83	12	Greyish brown SILTSTONE
DSRC317	16C	10.00	10.00	15	Greyish brown MUDSTONE
DSRC317	20C	13.00	13.00	7.3	Greyish brown SILTSTONE
DSRC317	29Cs	20.50	20.50	12	Grey MUDSTONE
DSRC326	9Cs	4.75	4.75	9.9	Grey MUDSTONE
DSRC326	18Cs	12.30	12.30	16	Grey MUDSTONE
DSRC326	26Cs	20.85	20.85	4.1	Light grey LIMESTONE
DSRC327	23Cs	13.27	13.30	11	Grey MUDSTONE
DSRC332	6Cs	2.45	2.45	8.3	Yellowish brown MUDSTONE
DSRC332	8Cs	3.80	3.85	8.1	Light grey SILTSTONE
DSRC332	12Cs	6.80	6.80	9.2	Greyish brown SILTSTONE
general remarks natural water content determined unless otherwise specified					
test method samples oven dried at 105°C				CONTRACT <b>35560/03</b>	
				CHECKED <b>TB</b>	

**ROCK WATER CONTENT**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	description and remarks
	no./type	depth (m)			
DSRC332	22Cs	15.25	15.25	10	Grey SILTSTONE
DSRC420	7Cs	1.90	1.90	3.0	Yellowish brown SANDSTONE
DSRCOH400	73Cs	57.92	57.92	15	Orangish brown SILTSTONE
DSRCOH400	97Cs	82.27	82.27	12	Dark grey SILTSTONE
OH413	25Cs	19.41	19.41	8.1	Light brown SILTSTONE
OH413	38Cs	28.64	28.64	8.1	Yellowish brown LIMESTONE
OH417	84Cs	77.47	77.47	5.8	Orangish brown MUDSTONE
general remarks natural water content determined unless otherwise specified					
test method samples oven dried at 105°C				CONTRACT <b>35560/03</b>	
				CHECKED <b>TB</b>	



# UNIAXIAL COMPRESSIVE STRENGTH OF ROCK

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole /trial pit no.	sample		specimen depth (m)	diameter D (mm)	height H (mm)	H/D	moisture content (%)	bulk density (Mg/m <sup>3</sup> )	loading rate (kN/min)	time to failure (min:sec)	UCS (MPa)	description, codes and remarks
	no./type	depth (m)										
DSRC220	31Cs	20.75	20.75	100.5	242.6	2.41	11.8	2.36	7	02:01	1.79	Grey LIMESTONE, P, Sh. H/D ratio falls outside ISRM specification
DSRC220	37Cs	25.65	25.65	102.1	290.9	2.85	7.6	2.41	20	06:46	16.56	Light grey LIMESTONE, P, AxCa.
DSRC315	12Cs	5.10	5.10	101.1	283.2	2.80	6.2	2.50	40	06:21	31.65	Light yellowish brown LIMESTONE, P, AxCa.
DSRC315	20Cs	10.15	10.15	101.6	250.9	2.47	6.0	2.45	15	08:34	15.80	Yellowish brown LIMESTONE, P, AxCa.
DSRC315	31Cs	20.90	20.90	101.6	289.3	2.85	7.4	2.41	15	10:06	18.89	Yellowish brown LIMESTONE, N, Ax.
DSRC329	14Cs	7.20	7.20	101.0	248.7	2.46	10.0	2.34	5	04:31	2.83	Yellowish brown LIMESTONE and MUDSTONE, N, AxCa.
DSRC329	19Cs	11.49	11.49	100.9	294.7	2.92	6.8	2.42	5	09:58	6.13	Yellowish brown mottled grey LIMESTONE and MUDSTONE, N, AxCa.
DSRC329	26C	18.00	18.00	100.2	292.1	2.91	1.8	2.44	40	06:19	32.10	Light yellowish brown LIMESTONE, P, AxCa.

general remarks

sample obtained from vertically drilled core (unless specified), test machine - VJT6000

coding:	moisture condition	sample storage	failure mode
	N - natural moisture content	U - not wrapped	Ax - axial cleavage
	F - fully saturated	F - wrapped in cling film/foil	Ca - cataclasis
	S - soaked	W - waxed	Sh - shear
	P - air/partially dried	G - contained in sealed Geoline	Ex - explosive
			Ot - other

CONTRACT	CHECKED
<b>35560/03</b>	<b>TB</b>

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole /trial pit no.	sample depth (m)	test type	test orientation	moisture condition	width		length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)								
DSRC218	1.39	A	X	N	100		40		0.04	71.36	0.01	1.17	0.01	Yellowish brown SILTSTONE
DSRC218	1.39	D	Y	N		40	100		0.10	100.00	0.01	1.37	0.01	Yellowish brown SILTSTONE
DSRC218	5.10	A	X	N	100		40		0.10	71.36	0.02	1.17	0.02	Greyish brown SILTSTONE
DSRC218	5.10	D	Y	N		30	100		0.05	100.00	0.00	1.37	0.01	Greyish brown SILTSTONE
DSRC218	9.05	A	X	N	100		50		16.98	79.79	2.67	1.23	3.29	Greyish brown LIMESTONE
DSRC218	9.05	D	Y	N		50	100		11.15	100.00	1.11	1.37	1.52	Greyish brown LIMESTONE
DSRC218	16.95	A	X	N	105		60		4.88	89.56	0.61	1.30	0.79	Greyish brown SILTSTONE
DSRC218	16.95	D	Y	N		70	105		8.16	105.00	0.74	1.40	1.03	Greyish brown SILTSTONE
DSRC218	22.30	A	X	N	100		50		1.89	79.79	0.30	1.23	0.37	Greyish brown MUDSTONE
DSRC218	22.30	D	Y	N		60	100		1.59	100.00	0.16	1.37	0.22	Greyish brown MUDSTONE
DSRC220	8.25	A	X	N	100		45		3.88	75.69	0.68	1.21	0.82	Greyish brown LIMESTONE
DSRC220	8.25	D	Y	N		50	100		9.01	100.00	0.90	1.37	1.23	Greyish brown LIMESTONE
DSRC220	10.50	A	X	N	100		50		1.37	79.79	0.22	1.23	0.27	Greyish brown LIMESTONE
DSRC220	10.50	D	Y	N		50	100		0.78	100.00	0.08	1.37	0.11	Greyish brown LIMESTONE
DSRC220	20.75	A	X	P	100		40		2.27	71.36	0.45	1.17	0.52	Grey LIMESTONE
DSRC220	20.75	D	Y	P		50	100		2.16	100.00	0.22	1.37	0.30	Grey LIMESTONE
DSRC220	23.40	A	X	P	100		40		15.64	71.36	3.07	1.17	3.61	Yellowish and orangish brown LIMESTONE
DSRC220	23.40	D	Y	P		50	100		23.90	100.00	2.39	1.37	3.27	Yellowish and orangish brown LIMESTONE
DSRC220	25.65	A	X	P	100		75		14.13	97.72	1.48	1.35	2.00	Light grey LIMESTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35560/03</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole /trial pit no.	sample depth (m)	test type	test orientation	moisture condition	width		length (mm)	platen sep. (mm)	failure load (kN)	equiv. diam. (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)								
DSRC220	25.65	D	Y	P		85	100	14.37	100.00	1.44	1.37	1.96	Light grey LIMESTONE	
DSRC220	29.80	A	X	P	100		50	5.30	79.79	0.83	1.23	1.03	Yellowish brown LIMESTONE	
DSRC220	29.80	D	Y	P		70	100	12.60	100.00	1.26	1.37	1.72	Yellowish brown LIMESTONE	
DSRC314	2.46	A	X	P	105		50	5.72	81.76	0.86	1.25	1.07	Yellowish brown LIMESTONE	
DSRC314	2.46	D	Y	P		55	105	13.87	105.00	1.26	1.40	1.76	Yellowish brown LIMESTONE	
DSRC314	6.15	A	X	P	100		50	5.60	79.79	0.88	1.23	1.09	Yellowish brown LIMESTONE	
DSRC314	6.15	D	Y	P		50	100	9.50	100.00	0.95	1.37	1.30	Yellowish brown LIMESTONE	
DSRC314	9.87	A	X	P	100		40	5.55	71.36	1.09	1.17	1.28	Yellowish brown LIMESTONE	
DSRC314	9.87	D	Y	P		40	100	10.88	100.00	1.09	1.37	1.49	Yellowish brown LIMESTONE	
DSRC314	13.98	A	X	P	100		45	2.87	75.69	0.50	1.21	0.60	Yellowish brown LIMESTONE	
DSRC314	13.98	D	Y	P		50	100	3.68	100.00	0.37	1.37	0.50	Yellowish brown LIMESTONE	
DSRC315	4.22	A	X	P	100		50	0.29	79.79	0.04	1.23	0.06	Yellowish brown MUDSTONE and LIMESTONE	
DSRC315	4.22	D	Y	P		60	100	1.50	100.00	0.15	1.37	0.20	Yellowish brown MUDSTONE and LIMESTONE	
DSRC315	7.05	A	X	P	100		45	5.83	75.69	1.02	1.21	1.23	Yellowish brown LIMESTONE	
DSRC315	7.05	D	Y	P		50	100	6.01	100.00	0.60	1.37	0.82	Yellowish brown LIMESTONE	
DSRC315	10.30	A	X	P	100		50	6.11	79.79	0.96	1.23	1.18	Yellowish brown LIMESTONE	
DSRC315	10.30	D	Y	P		40	100	5.96	100.00	0.60	1.37	0.81	Yellowish brown LIMESTONE	
DSRC315	15.82	A	X	P	105		60	3.48	89.56	0.43	1.30	0.56	Yellowish brown LIMESTONE	
DSRC315	15.82	D	Y	P		80	105	3.34	105.00	0.30	1.40	0.42	Yellowish brown LIMESTONE	

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35560/03</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)								
DSRC315	20.90	A	X	P	100		55	1.65	83.68	0.23	1.26	0.30	Yellowish brown LIMESTONE	
DSRC315	20.90	D	Y	P		50	100	3.24	100.00	0.32	1.37	0.44	Yellowish brown LIMESTONE	
DSRC315	24.40	A	X	P	105		60	4.20	89.56	0.52	1.30	0.68	Yellowish brown LIMESTONE	
DSRC315	24.40	D	Y	P		70	105	5.85	105.00	0.53	1.40	0.74	Yellowish brown LIMESTONE	
DSRC315	28.43	A	X	P	105		60	1.76	89.56	0.22	1.30	0.29	Orangish brown LIMESTONE	
DSRC315	28.43	D	Y	P		60	105	2.93	105.00	0.27	1.40	0.37	Orangish brown LIMESTONE	
DSRC315	31.42	A	X	P	105		60	1.27	89.56	0.16	1.30	0.21	Orangish brown LIMESTONE	
DSRC315	31.42	D	Y	P		80	105	2.90	105.00	0.26	1.40	0.37	Orangish brown LIMESTONE	
DSRC315	33.65	A	X	P	90		60	2.26	82.92	0.33	1.26	0.41	Orangish brown LIMESTONE	
DSRC315	33.65	D	Y	P		70	90	1.96	90.00	0.24	1.30	0.32	Orangish brown LIMESTONE	
DSRC315	36.80	A	X	P	105		45	3.81	77.56	0.63	1.22	0.77	Yellowish brown LIMESTONE	
DSRC315	36.80	D	Y	P		60	105	7.29	105.00	0.66	1.40	0.92	Yellowish brown LIMESTONE	
DSRC315	39.45	A	X	P	100		50	0.88	79.79	0.14	1.23	0.17	Yellowish brown LIMESTONE	
DSRC315	39.45	D	Y	P		70	100	0.77	100.00	0.08	1.37	0.11	Yellowish brown LIMESTONE	
DSRC315	41.70	A	X	P	90		50	1.54	75.69	0.27	1.21	0.32	Yellowish and orangish brown LIMESTONE	
DSRC315	41.70	D	Y	P		70	90	2.82	90.00	0.35	1.30	0.45	Yellowish and orangish brown LIMESTONE	
DSRC315	46.92	A	X	P	105		50	2.70	81.76	0.40	1.25	0.50	Light brown LIMESTONE	
DSRC315	46.92	D	Y	P		70	105	6.52	105.00	0.59	1.40	0.83	Light brown LIMESTONE	
DSRC315	49.65	A	X	P	105		40	3.28	73.13	0.61	1.19	0.73	Yellowish brown LIMESTONE	
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02														
test type		test orientation relative to discontinuities				moisture condition				CONTRACT	CHECKED			
A - axial		X - perpendicular		U - unknown		N - natural moisture content				<b>35560/03</b>	<b>TB</b>			
D - diametral		Y - parallel		P - partially air dried										
I - irregular lump		Z - oblique		S - soaked										

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
DSRC315	49.65	D	Y	P		70	105	8.83	105.00	0.80	1.40	1.12	Yellowish brown LIMESTONE
DSRC315	52.47	A	X	P	105		50	5.69	81.76	0.85	1.25	1.06	Grey LIMESTONE
DSRC315	52.47	D	Y	P		40	105	11.13	105.00	1.01	1.40	1.41	Grey LIMESTONE
DSRC317	2.50	A	X	P	105		50	7.58	81.76	1.13	1.25	1.41	Yellowish brown LIMESTONE
DSRC317	2.50	D	Y	P		50	105	8.18	105.00	0.74	1.40	1.04	Yellowish brown LIMESTONE
DSRC317	11.20	A	X	P	105		50	5.75	81.76	0.86	1.25	1.07	Grey and brown SANDSTONE
DSRC317	11.20	D	Y	P		50	105	10.11	105.00	0.92	1.40	1.28	Grey and brown SANDSTONE
DSRC317	11.75	A	X	P	115		55	20.58	89.74	2.56	1.30	3.32	Grey LIMESTONE
DSRC317	11.75	D	Y	P		50	115	32.35	115.00	2.45	1.45	3.56	Grey LIMESTONE
DSRC317	15.70	A	X	P	115		50	7.25	85.56	0.99	1.27	1.26	Grey LIMESTONE
DSRC317	15.70	D	Y	P		50	115	5.45	115.00	0.41	1.45	0.60	Grey LIMESTONE
DSRC317	19.45	A	X	P	115		50	4.39	85.56	0.60	1.27	0.76	Grey LIMESTONE
DSRC317	19.45	D	Y	P		70	115	4.20	115.00	0.32	1.45	0.46	Grey LIMESTONE
DSRC317	20.50	A	X	P	100		45	0.65	75.69	0.11	1.21	0.14	Grey MUDSTONE
DSRC317	20.50	D	Y	P		50	100	0.59	100.00	0.06	1.37	0.08	Grey MUDSTONE
DSRC326	4.75	A	X	N	105		40	0.59	73.13	0.11	1.19	0.13	Grey MUDSTONE
DSRC326	4.75	D	Y	N		40	105	0.08	105.00	0.01	1.40	0.01	Grey MUDSTONE
DSRC326	7.84	A	X	P	100		40	1.31	71.36	0.26	1.17	0.30	Yellowish brown LIMESTONE
DSRC326	7.84	D	Y	P		40	100	3.81	100.00	0.38	1.37	0.52	Yellowish brown LIMESTONE
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02													
test type		test orientation relative to discontinuities				moisture condition				CONTRACT	CHECKED		
A - axial		X - perpendicular		U - unknown		N - natural moisture content				<b>35560/03</b>	<b>TB</b>		
D - diametral		Y - parallel		P - partially air dried									
I - irregular lump		Z - oblique		S - soaked									

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole /trial pit no.	sample depth (m)	test type	test orientation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
DSRC326	15.90	A	X	P	105		50	2.18	81.76	0.33	1.25	0.41	Grey LIMESTONE
DSRC326	15.90	D	Y	P		50	105	3.33	105.00	0.30	1.40	0.42	Grey LIMESTONE
DSRC327	3.80	A	X	P	105		50	17.54	81.76	2.62	1.25	3.27	Light brown LIMESTONE
DSRC327	3.80	D	Y	P		50	105	15.05	105.00	1.37	1.40	1.91	Light brown LIMESTONE
DSRC329	7.25	A	X	P	100		50	8.96	79.79	1.41	1.23	1.74	Yellowish brown LIMESTONE
DSRC329	7.25	D	Y	P		30	100	8.35	100.00	0.84	1.37	1.14	Yellowish brown LIMESTONE
DSRC329	8.03	A	X	P	100		50	0.65	79.79	0.10	1.23	0.13	Yellowish brown LIMESTONE
DSRC329	8.03	D	Y	P		70	100	0.38	100.00	0.04	1.37	0.05	Yellowish brown LIMESTONE
DSRC329	11.72	A	X	P	100		35	2.16	66.76	0.48	1.14	0.55	Yellowish brown mottled grey LIMESTONE and MUDSTONE
DSRC329	11.72	D	Y	P		30	100	1.21	100.00	0.12	1.37	0.17	Yellowish brown mottled grey LIMESTONE and MUDSTONE
DSRC329	14.26	A	X	P	100		45	0.51	75.69	0.09	1.21	0.11	Yellowish brown LIMESTONE
DSRC329	14.26	D	Y	P		45	100	0.66	100.00	0.07	1.37	0.09	Yellowish brown LIMESTONE
DSRC329	16.74	A	X	P	105		40	7.87	73.13	1.47	1.19	1.75	Greyish brown LIMESTONE
DSRC329	16.74	D	Y	P		50	105	2.82	105.00	0.26	1.40	0.36	Greyish brown LIMESTONE
DSRC329	20.49	A	X	P	100		40	1.07	71.36	0.21	1.17	0.25	Light brown LIMESTONE
DSRC329	20.49	D	Y	P		55	100	12.13	100.00	1.21	1.37	1.66	Light brown LIMESTONE
DSRC329	24.18	A	X	P	105		45	9.18	77.56	1.53	1.22	1.86	Light brown LIMESTONE
DSRC329	24.18	D	Y	P		45	105	8.47	105.00	0.77	1.40	1.07	Light brown LIMESTONE
DSRC329	26.57	A	X	P	105		50	5.94	81.76	0.89	1.25	1.11	Grey LIMESTONE
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02													
test type		test orientation relative to discontinuities				moisture condition				CONTRACT	CHECKED		
A - axial		X - perpendicular		U - unknown		N - natural moisture content				<b>35560/03</b>	<b>TB</b>		
D - diametral		Y - parallel		P - partially air dried									
I - irregular lump		Z - oblique		S - soaked									

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole /trial pit no.	sample depth (m)	test type	test orientation	moisture condition	width		length	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)								
DSRC329	26.57	D	Y	P		50	105	3.61	105.00	0.33	1.40	0.46	Grey LIMESTONE	
DSRC329	28.90	A	X	P	100		60	2.55	87.40	0.33	1.29	0.43	Yellowish brown LIMESTONE	
DSRC329	28.90	D	Y	P		70	100	2.01	100.00	0.20	1.37	0.27	Yellowish brown LIMESTONE	
DSRC332	5.40	A	X	P	115		70	14.77	101.24	1.44	1.37	1.98	Grey LIMESTONE	
DSRC332	5.40	D	Y	P		60	115	8.11	115.00	0.61	1.45	0.89	Grey LIMESTONE	
DSRC332	9.50	A	X	P	115		60	8.50	93.73	0.97	1.33	1.28	Grey and yellowish brown LIMESTONE	
DSRC332	9.50	D	Y	P		60	115	10.90	115.00	0.82	1.45	1.20	Grey and yellowish brown LIMESTONE	
DSRC332	15.25	A	X	P	105		40	0.50	73.13	0.09	1.19	0.11	Grey SILTSTONE	
DSRC332	15.25	D	Y	P		40	105	0.54	105.00	0.05	1.40	0.07	Grey SILTSTONE	
DSRC420	28.00	A	X	P	115		70	7.69	101.24	0.75	1.37	1.03	Grey LIMESTONE	
DSRC420	28.00	D	Y	P		50	115	17.95	115.00	1.36	1.45	1.97	Grey LIMESTONE	
DSRCOH400	16.10	A	X	P	105		40	0.51	73.13	0.09	1.19	0.11	Yellowish brown LIMESTONE	
DSRCOH400	16.10	D	Y	P		40	105	1.24	105.00	0.11	1.40	0.16	Yellowish brown LIMESTONE	
DSRCOH400	21.09	A	X	P	105		40	1.39	73.13	0.26	1.19	0.31	Yellowish and orangish brown LIMESTONE	
DSRCOH400	21.09	D	Y	P		40	105	4.10	105.00	0.37	1.40	0.52	Yellowish and orangish brown LIMESTONE	
DSRCOH400	28.86	A	X	P	100		40	2.55	71.36	0.50	1.17	0.59	Yellowish brown LIMESTONE	
DSRCOH400	28.86	D	Y	P		50	100	7.05	100.00	0.70	1.37	0.96	Yellowish brown LIMESTONE	
DSRCOH400	34.44	A	X	P	105		40	3.34	73.13	0.62	1.19	0.74	Grey LIMESTONE	
DSRCOH400	34.44	D	Y	P		45	105	2.98	105.00	0.27	1.40	0.38	Grey LIMESTONE	

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35560/03</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)								
DSRCH4 00	41.57	A	X	P	105		50		5.82	81.76	0.87	1.25	1.09	Light brown LIMESTONE
DSRCH4 00	41.57	D	Y	P		50	105		7.47	105.00	0.68	1.40	0.95	Light brown LIMESTONE
DSRCH4 00	46.95	A	X	P	100		50		0.50	79.79	0.08	1.23	0.10	Yellowish brown LIMESTONE
DSRCH4 00	46.95	D	Y	P		50	100		0.22	100.00	0.02	1.37	0.03	Yellowish brown LIMESTONE
DSRCH4 00	52.80	A	X	P	105		50		4.70	81.76	0.70	1.25	0.88	Yellowish brown LIMESTONE
DSRCH4 00	52.80	D	Y	P		50	105		5.59	105.00	0.51	1.40	0.71	Yellowish brown LIMESTONE
DSRCH4 00	57.92	A	X	P	100		55		2.93	83.68	0.42	1.26	0.53	Orangish brown SILTSTONE
DSRCH4 00	57.92	D	Y	P		50	100		1.76	100.00	0.18	1.37	0.24	Orangish brown SILTSTONE
DSRCH4 00	64.80	A	X	P	100		40		3.61	71.36	0.71	1.17	0.83	Yellowish brown LIMESTONE
DSRCH4 00	64.80	D	Y	P		40	100		7.68	100.00	0.77	1.37	1.05	Yellowish brown LIMESTONE
DSRCH4 00	70.85	A	X	P	100		50		5.30	79.79	0.83	1.23	1.03	Yellowish brown LIMESTONE
DSRCH4 00	70.85	D	Y	P		40	100		4.14	100.00	0.41	1.37	0.57	Yellowish brown LIMESTONE
DSRCH4 00	76.36	A	X	P	105		40		1.71	73.13	0.32	1.19	0.38	Orangish brown LIMESTONE
DSRCH4 00	76.36	D	Y	P		40	105		1.01	105.00	0.09	1.40	0.13	Orangish brown LIMESTONE
DSRCH4 00	78.92	A	X	P	105		35		0.90	68.40	0.19	1.15	0.22	Dark grey SILTSTONE
DSRCH4 00	78.92	D	Y	P		45	105		0.65	105.00	0.06	1.40	0.08	Dark grey SILTSTONE
DSRCH4 00	82.27	A	X	P	100		45		1.96	75.69	0.34	1.21	0.41	Dark grey SILTSTONE
DSRCH4 00	82.27	D	Y	P		40	100		0.70	100.00	0.07	1.37	0.10	Dark grey SILTSTONE
DSRCH4 12	17.32	A	X	P	100		45		3.06	75.69	0.53	1.21	0.64	Yellowish brown LIMESTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35560/03</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		



**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)								
DSRCHO4 12	17.32	D	Y	P		40	100	2.96	100.00	0.30	1.37	0.40	Yellowish brown LIMESTONE	
DSRCHO4 12	19.58	A	X	P	105		40	0.15	73.13	0.03	1.19	0.03	Orangish brown LIMESTONE	
DSRCHO4 12	19.58	D	Y	P		50	105	0.29	105.00	0.03	1.40	0.04	Orangish brown LIMESTONE	
DSRCHO4 12	22.50	A	X	P	115		30	11.64	66.28	2.65	1.14	3.01	Yellowish brown LIMESTONE	
DSRCHO4 12	22.50	D	Y	P		30	115	4.83	115.00	0.37	1.45	0.53	Yellowish brown LIMESTONE	
DSRCHO4 12	27.76	A	X	P	115		50	5.67	85.56	0.77	1.27	0.99	Yellowish brown LIMESTONE	
DSRCHO4 12	27.76	D	Y	P		50	115	9.33	115.00	0.71	1.45	1.03	Yellowish brown LIMESTONE	
DSRCHO4 12	29.50	A	X	P	100		45	0.87	75.69	0.15	1.21	0.18	Orangish brown LIMESTONE	
DSRCHO4 12	29.50	D	Y	P		40	100	0.67	100.00	0.07	1.37	0.09	Orangish brown LIMESTONE	
DSRCHO4 14	2.40	A	X	P	100		60	0.81	87.40	0.11	1.29	0.14	Yellowish brown LIMESTONE	
DSRCHO4 14	2.40	D	Y	P		60	100	0.45	100.00	0.05	1.37	0.06	Yellowish brown LIMESTONE	
DSRCHO4 14	6.16	A	X	P	100		45	0.69	75.69	0.12	1.21	0.14	Yellowish brown LIMESTONE	
DSRCHO4 14	6.16	D	Y	P		45	100	0.02	100.00	0.00	1.37	0.00	Yellowish brown LIMESTONE	
DSRCHO4 14	9.32	A	X	P	100		50	8.92	79.79	1.40	1.23	1.73	Light brown LIMESTONE	
DSRCHO4 14	9.32	D	Y	P		50	100	12.27	100.00	1.23	1.37	1.68	Light brown LIMESTONE	
DSRCHO4 14	14.14	A	X	P	100		50	4.91	79.79	0.77	1.23	0.95	Yellowish brown LIMESTONE	
DSRCHO4 14	14.14	D	Y	P		50	100	12.81	100.00	1.28	1.37	1.75	Yellowish brown LIMESTONE	
DSRCHO4 14	17.65	A	X	P	100		45	3.39	75.69	0.59	1.21	0.71	Yellowish brown LIMESTONE	
DSRCHO4 14	17.65	D	Y	P		55	100	13.05	100.00	1.30	1.37	1.78	Yellowish brown LIMESTONE	
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02														
test type		test orientation relative to discontinuities				moisture condition				CONTRACT	CHECKED			
A - axial		X - perpendicular		U - unknown		N - natural moisture content				<b>35560/03</b>	<b>TB</b>			
D - diametral		Y - parallel		P - partially air dried										
I - irregular lump		Z - oblique		S - soaked										

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
DSRCOH4 14	21.85	A	X	P	100		60	8.25	87.40	1.08	1.29	1.39	Yellowish brown LIMESTONE
DSRCOH4 14	21.85	D	Y	P		60	100	4.43	100.00	0.44	1.37	0.60	Yellowish brown LIMESTONE
DSRCOH4 14	25.70	A	X	P	100		45	2.41	75.69	0.42	1.21	0.51	Yellowish brown LIMESTONE
DSRCOH4 14	25.70	D	Y	P		45	100	6.04	100.00	0.60	1.37	0.83	Yellowish brown LIMESTONE
DSRCOH4 14	31.00	A	X	P	100		45	5.05	75.69	0.88	1.21	1.06	Yellowish brown LIMESTONE
DSRCOH4 14	31.00	D	Y	P		30	100	2.95	100.00	0.30	1.37	0.40	Yellowish brown LIMESTONE
DSRCOH4 14	35.25	A	X	P	100		60	4.84	87.40	0.63	1.29	0.81	Yellowish brown LIMESTONE
DSRCOH4 14	35.25	D	Y	P		60	100	5.81	100.00	0.58	1.37	0.79	Yellowish brown LIMESTONE
DSRCOH4 14	41.50	A	X	P	100		50	6.12	79.79	0.96	1.23	1.19	Yellowish and orangish brown LIMESTONE
DSRCOH4 14	41.50	D	Y	P		45	100	2.78	100.00	0.28	1.37	0.38	Yellowish and orangish brown LIMESTONE
DSRCOH4 14	45.55	A	X	P	100		35	3.15	66.76	0.71	1.14	0.81	Light brown LIMESTONE
DSRCOH4 14	45.55	D	Y	P		40	100	6.23	100.00	0.62	1.37	0.85	Light brown LIMESTONE
DSRCOH4 14	50.75	A	X	P	100		45	4.88	75.69	0.85	1.21	1.03	Light brown LIMESTONE
DSRCOH4 14	50.75	D	Y	P		40	100	14.84	100.00	1.48	1.37	2.03	Light brown LIMESTONE
DSRCOH4 14	56.22	A	X	P	100		45	5.97	75.69	1.04	1.21	1.26	Yellowish brown LIMESTONE
DSRCOH4 14	56.22	D	Y	P		60	100	11.39	100.00	1.14	1.37	1.56	Yellowish brown LIMESTONE
DSRCOH4 14	71.61	A	X	P	100		60	0.18	87.40	0.02	1.29	0.03	Grey SILTSTONE
DSRCOH4 14	71.61	D	Y	P		50	100	0.21	100.00	0.02	1.37	0.03	Grey SILTSTONE
OH413	2.19	A	X	P	100		30	2.99	61.80	0.78	1.10	0.86	Light brown LIMESTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35560/03</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)	L (mm)						
OH413	2.19	D	Y	P		45	100	6.90	100.00	0.69	1.37	0.94	Light brown LIMESTONE	
OH413	6.43	A	X	P	100		50	0.86	79.79	0.13	1.23	0.17	Yellowish brown LIMESTONE	
OH413	6.43	D	Y	P		55	100	9.54	100.00	0.95	1.37	1.30	Yellowish brown LIMESTONE	
OH413	11.70	A	X	P	100		50	9.92	79.79	1.56	1.23	1.92	Yellowish brown LIMESTONE	
OH413	11.70	D	Y	P		60	100	19.88	100.00	1.99	1.37	2.72	Yellowish brown LIMESTONE	
OH413	15.30	A	X	P	100		40	3.82	71.36	0.75	1.17	0.88	Yellowish brown LIMESTONE	
OH413	15.30	D	Y	P		50	100	7.72	100.00	0.77	1.37	1.05	Yellowish brown LIMESTONE	
OH413	40.40	A	X	P	100		40	1.32	71.36	0.26	1.17	0.30	Grey LIMESTONE	
OH413	40.40	D	Y	P		60	100	1.81	100.00	0.18	1.37	0.25	Grey LIMESTONE	
OH413	44.47	A	X	P	105		70	10.84	96.74	1.16	1.35	1.56	Grey LIMESTONE	
OH413	44.47	D	Y	P		70	105	6.39	105.00	0.58	1.40	0.81	Grey LIMESTONE	
OH413	46.75	A	X	P	105		70	5.29	96.74	0.57	1.35	0.76	Yellowish brown LIMESTONE	
OH413	46.75	D	Y	P		70	105	2.52	105.00	0.23	1.40	0.32	Yellowish brown LIMESTONE	
OH413	50.25	A	X	P	105		50	0.36	81.76	0.05	1.25	0.07	Yellowish brown MUDSTONE with shell fragments	
OH413	50.25	D	Y	P		30	105	0.21	105.00	0.02	1.40	0.03	Yellowish brown MUDSTONE with shell fragments	
OH413	54.05	A	X	P	105		60	19.48	89.56	2.43	1.30	3.16	Light brown LIMESTONE	
OH413	54.05	D	Y	P		60	105	20.86	105.00	1.89	1.40	2.64	Light brown LIMESTONE	
OH413	57.90	A	X	P	90		60	5.07	82.92	0.74	1.26	0.93	Light yellowish brown LIMESTONE	
OH413	57.90	D	Y	P		70	90	8.49	90.00	1.05	1.30	1.37	Light yellowish brown LIMESTONE	

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35560/03</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
OH413	62.33	A	X	P	105		55	0.75	85.75	0.10	1.27	0.13	Yellowish brown mottled orange LIMESTONE
OH413	62.33	D	Y	P		60	105	1.24	105.00	0.11	1.40	0.16	Yellowish brown mottled orange LIMESTONE
OH413	69.55	A	X	P	150		55	1.72	102.49	0.16	1.38	0.23	Yellowish brown LIMESTONE
OH413	69.55	D	Y	P		70	105	4.86	105.00	0.44	1.40	0.62	Yellowish brown LIMESTONE
OH413	73.40	A	X	P	105		70	4.07	96.74	0.43	1.35	0.58	Yellowish brown LIMESTONE
OH413	73.40	D	Y	P		60	105	3.20	105.00	0.29	1.40	0.41	Yellowish brown LIMESTONE
OH413	79.60	A	X	P	105		45	7.23	77.56	1.20	1.22	1.46	Grey LIMESTONE
OH413	79.60	D	Y	P		70	105	6.98	105.00	0.63	1.40	0.88	Grey LIMESTONE
OH413	84.20	A	X	P	100		50	1.58	79.79	0.25	1.23	0.31	Orangish brown LIMESTONE
OH413	84.20	D	Y	P		90	100	0.23	100.00	0.02	1.37	0.03	Orangish brown LIMESTONE
OH413	91.40	A	X	P	105		70	3.34	96.74	0.36	1.35	0.48	Grey LIMESTONE
OH413	91.40	D	Y	P		60	105	4.58	105.00	0.42	1.40	0.58	Grey LIMESTONE
OH413	96.66	A	X	P	90		60	7.99	82.92	1.16	1.26	1.46	Grey LIMESTONE
OH413	96.66	D	Y	P		60	90	8.25	90.00	1.02	1.30	1.33	Grey LIMESTONE
OH413	98.90	A	X	P	105		55	4.53	85.75	0.62	1.27	0.78	Grey LIMESTONE
OH413	98.90	D	Y	P		80	105	2.56	105.00	0.23	1.40	0.32	Grey LIMESTONE
OH417	7.20	A	X	P	100		60	5.10	87.40	0.67	1.29	0.86	Yellowish brown LIMESTONE
OH417	7.20	D	Y	P		70	100	10.14	100.00	1.01	1.37	1.39	Yellowish brown LIMESTONE
OH417	10.50	A	X	P	100		60	6.46	87.40	0.85	1.29	1.09	Light brown LIMESTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular      U - unknown	N - natural moisture content	<b>35560/03</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole /trial pit no.	sample depth (m)	test type	test orientation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
OH417	10.50	D	Y	P		50	100	4.97	100.00	0.50	1.37	0.68	Light brown LIMESTONE
OH417	14.23	A	X	P	100		60	9.51	87.40	1.24	1.29	1.60	Light brown LIMESTONE
OH417	14.23	D	Y	P		60	100	15.57	100.00	1.56	1.37	2.13	Light brown LIMESTONE
OH417	19.92	A	X	P	100		70	4.51	94.41	0.51	1.33	0.67	Yellowish brown LIMESTONE
OH417	19.92	D	Y	P		45	100	1.52	100.00	0.15	1.37	0.21	Yellowish brown LIMESTONE
OH417	26.30	A	X	P	100		70	3.07	94.41	0.34	1.33	0.46	Light grey LIMESTONE
OH417	26.30	D	Y	P		40	100	5.50	100.00	0.55	1.37	0.75	Light grey LIMESTONE
OH417	30.05	A	X	P	100		50	1.18	79.79	0.19	1.23	0.23	Light brown LIMESTONE
OH417	30.05	D	Y	P		40	100	10.78	100.00	1.08	1.37	1.47	Light brown LIMESTONE
OH417	33.30	A	X	P	100		60	1.35	87.40	0.18	1.29	0.23	Light brown LIMESTONE
OH417	33.30	D	Y	P		50	100	3.63	100.00	0.36	1.37	0.50	Light brown LIMESTONE
OH417	38.40	A	X	P	100		50	1.80	79.79	0.28	1.23	0.35	Yellowish brown LIMESTONE
OH417	38.40	D	Y	P		40	100	0.57	100.00	0.06	1.37	0.08	Yellowish brown LIMESTONE
OH417	43.30	A	X	P	100		50	0.35	79.79	0.05	1.23	0.07	Yellowish brown LIMESTONE
OH417	43.30	D	Y	P		50	100	6.58	100.00	0.66	1.37	0.90	Yellowish brown LIMESTONE
OH417	49.08	A	X	P	100		50	2.96	79.79	0.46	1.23	0.57	Yellowish brown LIMESTONE
OH417	49.08	D	Y	P		50	100	3.92	100.00	0.39	1.37	0.54	Yellowish brown LIMESTONE
OH417	54.00	A	X	P	105		45	2.57	77.56	0.43	1.22	0.52	Light brown LIMESTONE
OH417	54.00	D	Y	P		50	105	13.01	105.00	1.18	1.40	1.65	Light brown LIMESTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35560/03</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole / trial pit no.	sample depth (m)	test type	test orientation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
OH417	62.30	A	X	P	100		40	4.13	71.36	0.81	1.17	0.95	Orangish brown LIMESTONE
OH417	62.30	D	Y	P		50	100	8.42	100.00	0.84	1.37	1.15	Orangish brown LIMESTONE
OH417	62.87	A	X	P	105		55	8.29	85.75	1.13	1.27	1.44	Yellowish brown LIMESTONE
OH417	62.87	D	Y	P		60	105	19.22	105.00	1.74	1.40	2.43	Yellowish brown LIMESTONE
OH417	73.10	A	X	P	105		55	0.23	85.75	0.03	1.27	0.04	Grey MUDSTONE
OH417	73.10	D	Y	P		50	105	0.16	105.00	0.01	1.40	0.02	Grey MUDSTONE
OH417	89.50	A	X	P	100		40	0.26	71.36	0.05	1.17	0.06	Grey MUDSTONE
OH417	89.50	D	Y	P		30	100	0.22	100.00	0.02	1.37	0.03	Grey MUDSTONE
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02													
test type		test orientation relative to discontinuities				moisture condition				CONTRACT	CHECKED		
A - axial		X - perpendicular		U - unknown		N - natural moisture content				<b>35560/03</b>	<b>TB</b>		
D - diametral		Y - parallel		P - partially air dried									
I - irregular lump		Z - oblique		S - soaked									

Geotechnical Engineering Limited  
Centurion House  
Olympus Park, Quedgeley  
Gloucester  
GL2 4NF

Date: 25 March 2020  
Test Report Ref: TR 722661

Order No: 35560-02/TB 35560-03/TB

Page 1 of 1

Contract: A417 Missing Link.

**LABORATORY TEST REPORT**

**TEST REQUIREMENTS:**

To determine the Fragmentation of Aggregate - Los Angeles  
Test Method in accordance with **BS EN 1097-2: 2010**

**SAMPLE DETAILS:**

Certificate of sampling received:	<b>No</b>
Laboratory Ref. No:	<b>S86353</b>
Client Ref. No:	<b>DSRC314 - 5C - 3.0 - 4.5m</b>
Date and Time of Sampling:	<b>Unknown</b>
Date of Receipt at Lab:	<b>18/02/2020</b>
Date of Start of Test:	<b>25/03/2020</b>
Sampling Location:	<b>3.0 - 4.5m</b>
Name of Source:	<b>A417 Missing Link.</b>
Method of Sampling:	<b>Unknown</b>
Sampled By:	<b>Client</b>
Tested By:	<b>DW</b>
Material Description:	<b>Cores</b>
Target Specification:	<b>N/A</b>

**RESULTS:**

<b>Size fraction from which the test portion was obtained:</b>	<b>14mm to 12.5mm</b> <b>12.5mm to 10.0mm</b>
<b>Los Angeles Coefficient (LA) =</b>	<b>51</b>

This test report shall not be reproduced, except in full, without the written approval of Celtest Company Limited.

These results relate only to the items tested.

<p><b><u>Comments:</u></b> None</p>	<p>Report checked and approved by:  Neil Hughes Aggregate Team Coordinator</p>
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Geotechnical Engineering Limited  
Centurion House  
Olympus Park, Quedgeley  
Gloucester  
GL2 4NF

Date: 25 March 2020  
Test Report Ref: TR 722662

Order No: 35560-02/TB 35560-03/TB

Page 1 of 1

Contract: A417 Missing Link.

**LABORATORY TEST REPORT**

**TEST REQUIREMENTS:**

To determine the Fragmentation of Aggregate - Los Angeles  
Test Method in accordance with **BS EN 1097-2: 2010**

**SAMPLE DETAILS:**

Certificate of sampling received:	<b>No</b>
Laboratory Ref. No:	<b>S86353</b>
Client Ref. No:	<b>DSRC314 - 7C - 4.5 - 6.0m</b>
Date and Time of Sampling:	<b>Unknown</b>
Date of Receipt at Lab:	<b>18/02/2020</b>
Date of Start of Test:	<b>25/03/2020</b>
Sampling Location:	<b>4.5 - 6.0m</b>
Name of Source:	<b>A417 Missing Link.</b>
Method of Sampling:	<b>Unknown</b>
Sampled By:	<b>Client</b>
Tested By:	<b>DW</b>
Material Description:	<b>Cores</b>
Target Specification:	<b>N/A</b>

**RESULTS:**

<b>Size fraction from which the test portion was obtained:</b>	<b>14mm to 12.5mm</b> <b>12.5mm to 10.0mm</b>
<b>Los Angeles Coefficient (LA) =</b>	<b>55</b>

This test report shall not be reproduced, except in full, without the written approval of Celtest Company Limited.

These results relate only to the items tested.

<p><b><u>Comments:</u></b> None</p>	<p>Report checked and approved by:  Neil Hughes Aggregate Team Coordinator</p>
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Geotechnical Engineering Limited  
Centurion House  
Olympus Park, Quedgeley  
Gloucester  
GL2 4NF

Date: 25 March 2020  
Test Report Ref: TR 722663

Order No: 35560-02/TB 35560-03/TB

Page 1 of 1

Contract: A417 Missing Link.

**LABORATORY TEST REPORT**

**TEST REQUIREMENTS:**

To determine the Fragmentation of Aggregate - Los Angeles  
Test Method in accordance with **BS EN 1097-2: 2010**

**SAMPLE DETAILS:**

Certificate of sampling received:	<b>No</b>
Laboratory Ref. No:	<b>S86353</b>
Client Ref. No:	<b>DSRC317 - 4C - 1.2 - 2.7m</b>
Date and Time of Sampling:	<b>Unknown</b>
Date of Receipt at Lab:	<b>18/02/2020</b>
Date of Start of Test:	<b>25/03/2020</b>
Sampling Location:	<b>1.2 - 2.7m</b>
Name of Source:	<b>A417 Missing Link.</b>
Method of Sampling:	<b>Unknown</b>
Sampled By:	<b>Client</b>
Tested By:	<b>DW</b>
Material Description:	<b>Cores</b>
Target Specification:	<b>N/A</b>

**RESULTS:**

<b>Size fraction from which the test portion was obtained:</b>	<b>14mm to 12.5mm</b> <b>12.5mm to 10.0mm</b>
<b>Los Angeles Coefficient (LA) =</b>	<b>51</b>

This test report shall not be reproduced, except in full, without the written approval of Celtest Company Limited.

These results relate only to the items tested.

<p><b><u>Comments:</u></b> None</p>	<p>Report checked and approved by:  Neil Hughes Aggregate Team Coordinator</p>
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Geotechnical Engineering Limited  
Centurion House  
Olympus Park, Quedgeley  
Gloucester  
GL2 4NF

Date: 25 March 2020  
Test Report Ref: TR 722664

Order No: 35560-02/TB 35560-03/TB

Page 1 of 1

Contract: A417 Missing Link.

**LABORATORY TEST REPORT**

**TEST REQUIREMENTS:**

To determine the Fragmentation of Aggregate - Los Angeles  
Test Method in accordance with **BS EN 1097-2: 2010**

**SAMPLE DETAILS:**

Certificate of sampling received:	<b>No</b>
Laboratory Ref. No:	<b>S86353</b>
Client Ref. No:	<b>OH413 - 6C - 2.90 - 4.40m</b>
Date and Time of Sampling:	<b>Unknown</b>
Date of Receipt at Lab:	<b>18/02/2020</b>
Date of Start of Test:	<b>25/03/2020</b>
Sampling Location:	<b>2.90 - 4.40m</b>
Name of Source:	<b>A417 Missing Link.</b>
Method of Sampling:	<b>Unknown</b>
Sampled By:	<b>Client</b>
Tested By:	<b>DW</b>
Material Description:	<b>Cores</b>
Target Specification:	<b>N/A</b>

**RESULTS:**

<b>Size fraction from which the test portion was obtained:</b>	<b>14mm to 12.5mm</b> <b>12.5mm to 10.0mm</b>
<b>Los Angeles Coefficient (LA) =</b>	<b>57</b>

This test report shall not be reproduced, except in full, without the written approval of Celtest Company Limited.

These results relate only to the items tested.

<p><b><u>Comments:</u></b> None</p>	<p>Report checked and approved by:  Neil Hughes Aggregate Team Coordinator</p>
---	---

Geotechnical Engineering Limited  
Centurion House  
Olympus Park, Quedgeley  
Gloucester  
GL2 4NF

Date: 25 March 2020  
Test Report Ref: TR 722665

Order No: 35560-02/TB 35560-03/TB

Page 1 of 1

Contract: A417 Missing Link.

**LABORATORY TEST REPORT**

**TEST REQUIREMENTS:**

To determine the Fragmentation of Aggregate - Los Angeles  
Test Method in accordance with **BS EN 1097-2: 2010**

**SAMPLE DETAILS:**

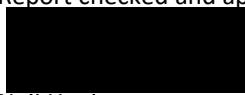
Certificate of sampling received:	<b>No</b>
Laboratory Ref. No:	<b>S86353</b>
Client Ref. No:	<b>OH417 - 15C - 9.00 - 10.50m</b>
Date and Time of Sampling:	<b>Unknown</b>
Date of Receipt at Lab:	<b>18/02/2020</b>
Date of Start of Test:	<b>25/03/2020</b>
Sampling Location:	<b>9.00 - 10.50m</b>
Name of Source:	<b>A417 Missing Link.</b>
Method of Sampling:	<b>Unknown</b>
Sampled By:	<b>Client</b>
Tested By:	<b>DW</b>
Material Description:	<b>Cores</b>
Target Specification:	<b>N/A</b>

**RESULTS:**

<b>Size fraction from which the test portion was obtained:</b>	<b>14mm to 12.5mm</b> <b>12.5mm to 10.0mm</b>
<b>Los Angeles Coefficient (LA) =</b>	<b>58</b>

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<p><b><u>Comments:</u></b> None</p>	<p>Report checked and approved by:  Neil Hughes Aggregate Team Coordinator</p>
---	---

## Final Report

---

**Report No.:** 20-01587-1

**Initial Date of Issue:** 21-Jan-2020

**Client** Geotechnical Engineering Ltd

**Client Address:** Centurion House  
Olympus Park  
Quedgeley  
Gloucester  
Gloucestershire  
GL2 4NF

**Contact(s):** GEL  
Tom Best

**Project** 35560 A417 Missing Link


**Quotation No.:** Q20-19309 **Date Received:** 20-Jan-2020

**Order No.:** 35560/LAB **Date Instructed:** 20-Jan-2020

**No. of Samples:** 12

**Turnaround (Wkdays):** 5 **Results Due:** 24-Jan-2020

**Date Approved:** 21-Jan-2020

**Approved By:**  


**Details:** Darrell Hall, Director

---

## Results - Soil

Client: Geotechnical Engineering Ltd	Chemtest Job No.:					20-01587	20-01587	20-01587	20-01587	20-01587	20-01587	20-01587	20-01587	20-01587
Quotation No.: Q20-19309	Chemtest Sample ID.:					955746	955747	955748	955749	955750	955751	955752	955753	955754
	Client Sample ID.:					7Cs	17C	21C	10C	20C	26C	5L	10C	16C
	Sample Location:					DSRC218	DSRC218	DSRC218	DSRC220	DSRC220	DSRC220	DSRC315	DSRC326	DSRC326
	Sample Type:					SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):					3.00	10.50	13.50	5.00	12.70	17.40	1.20	5.70	10.80
	Bottom Depth (m):					4.50	12.00	15.00	6.50	14.30	18.90	2.20	7.30	12.30
	Date Sampled:					17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020
Determinand	Accred.	SOP	Units	LOD										
Moisture	N	2030	%	0.020	4.5	5.1	3.1	8.0	8.8	7.3	23	12	7.0	
Carbonate	N	2260	%	0.10	27	24	36	21	11	26	< 0.10	12	17	

**Project: 35560 A417 Missing Link**

<b>Client: Geotechnical Engineering Ltd</b>	<b>Chemtest Job No.:</b>				20-01587	20-01587	20-01587
Quotation No.: Q20-19309	<b>Chemtest Sample ID.:</b>				955755	955756	955757
	Client Sample ID.:				4B	8C	11CS
	Sample Location:				DSRC329	DSRC329	DSRC329
	Sample Type:				SOIL	SOIL	SOIL
	Top Depth (m):				1.00	2.50	3.65
	Bottom Depth (m):				1.20	3.00	3.92
	Date Sampled:				17-Jan-2020	17-Jan-2020	17-Jan-2020
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>			
Moisture	N	2030	%	0.020	25	7.5	16
Carbonate	N	2260	%	0.10	17	24	19

<b>SOP</b>	<b>Title</b>	<b>Parameters included</b>	<b>Method summary</b>
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2260	Carbonate	Carbonate	Titration

## **Report Information**

### **Key**

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### **Sample Deviation Codes**

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- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

---

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



## Final Report

---

**Report No.:** 20-01590-1

**Initial Date of Issue:** 21-Jan-2020

**Client** Geotechnical Engineering Ltd

**Client Address:** Centurion House  
Olympus Park  
Quedgeley  
Gloucester  
Gloucestershire  
GL2 4NF

**Contact(s):** GEL  
Tom Best

**Project** 35560 A417 Missing Link

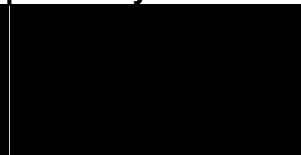
**Quotation No.:** Q20-19309 **Date Received:** 20-Jan-2020

**Order No.:** 35560/LAB **Date Instructed:** 20-Jan-2020

**No. of Samples:** 11

**Turnaround (Wkdays):** 5 **Results Due:** 24-Jan-2020

**Date Approved:** 21-Jan-2020

**Approved By:**  


**Details:** Darrell Hall, Director

---

## Results - Soil

**Project: 35560 A417 Missing Link**

<b>Client: Geotechnical Engineering Ltd</b>	<b>Chemtest Job No.:</b>		20-01590	20-01590	20-01590	20-01590	20-01590	20-01590	20-01590	20-01590	20-01590		
Quotation No.: Q20-19309	<b>Chemtest Sample ID.:</b>		955764	955765	955766	955767	955768	955769	955770	955771	955772		
	Client Sample ID.:		6CS	8CS	22CS	9L	19CS	24CS	15D	29D	8C		
	Sample Location:		DSRC332	DSRC332	DSRC332	DSRCOH400	DSRCOH400	DSRCOH400	DSRCOH412	DSRCOH412	DSRCOH412		
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
	Top Depth (m):		2.45	3.80	15.25	2.20	7.49	10.46	5.45	11.36	2.00		
	Bottom Depth (m):		2.60	4.00	15.48	3.20	7.66	10.77	5.55	11.46	3.00		
	Date Sampled:		17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020		
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>									
Moisture	N	2030	%	0.020	7.7	7.6	8.0	13	16	16	15	12	12
Carbonate	N	2260	%	0.10	35	33	30	23	23	24	15	18	21

**Project: 35560 A417 Missing Link**

<b>Client: Geotechnical Engineering Ltd</b>	<b>Chemtest Job No.:</b>		20-01590	20-01590		
Quotation No.: Q20-19309	<b>Chemtest Sample ID.:</b>		955773	955774		
	Client Sample ID.:		26C	10CS		
	Sample Location:		DSRCOH412	DSRCOH417		
	Sample Type:		SOIL	SOIL		
	Top Depth (m):		9.00	4.74		
	Bottom Depth (m):		10.50	5.04		
	Date Sampled:		17-Jan-2020	17-Jan-2020		
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>		
Moisture	N	2030	%	0.020	11	11
Carbonate	N	2260	%	0.10	21	17

<b>SOP</b>	<b>Title</b>	<b>Parameters included</b>	<b>Method summary</b>
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2260	Carbonate	Carbonate	Titration

## **Report Information**

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- N/E not evaluated
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- > "greater than"

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All results are expressed on a dry weight basis

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All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

---

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

---

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



## Final Report

---

**Report No.:** 20-01596-1  
**Initial Date of Issue:** 23-Jan-2020  
**Client:** Geotechnical Engineering Ltd  
**Client Address:** Centurion House  
Olympus Park  
Quedgeley  
Gloucester  
Gloucestershire  
GL2 4NF  
**Contact(s):** GEL  
Tom Best  
**Project:** 35560 A417 Missing Link  
**Quotation No.:** **Date Received:** 20-Jan-2020  
**Order No.:** 35560/LAB **Date Instructed:** 20-Jan-2020  
**No. of Samples:** 9  
**Turnaround (Wkdays):** 5 **Results Due:** 24-Jan-2020  
**Date Approved:** 23-Jan-2020

**Approved By:**



**Details:** Ken Scally, Technical Director

---

## Results - Soil

**Project: 35560 A417 Missing Link**

<b>Client: Geotechnical Engineering Ltd</b>		<b>Chemtest Job No.:</b>											
Quotation No.:	<b>Chemtest Sample ID.:</b>	20-01596	20-01596	20-01596	20-01596	20-01596	20-01596	20-01596	20-01596	20-01596	20-01596	20-01596	
	Client Sample ID.:	27Cs	11Cs	23Cs	26Cs	28Cs	9Cs	7Cs	28Cs	27Cs			
	Sample Location:	DSRC218	DSRC220	DSRC220	DSRC326	DSRC327	DSRC329	DSRCOH400	DSRCOH400	DSRCOH412			
	Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
	Top Depth (m):	18.90	5.40	14.30	20.85	17.44	2.80	1.85	14.48	9.15			
	Bottom Depth (m):	19.05	5.55	14.50	21.01	17.71	2.95	2.11	12.84	9.32			
	Date Sampled:	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>									
Moisture	N	2030	%	0.020	7.7	8.3	8.5	4.0	9.2	16	15	15	11
pH	U	2010		4.0	8.4	7.8	8.2	8.4	8.4	7.8	8.2	7.7	7.7
pH (2.5:1)	N	2010		4.0	8.5								
Magnesium (Water Soluble)	N	2120	g/l	0.010	0.015								
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.18	0.70	0.19	0.19	0.20	0.28	< 0.010	0.40	0.67
Total Sulphur	U	2175	%	0.010	0.91	1.4	1.1	0.78	1.3	1.2	0.088	1.3	1.1
Chloride (Water Soluble)	U	2220	g/l	0.010	0.010								
Nitrate (Water Soluble)	N	2220	g/l	0.010	< 0.010								
Sulphate (Acid Soluble)	U	2430	%	0.010	0.13	0.41	0.21	0.11	0.17	0.22	0.074	0.21	0.35

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measurement by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.



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### **Sample Deviation Codes**

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- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 45 days from the date of receipt

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**Project: 35560 A417 Missing Link**

<b>Client: Geotechnical Engineering Ltd</b>	<b>Chemtest Job No.:</b>		20-01757	20-01757	20-01757	20-01757	20-01757	20-01757		
Quotation No.: Q20-19309	<b>Chemtest Sample ID.:</b>		956472	956473	956474	956475	956476	956477		
	Client Sample ID.:		5B	5B	1LB	B3	1LB	7B		
	Sample Location:		TP620	TP622A	TP622A	TP628	TP628	TP628		
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
	Top Depth (m):		1.60	2.00	0.30	1.00	0.40	2.80		
	Bottom Depth (m):		1.80	2.00	0.50	1.10	0.60	2.90		
	Date Sampled:		17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020	17-Jan-2020		
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>						
Moisture	N	2030	%	0.020	19	13	20	24	28	16
Carbonate	N	2260	%	0.10	14	16	< 0.10	1.4	1.1	23

<b>SOP</b>	<b>Title</b>	<b>Parameters included</b>	<b>Method summary</b>
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2260	Carbonate	Carbonate	Titration

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2718

GEOTECHNICAL ENGINEERING LIMITED



For the attention of Edward Crimp / David Owen


Version No. 2  
Page No. 1 of 9  
Date of Issue 03/09/2020

**TEST REPORT**

PROJECT/SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION-PHASE 2A (1118)	Samples received	02/07/2020
GEL REPORT NUMBER	35560/03	Schedule received	02/07/2020
Test report refers to	Schedule B (TP211)	Testing commenced	09/07/2020
		Status	Final

**SUMMARY OF RESULTS ATTACHED**

TEST METHOD & DESCRIPTION	QUANTITY	ACCREDITED TEST
BS EN ISO 17892-1: 2014:5. Water Content	4	YES
BS1377: Part 2: 1990:4.2-4.4&5.2-5.4, Liquid & Plastic Limits	4	YES
BS EN ISO 17892-4: 2016: 5.2, Particle Size Distribution - Wet Sieve	2	YES
BS EN ISO 17892-4: 2016: 5.4, Particle Size Distribution - Pipette	2	YES
BS1377: Part 7: 1990:4.5, Determination of Shear Strength by Direct Shear	1	YES
BS1377: Part 8: 1990: Effective Stress Testing	1	YES
Carbonate Content by Titration (Subcontracted)	1	NO

Remarks This report may not be partially reproduced without written permission from this laboratory.  The results reported relate to samples received in the laboratory	Approved Signatories: T Best (Deputy Laboratory Manager) E Crimp (Senior Engineer) J Hanson (Director) N Parry (Director)  
--	---

Doc TR01 Rev No. 22 Revision date 02/01/20 DC:JH

**Geotechnical Engineering Ltd**  
Centurion House  
Olympus Park, Quedgeley  
Gloucester GL2 4NF

[www.geoeng.co.uk](http://www.geoeng.co.uk)  
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TEL: 01452 527743  
Fax: 01452 729314

Registered number: 00700739  
VAT Number: 682 5857 89

Payments: Geotechnical Engineering Limited  
Sort code: 16-22-11 Bank account: 11125135

# LIQUID AND PLASTIC LIMITS

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
TP211	4D	0.30	0.30	15.1	BXE	39	71	29	42	Brown slightly sandy gravelly silty CLAY
TP211	6D	0.50	0.50	18.1	BXE	42	72	27	45	Brown slightly sandy gravelly silty CLAY
TP211	9BLK	1.10	1.10	33.9	BXE	2	75	28	47	Brown slightly gravelly slightly sandy silty CLAY
TP211	11D	2.00	2.00	51.0	BXE	1	87	35	52	Brown slightly gravelly slightly sandy silty CLAY

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

specimen preparation

A - as received

B - washed on 0.425mm sieve

C - air dried

D - oven dried (60°C)

E - oven dried (105°C)

F - not known

test method

X - cone penetrometer (test 4.3)

Y - cone penetrometer (test 4.4)

Z - casagrande apparatus (test 4.5)

CONTRACT

**35560/03**

CHECKED

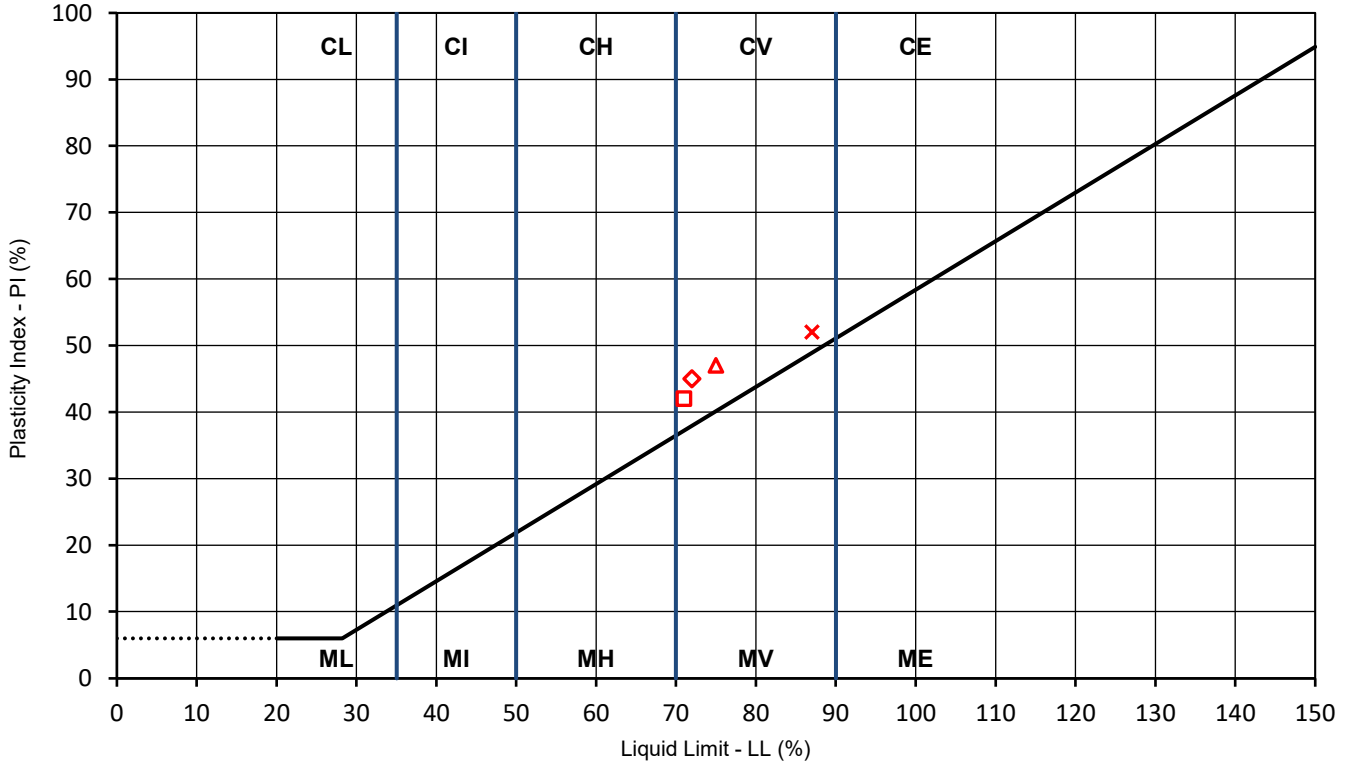
**TB**

Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	TP211	0.30	71	29	42	
◇	TP211	0.50	72	27	45	
△	TP211	1.10	75	28	47	
×	TP211	2.00	87	35	52	

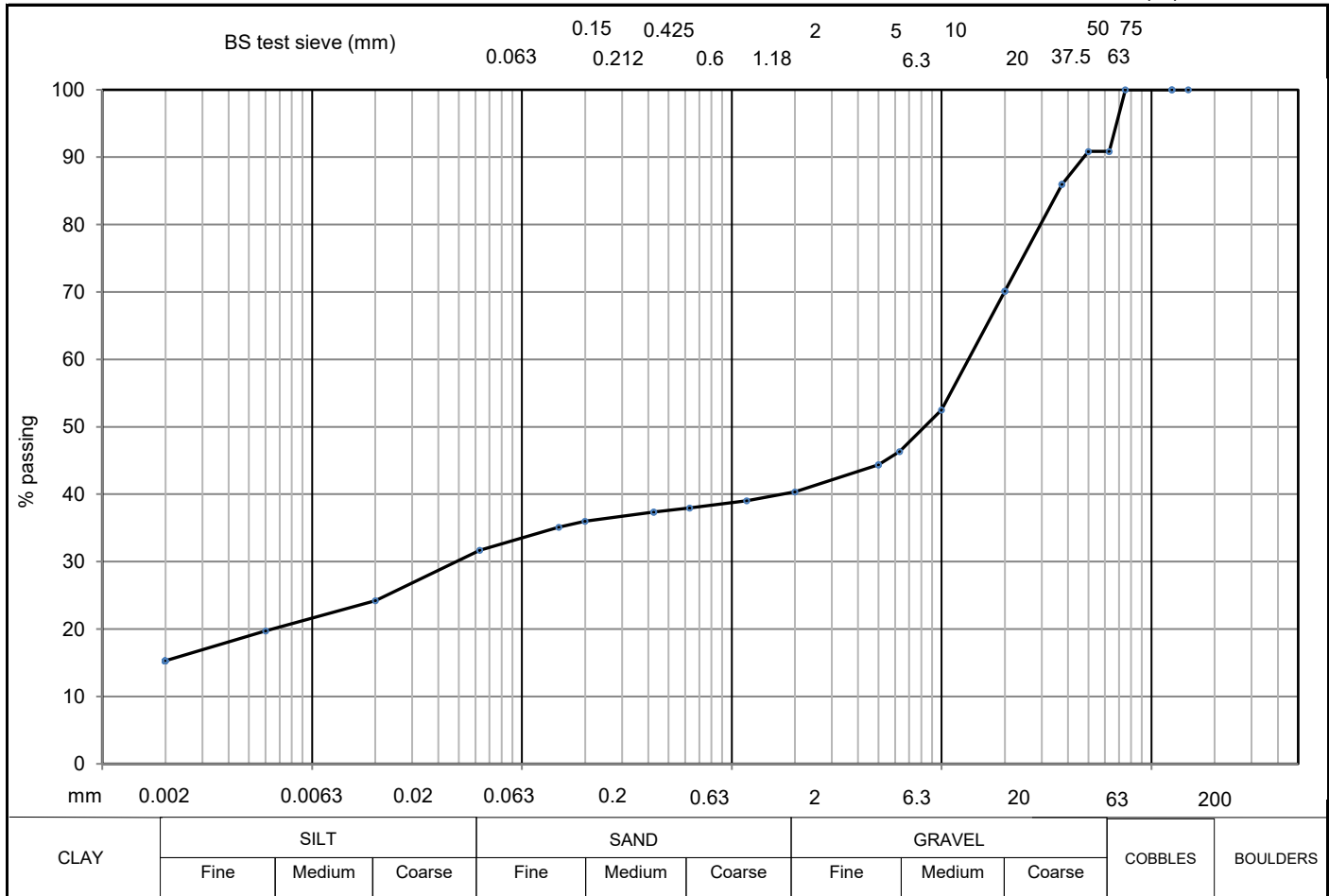
CONTRACT	CHECKED
<b>35560/03</b>	<b>TB</b>



Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP211
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	3LB
DESCRIPTION	Brown slightly sandy gravelly silty CLAY with medium cobble content	SAMPLE DEPTH (m)	0.30
		SPECIMEN TOP (m)	0.30
		SPECIMEN BASE (m)	0.50



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	15			5	44	20	24
SILT	16	150		2	40	6	20
SILT & CLAY	32			1.18	39	2	15
SAND	9	75	100				
GRAVEL	51						
COBBLE & BOULDER	9	63	91				
test method(s)	5.2 & 5.4	50	91	0.63	38		
test method		37.5	86	0.425	37		
5.2 - sieving		20	70	0.2	36		
5.3 - sedimentation by hydrometer		10	53	0.15	35		
5.4 - sedimentation by pipette		6.3	46	0.063	32		

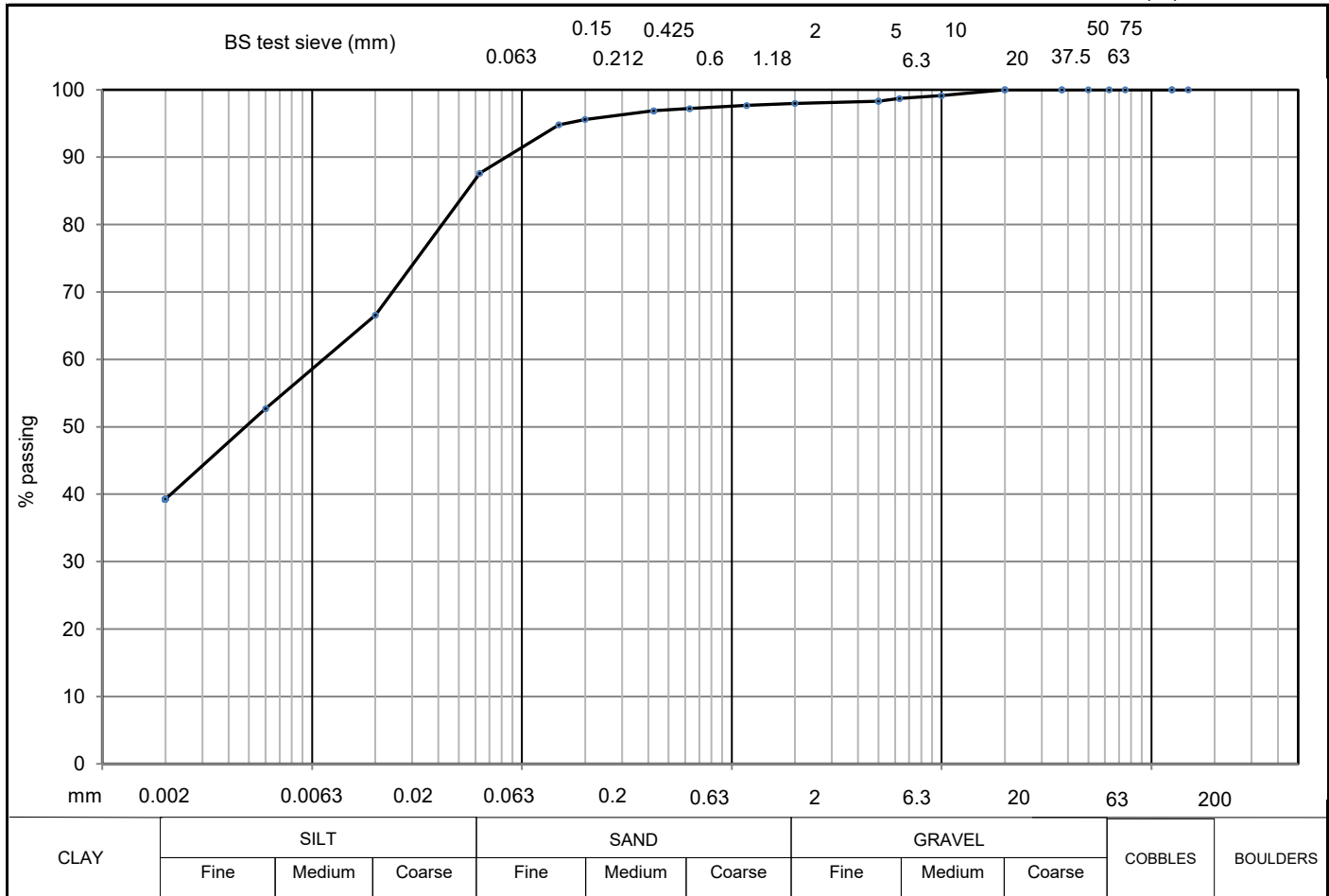
remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35560/03</b>	<b>CHECKED</b> <b>TB</b>
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# PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP211
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1118)	SAMPLE No./TYPE	7LB
DESCRIPTION	Brown slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	1.00
		SPECIMEN TOP (m)	1.00
		SPECIMEN BASE (m)	1.20



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	39						
SILT	48	150		5	98	20	67
SILT & CLAY	88						
SAND	10	75		2	98	6	53
GRAVEL	2						
COBBLE & BOULDER	0	63		1.18	98	2	39
test method(s)	5.2 & 5.4	50		0.63	97		
test method		37.5		0.425	97		
5.2 - sieving		20	100	0.2	96		
5.3 - sedimentation by hydrometer		10	99	0.15	95		
5.4 - sedimentation by pipette		6.3	99	0.063	88		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	CONTRACT <b>35560/03</b>	CHECKED <b>TB</b>
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# SHEAR STRENGTH BY DIRECT SHEAR



BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No. TP211

SAMPLE No./TYPE 9BLK

SITE HE551505 A417 Missing Link Ground Investigation - Phase 2A (1118)

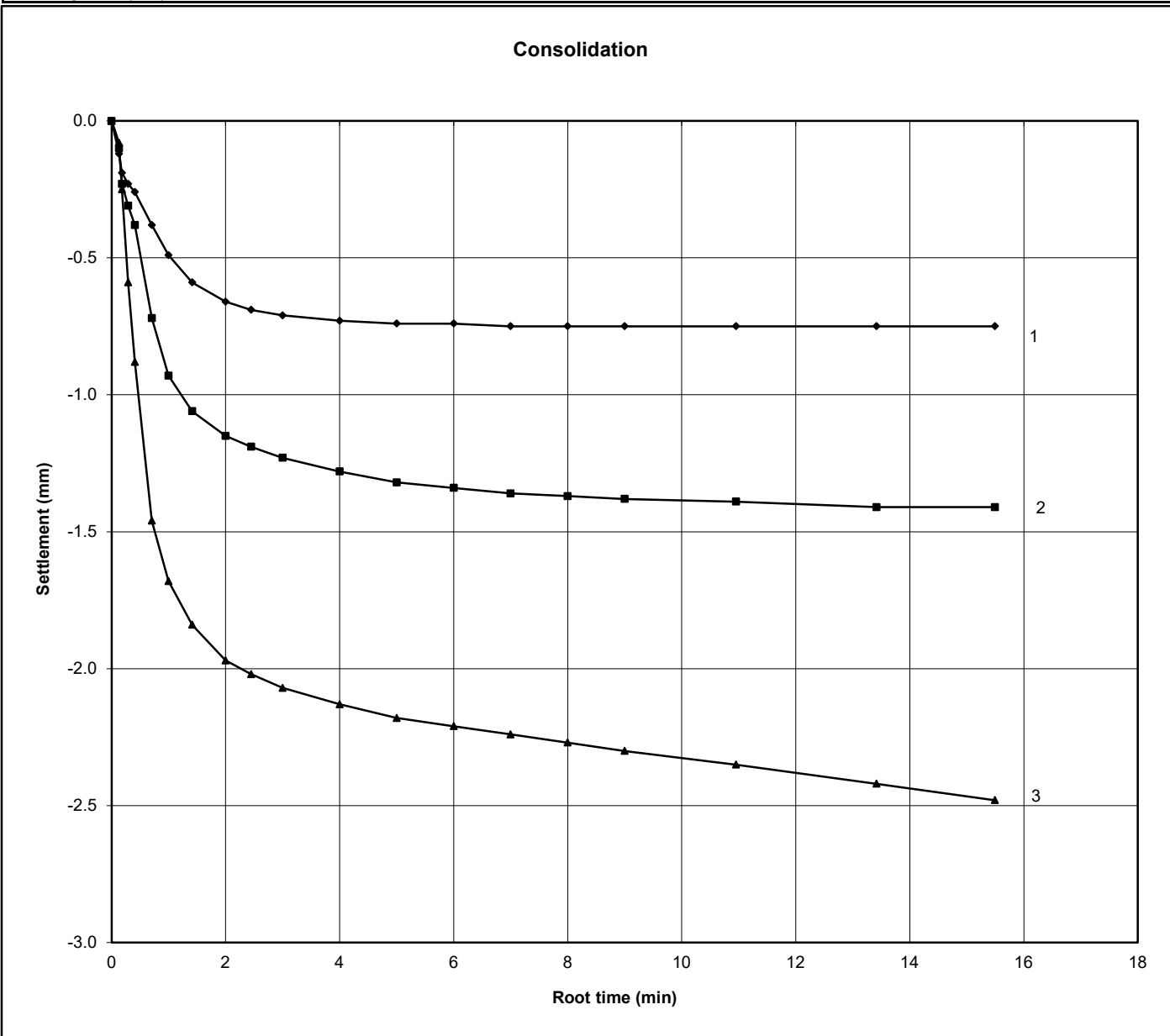
SAMPLE DEPTH (m) 1.10-1.25

SPECIMEN DEPTH (m) 1.10-1.25

DESCRIPTION Orangish brown slightly sandy silty CLAY

PREPARATION DETAILS Remoulded using a tamping rod - 0% removed (retained on 2mm sieve).

CONSOLIDATION STAGE RESULTS			
Specimen	1	2	3
t100 (min)	2.80	2.30	1.60
t <sub>f</sub> (min)	35.56	29.21	20.32
Machine speed (mm/min)	0.0100	0.0100	0.0100
Normal Stress (kPa)	50	100	200
Initial height (mm)	19.90	19.90	19.90
Final height (mm)	19.15	18.49	17.42



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remarks: Specimens are submerged throughout the test.	CONTRACT	CHECKED
	<b>35560/03</b>	<b>NP</b>



# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

TP211

SAMPLE No./TYPE

9BLK

SITE HE551505 A417 Missing Link Ground Investigation - Phase 2A (1118)

SAMPLE DEPTH (m)

1.10-1.25

SPECIMEN DEPTH (m)

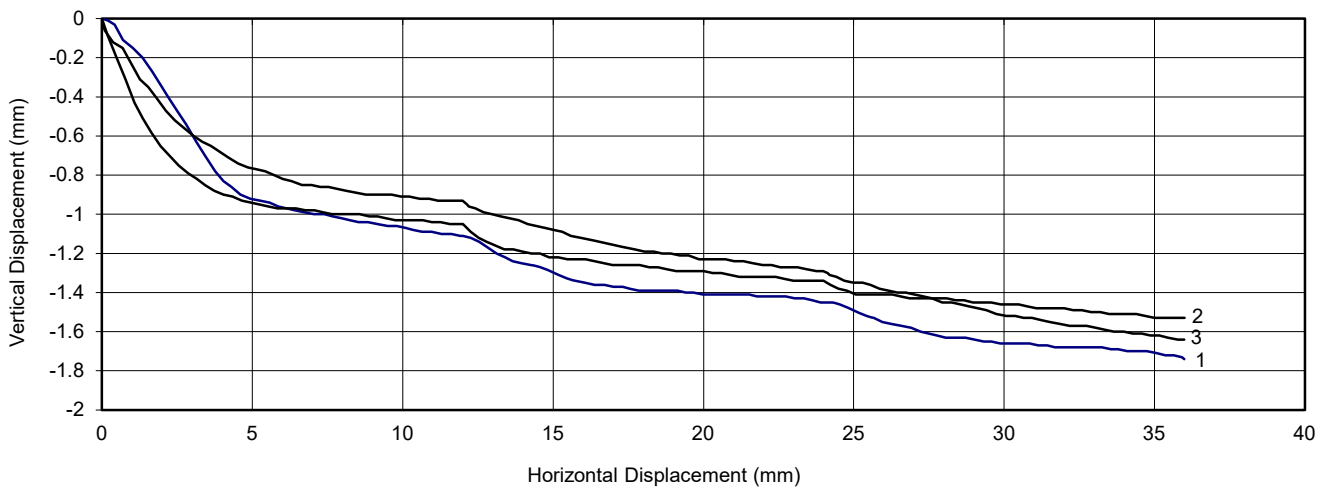
1.10-1.25

DESCRIPTION Orangish brown slightly sandy silty CLAY

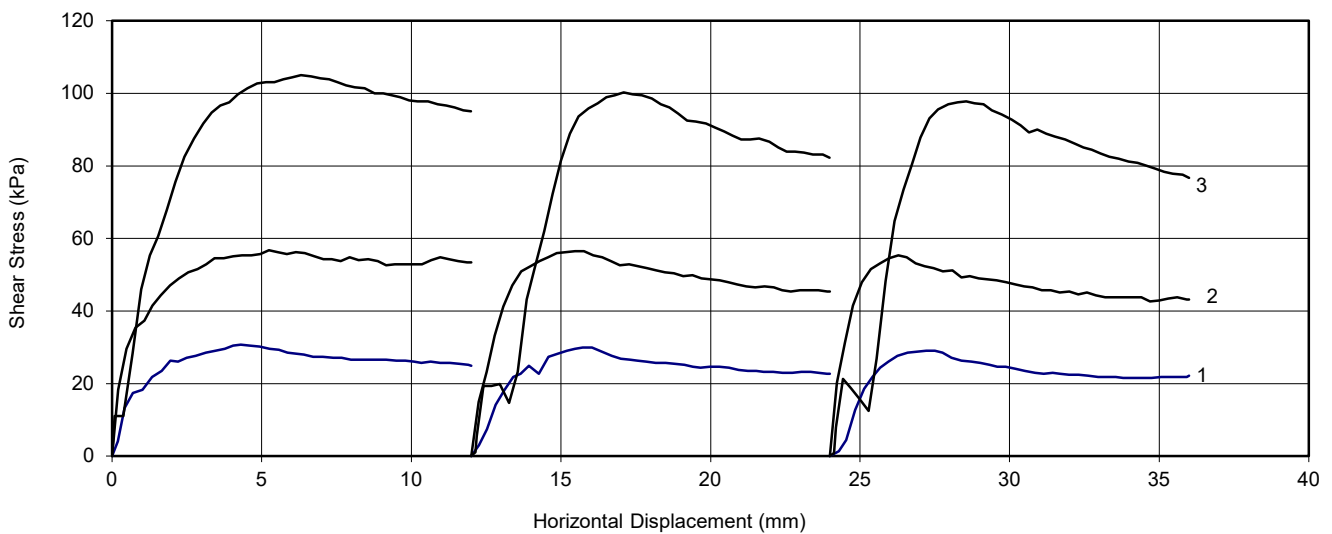
**SHEAR STAGE RESULTS**

Specimen	1	2	3
Peak Shear Strength (kPa)	30.7	56.8	105.0
Residual Shear Strength (kPa)	21.6	42.7	76.7
Cum. Vertical Displ. (mm)	-1.740	-1.530	-1.640
Cum. Forward Displ. (mm)	35.990	36.000	35.990
Normal Stress (kPa)	50	100	200

**Vertical Displacement**



**Shear Stress**



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remarks:

slow machine reversal

CONTRACT

**35560/03**

CHECKED

**NP**

# SHEAR STRENGTH BY DIRECT SHEAR



BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No. TP211

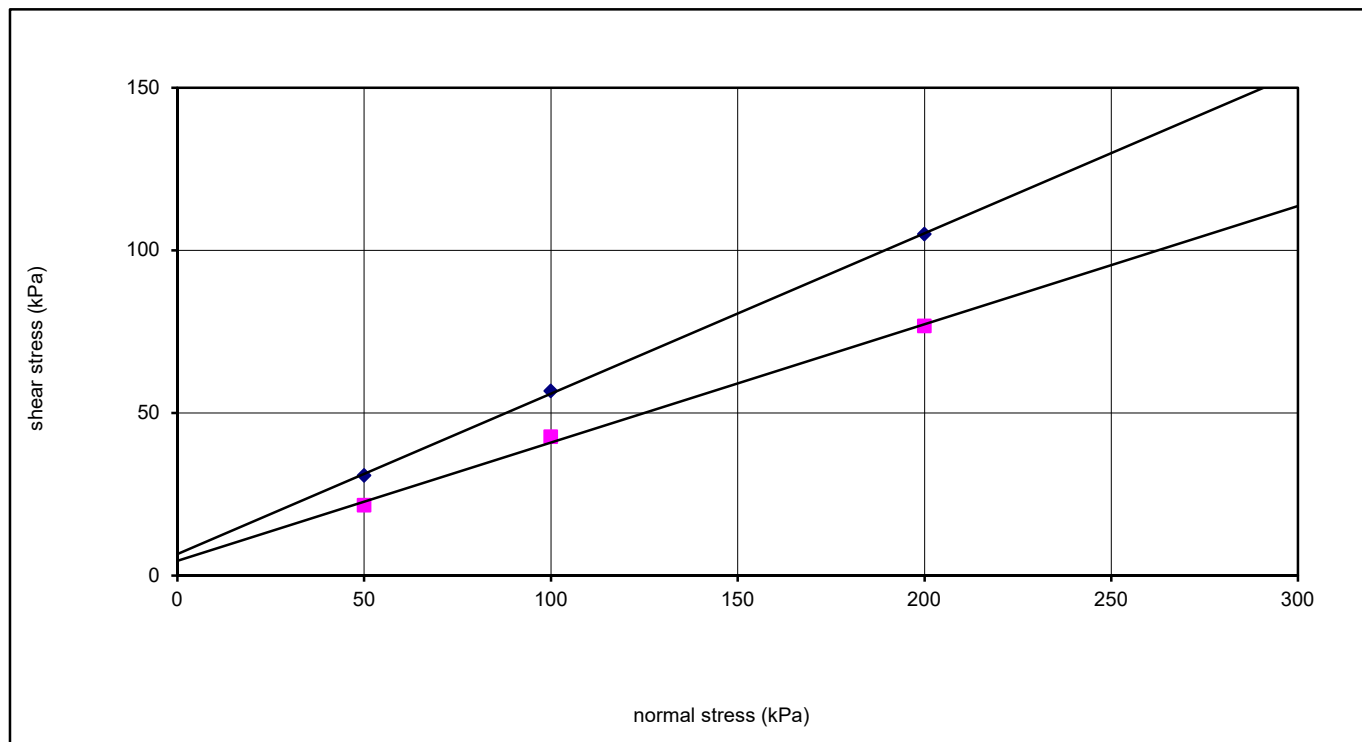
SITE HE551505 A417 Missing Link Ground Investigation - Phase 2A (1118)

SAMPLE No./TYPE 9BLK

SAMPLE DEPTH (m) 1.10-1.25

DESCRIPTION Orangish brown slightly sandy silty CLAY

SPECIMEN DEPTH (m) 1.10-1.25



INITIAL CONDITIONS						
				specimen 1	specimen 2	specimen 3
specimen size (mm)	60	moisture content (%)		37.9	32.7	35.2
	Square	bulk density Mg/m <sup>3</sup>		1.61	1.62	1.62
specimen height (mm)	19.90	dry density Mg/m <sup>3</sup>		1.17	1.22	1.20
		voids ratio		1.315	1.217	1.259
particle density (Mg/m <sup>3</sup> )	2.70 #	degree of saturation (%)		78	73	76
		strain rate (mm/min)		0.01	0.01	0.01

SHEARING STAGES						
specimen	normal stress (kPa)	peak shear stress (kPa)	horizontal displacement (mm)	residual shear stress (kPa)	traverses (No.)	total forward displacement (mm)
1	50	30.7	4.300	21.6	3	35.990
2	100	56.8	5.240	42.7	3	36.000
3	200	105.0	6.310	76.7	3	35.990

SHEAR STRENGTH PARAMETERS			
peak angle of shearing resistance $\phi'$	26	residual angle of shearing resistance $\phi'_r$	20
peak effective cohesion intercept, $c'$ (kPa)	7	residual effective cohesion intercept, $c'_r$ (kPa)	5

remarks: # denotes particle density has been assigned an assumed value.	CONTRACT	CHECKED
	<b>35560/03</b>	<b>NP</b>

◆ peak ■ residual

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# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	TP211
SITE	HE551505 A417 Missing Link Ground Investigation - Phase 2A (1118)	SAMPLE No./TYPE	9BLK
		SAMPLE DEPTH (m)	1.10-1.25
DESCRIPTION	Orangish brown slightly sandy silty CLAY	SPECIMEN DEPTH (m)	1.10-1.25

**TYPE OF SPECIMEN** Undisturbed / Vertical  
**TYPE OF TEST** Multi Specimen Single Stage  
**SIDE DRAINS FITTED** yes  
**DRAINAGE CONDITIONS** One end and radial boundary

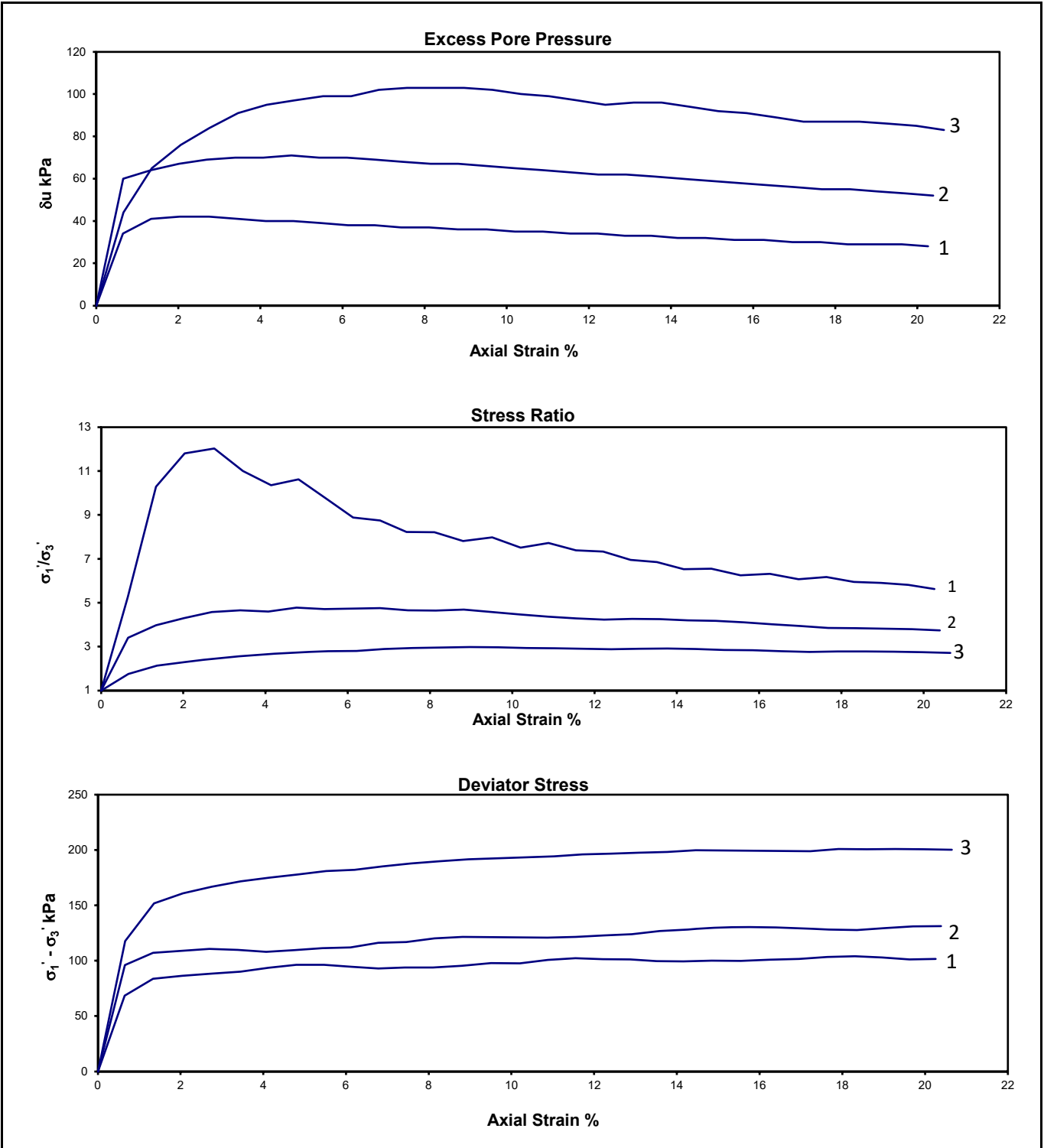
		SPECIMEN	1	2	3
<b>INITIAL CONDITIONS</b>	Length	mm	76.11	76.15	76.2
	Diameter	mm	37.89	37.95	37.86
	Moisture Content	%	31	28	31
	Bulk Density	Mg/m <sup>3</sup>	1.82	1.82	1.74
	Dry Density	Mg/m <sup>3</sup>	1.40	1.42	1.33
<b>FINAL CONDITIONS</b>	Moisture Content	%	39	37	37
	Bulk Density	Mg/m <sup>3</sup>	1.98	2.04	1.98
	Dry Density	Mg/m <sup>3</sup>	1.42	1.50	1.45
<b>SATURATION</b> (by cell pressure and back pressure increments)	Initial PWP	kPa	-4	-5	-4
	Saturated PWP	kPa	631	383	382
	Final Cell Pressure	kPa	640	400	400
	B Value		0.95	1	1
<b>CONSOLIDATION</b>	Cell Pressure	kPa	640	540	640
	Back Pressure	kPa	590	440	440
	Initial PWP	kPa	632	522	619
	Final PWP	kPa	590	436	447
<b>COMPRESSION</b>	Cell Pressure	kPa	640	540	640
	Back Pressure	kPa	590	440	440
	$\sigma_3$	kPa	50	100	200
	Rate of Strain	%/hr	1.345	1.345	1.345
<b>FAILURE CONDITIONS</b> (based on maximum deviator stress)	Strain ( $\epsilon$ )	%	18.3	20.4	19.3
	$\delta u$	kPa	29	52	86
	$\sigma_{3f}$	kPa	21	48	114
	$(\sigma_1' - \sigma_3')_f$	kPa	104	131	201
Membrane correction of 0.1kPa/% strain applied to the deviator stress. Side drain correction of 10kPa applied to deviator stress (38mm diameter).					
<b>FAILURE MODE</b> (also see photographs)		INTER	BARREL	BARREL	
		<b>EFFECTIVE STRESS PARAMETERS</b>	<b>c' kPa :</b>	<b><math>\phi'</math> deg :</b>	
			<b>28.5</b>	<b>20.1</b>	
remarks * Calculated values			CONTRACT	CHECKED	
			<b>35560/03</b>	<b>NP</b>	

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	TP211
SITE	HE551505 A417 Missing Link Ground Investigation - Phase 2A (1118)	SAMPLE No./TYPE	9BLK
		SAMPLE DEPTH (m)	1.10-1.25
		SPECIMEN DEPTH (m)	1.10-1.25



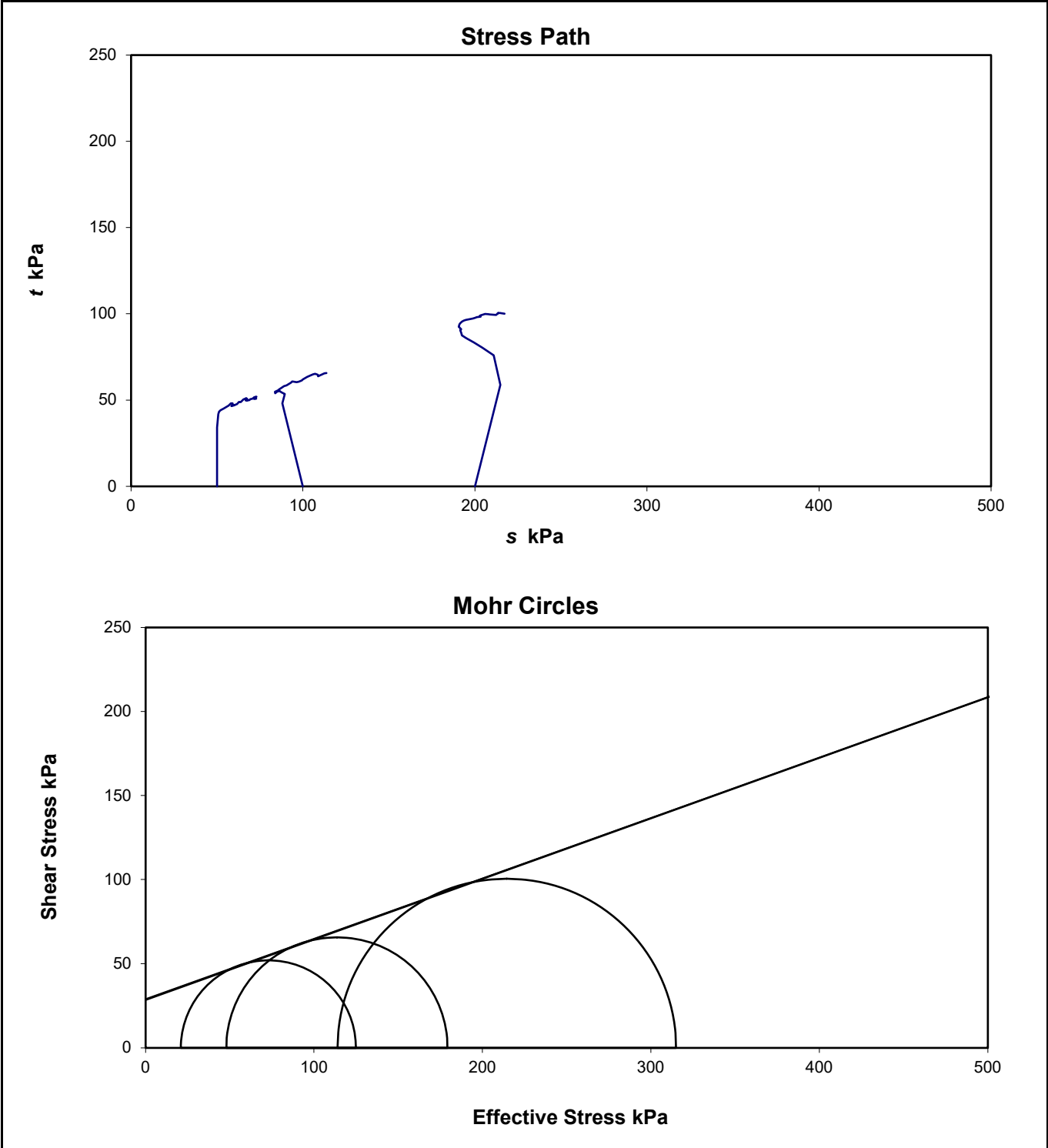
remarks	CONTRACT	CHECKED
	<b>35560/03</b>	<b>NP</b>

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	TP211
SITE	HE551505 A417 Missing Link Ground Investigation - Phase 2A (1118)	SAMPLE No./TYPE	9BLK
		SAMPLE DEPTH (m)	1.10-1.25
		SPECIMEN DEPTH (m)	1.10-1.25



remarks	CONTRACT	CHECKED
	<b>35560/03</b>	<b>NP</b>






# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	TP211
SITE	HE551505 A417 Missing Link Ground Investigation - Phase 2A (1118)	SAMPLE No./TYPE	9BLK
		SAMPLE DEPTH (m)	1.10-1.25
		SPECIMEN DEPTH (m)	1.10-1.25

Specimen 1		Failure Mode <div style="border: 1px solid black; padding: 2px; display: inline-block;">INTER</div>
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Specimen 2		Failure Mode <div style="border: 1px solid black; padding: 2px; display: inline-block;">BARREL</div>
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Specimen 3		Failure Mode <div style="border: 1px solid black; padding: 2px; display: inline-block;">BARREL</div>
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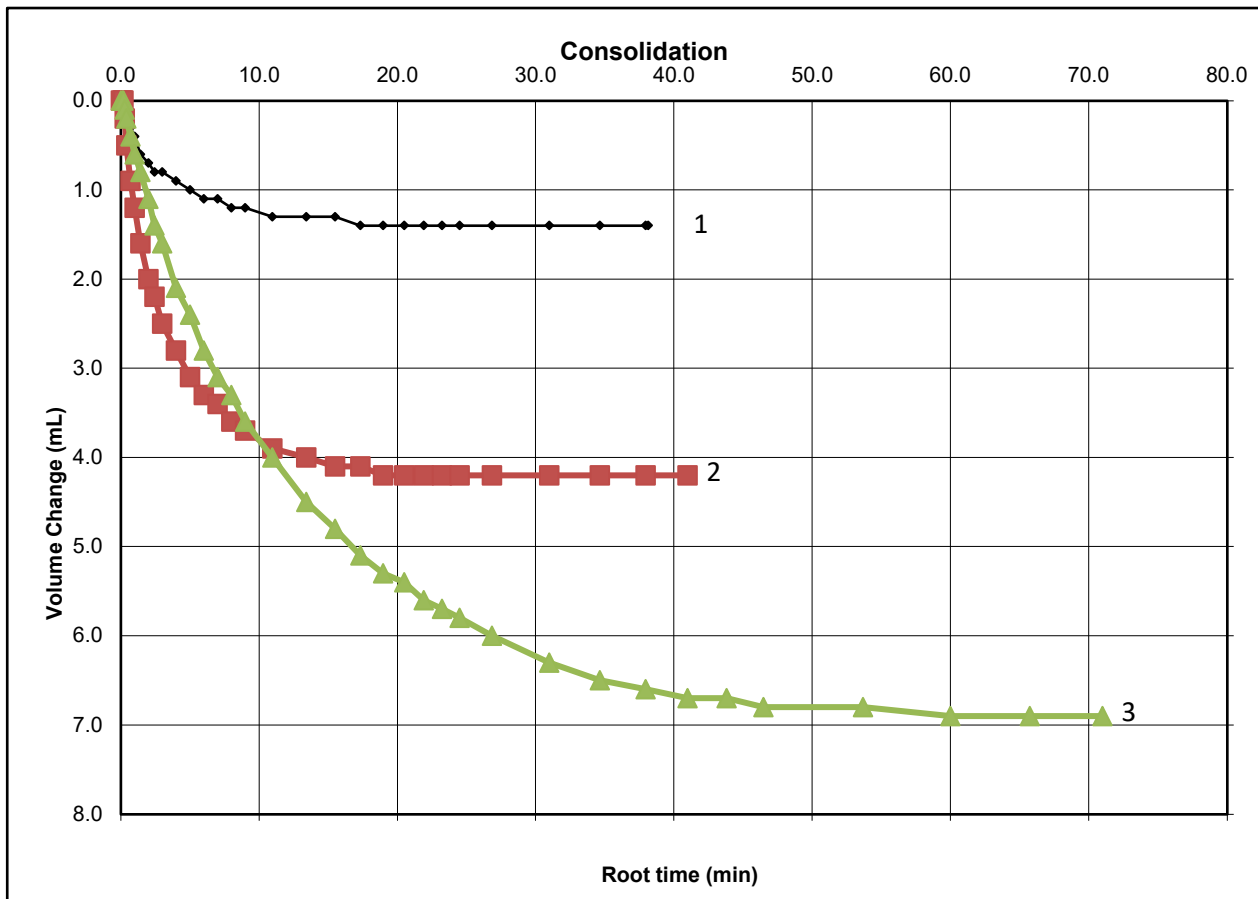
remarks Please note the photos are intended to show the mode of failure only.	CONTRACT <b>35560/03</b>	CHECKED <b>NP</b>
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# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	TP211
SITE	HE551505 A417 Missing Link Ground Investigation - Phase 2A (1118)	SAMPLE No./TYPE	9BLK
		SAMPLE DEPTH (m)	1.10-1.25
		SPECIMEN DEPTH (m)	1.10-1.25



Specimen 1    Specimen 2    Specimen 3

Cell pressure	kPa	640	540	640
Back pressure	kPa	590	440	440
Effective pressure	kPa	50	100	200
Initial PWP	kPa	632	522	619
Final PWP	kPa	590	436	447
PWP Dissipation	%	100.00	104.88	96.09
Volume change	mL	1.4	4.2	6.9
	t100	78.28	64.5	247.88

remarks

CONTRACT  
**35560/03**

CHECKED  
**NP**

# Final Report

---

<b>Report No.:</b>	20-17809-1		
<b>Initial Date of Issue:</b>	16-Jul-2020		
<b>Client</b>	Geotechnical Engineering Ltd		
<b>Client Address:</b>	Centurion House Olympus Park Quedgeley Gloucester Gloucestershire GL2 4NF		
<b>Contact(s):</b>	GEL Tom Best		
<b>Project</b>	35560/03BA417 Missing Link		
<b>Quotation No.:</b>		<b>Date Received:</b>	13-Jul-2020
<b>Order No.:</b>	35560/TB	<b>Date Instructed:</b>	13-Jul-2020
<b>No. of Samples:</b>	1		
<b>Turnaround (Wkdays):</b>	5	<b>Results Due:</b>	17-Jul-2020
<b>Date Approved:</b>	16-Jul-2020		

**Approved By:**



**Details:** Glynn Harvey, Technical Manager

---

## Results - Soil

**Project: 35560/03BA417 Missing Link**

<b>Client: Geotechnical Engineering Ltd</b>	<b>Chemtest Job No.:</b>	20-17809			
Quotation No.:	<b>Chemtest Sample ID.:</b>	1030293			
Order No.: 35560/TB	Client Sample Ref.:	11			
	Client Sample ID.:	D			
	Sample Location:	TP211			
	Sample Type:	SOIL			
	Top Depth (m):	1.1			
	Bottom Depth (m):	1.25			
	Date Sampled:	09-Jul-2020			
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>	
Moisture	N	2030	%	0.020	23
Carbonate	N	2260	%	0.10	0.60

## Test Methods

<b>SOP</b>	<b>Title</b>	<b>Parameters included</b>	<b>Method summary</b>
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2260	Carbonate	Carbonate	Titration

## **Report Information**

### **Key**

---

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

---

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

---

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



2718

GEOTECHNICAL ENGINEERING LIMITED



For the attention of David Owen

Version No. 1  
Page No. 1 of 8  
Date of Issue 24/04/2020

### TEST REPORT

PROJECT/SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1245)	Samples received	02/12/2019
GEL REPORT NUMBER	35560/05	Schedule received	18/03/2020
Test report refers to	DSRC401	Testing commenced	24/03/2020
		Status	Final

### SUMMARY OF RESULTS ATTACHED

TEST METHOD & DESCRIPTION	QUANTITY	ACCREDITED TEST
BS EN ISO 17892-1: 2014:5. Water Content	6	YES
BS1377: Part 2: 1990:4.2-4.4&5.2-5.4, Liquid & Plastic Limits	6	YES
ISRM: 2007: Point Load Strength Test	6	YES
Carbonate Content (subcontracted)	2	NO

Remarks This report may not be partially reproduced without written permission from this laboratory.  The results reported relate to samples received in the laboratory	Approved Signatories: T Best (Deputy Laboratory Manager) E Crimp (Senior Engineer) J Hanson (Director) N Parry (Director) <div style="background-color: black; width: 100px; height: 40px; margin-top: 10px;"></div>
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Doc TR01 Rev No. 22 Revision date 02/01/20 DC:JH

### Geotechnical Engineering Ltd

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Olympus Park, Quedgeley  
Gloucester GL2 4NF

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geotech@geoeng.co.uk  
TEL: 01452 527743  
Fax: 01452 729314

Registered number: 00700739  
VAT Number: 682 5857 89

Payments: Geotechnical Engineering Limited  
Sort code: 16-22-11 Bank account: 11125135

**LIQUID AND PLASTIC LIMITS**

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1245)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
DSRC401	3D	0.90	0.90	12.3	BXE	61	42	17	25	Yellowish brown slightly sandy gravelly CLAY
DSRC401	5Cs	2.65	2.65	13.6	BXE	19	38	15	23	Grey slightly sandy slightly gravelly CLAY/MUDSTONE
DSRC401	7Cs	4.18	4.18	13.3	BXE	5	49	17	32	Grey slightly gravelly slightly sandy CLAY/MUDSTONE
DSRC401	13Cs	8.75	8.75	15.1	BXE	29	50	19	31	Greyish and orangish brown slightly sandy slightly gravelly CLAY/MUDSTONE
DSRC401	20Cs	14.66	14.66	13.3	BXE	9	39	19	20	Grey mottled orangish brown slightly sandy slightly gravelly CLAY/MUDSTONE
DSRC401	23Cs	17.18	17.18	12.4	BXE	39	54	18	36	Grey slightly sandy slightly gravelly CLAY/MUDSTONE

## general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

## specimen preparation

A - as received

B - washed on 0.425mm sieve

C - air dried

D - oven dried (60°C)

E - oven dried (105°C)

F - not known

## test method

X - cone penetrometer (test 4.3)

Y - cone penetrometer (test 4.4)

Z - casagrande apparatus (test 4.5)

CONTRACT

**35560/05**

CHECKED

**EC**

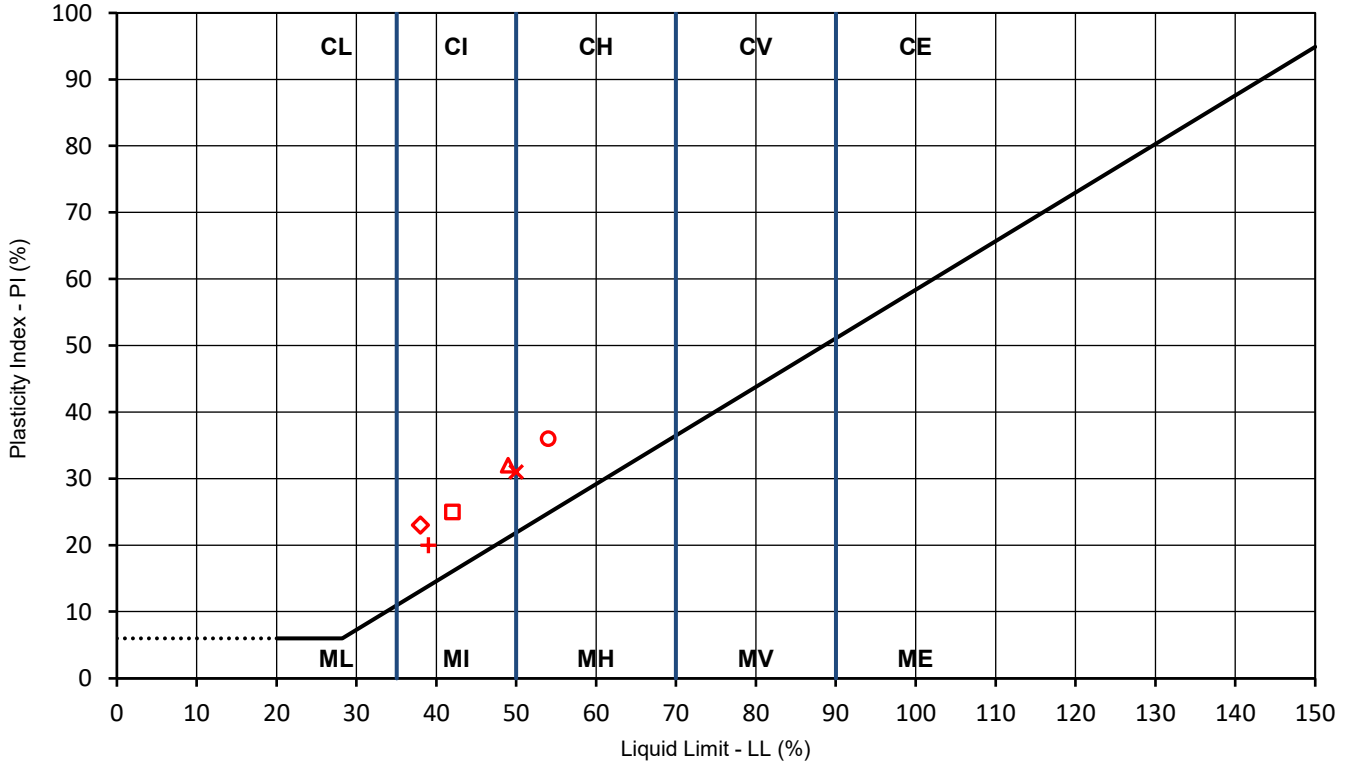


Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1245)



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	DSRC401	0.90	42	17	25	
◇	DSRC401	2.65	38	15	23	
△	DSRC401	4.18	49	17	32	
×	DSRC401	8.75	50	19	31	
+	DSRC401	14.66	39	19	20	
○	DSRC401	17.18	54	18	36	

CONTRACT	CHECKED
<b>35560/05</b>	<b>EC</b>

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1245)

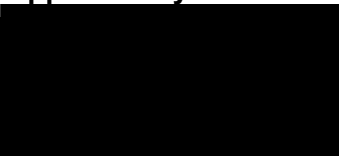
borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
DSRC401	4.25	A	X	N	100		70	0.52	94.41	0.06	1.33	0.08	Grey MUDSTONE
DSRC401	4.25	D	Y	N		70	100	0.55	100.00	0.06	1.37	0.08	Grey MUDSTONE
DSRC401	5.15	A	X	N	100		50	0.82	79.79	0.13	1.23	0.16	Yellowish brown MUDSTONE
DSRC401	5.15	D	Y	N		60	100	0.23	100.00	0.02	1.37	0.03	Yellowish brown MUDSTONE
DSRC401	6.85	A	X	N	100		40	17.21	71.36	3.38	1.17	3.97	Yellowish brown LIMESTONE
DSRC401	6.85	D	Y	N		50	100	15.00	100.00	1.50	1.37	2.05	Yellowish brown LIMESTONE
DSRC401	8.80	A	X	N	100		60	0.11	87.40	0.01	1.29	0.02	Grey and orangish brown MUDSTONE
DSRC401	8.80	D	Y	N		50	100	0.06	100.00	0.01	1.37	0.01	Grey and orangish brown MUDSTONE
DSRC401	14.70	A	X	N	100		70	1.17	94.41	0.13	1.33	0.17	Grey MUDSTONE
DSRC401	14.70	D	Y	N		70	100	1.07	100.00	0.11	1.37	0.15	Grey MUDSTONE
DSRC401	17.25	A	X	N	100		60	0.70	87.40	0.09	1.29	0.12	Grey MUDSTONE
DSRC401	17.25	D	Y	N		70	100	0.66	100.00	0.07	1.37	0.09	Grey MUDSTONE
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02													
test type		test orientation relative to discontinuities				moisture condition				CONTRACT	CHECKED		
A - axial		X - perpendicular		U - unknown		N - natural moisture content				<b>35560/05</b>	<b>EC</b>		
D - diametral		Y - parallel		P - partially air dried									
I - irregular lump		Z - oblique		S - soaked									

# Final Report

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**Report No.:** 20-09642-1  
**Initial Date of Issue:** 02-Apr-2020  
**Client** Geotechnical Engineering Ltd  
**Client Address:** Centurion House  
Olympus Park  
Quedgeley  
Gloucester  
Gloucestershire  
GL2 4NF  
**Contact(s):** GEL  
Tom Best  
**Project** 35660-5 A417 Missing Link  
**Quotation No.:** Q20-19309 **Date Received:** 30-Mar-2020  
**Order No.:** 35560/LAB **Date Instructed:** 30-Mar-2020  
**No. of Samples:** 2  
**Turnaround (Wkdays):** 5 **Results Due:** 03-Apr-2020  
**Date Approved:** 02-Apr-2020

**Approved By:**



**Details:** Glynn Harvey, Technical Manager

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**Project: 35660-5 A417 Missing Link**

<b>Client: Geotechnical Engineering Ltd</b>	<b>Chemtest Job No.:</b> 20-09642				20-09642	
Quotation No.: Q20-19309	<b>Chemtest Sample ID.:</b> 993333				993334	
	Client Sample ID.:				7Cs	13Cs
	Sample Location:				DSRC401	DSRC401
	Sample Type:				SOIL	SOIL
	Top Depth (m):				4.18	8.75
	Bottom Depth (m):				4.38	8.85
	Date Sampled:				24-Mar-2020	24-Mar-2020
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>		
Moisture	N	2030	%	0.020	9.7	8.3
Carbonate	N	2260	%	0.10	25	22

<b>SOP</b>	<b>Title</b>	<b>Parameters included</b>	<b>Method summary</b>
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2260	Carbonate	Carbonate	Titration

## **Report Information**

### **Key**

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- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

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- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



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GEOTECHNICAL ENGINEERING LIMITED



For the attention of Dave Owen/ Ed Crimp


Version No. 1  
Page No. 1 of 36  
Date of Issue 23/07/2020

**TEST REPORT**

PROJECT/SITE	HE551505 A417 Missing Link Ground Investigation - Phase 2A	Samples received	15/05/2020
GEL REPORT NUMBER	35560/06	Schedule received	15/05/2020
Test report refers to	1158	Testing commenced	01/06/2020
		Status	Final

**SUMMARY OF RESULTS ATTACHED**

TEST METHOD & DESCRIPTION	QUANTITY	ACCREDITED TEST
BS EN ISO 17892-1: 2014:5. Water Content	16	YES
BS1377: Part 2: 1990:4.2-4.4&5.2-5.4, Liquid & Plastic Limits	14	YES
BS EN ISO 17892-4: 2016: 5.2, Particle Size Distribution - Wet Sieve	10	YES
BS EN ISO 17892-4: 2016: 5.4, Particle Size Distribution - Pipette	7	YES
BS1377: Part 4: 1990:3, Dry Density/Moisture Content Relationship (2.5kg)	1	YES
BS1377: Part 4: 1990:3, Dry Density/Moisture Content Relationship (4.5kg)	1	YES
BS1377: Part 7: 1990:4.5, Determination of Shear Strength by Direct Shear	1	YES
BS1377: Part 4: 1990:7, California Bearing Ratio (CBR)	3	YES
ISRM: Suggested Methods: 2007: Uniaxial Compressive Strength of Rock	6	YES
ISRM: 2007: Point Load Strength Test	55	YES
BS EN 1097-2:2010, Fragmentation of Aggregate- Los Angeles Method (Subcontracted)	3	YES
BRE SD1 Reduced Suite: pH, Sulphate - water and acid soluble, sulphur (Subcontracted)	4	YES

Remarks This report may not be partially reproduced without written permission from this laboratory.  The results reported relate to samples received in the laboratory	Approved Signatories: <b>T Best (Deputy Laboratory Manager)</b> E Crimp (Senior Engineer) J Hanson (Director) N Parry (Director) 
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Doc TR01 Rev No. 22 Revision date 02/01/20 DC:JH

**Geotechnical Engineering Ltd**

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VAT Number: 682 5857 89

Payments: Geotechnical Engineering Limited  
Sort code: 16-22-11 Bank account: 11125135

**LIQUID AND PLASTIC LIMITS**

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
DSRC310	8D	1.20	1.20	10.8	BYE	57	27	NP		Brown sandy very silty GRAVEL
DSRC311	8D	0.95	0.95	33.3	BXE	12	73	31	42	Brown slightly sandy gravelly silty CLAY
RC520	18Cs	16.05	16.05	21.9	BXE	7	66	23	43	Grey slightly gravelly slightly sandy CLAY
RC520	23Cs	20.50	20.50	9.9	E					Grey slightly gravelly slightly sandy SILT
TP210	1ES	0.10	0.10	41.1	BXE	3	80	45	35	Dark brown slightly sandy clayey SILT with frequent rootlets
TP210	4B	1.00	1.00	11.4	BXE	49	30	19	11	Brown slightly sandy gravelly clayey SILT
TP210	6B	2.90	2.90	21.2	BXE	13	56	21	35	Light greyish brown slightly sandy slightly gravelly silty CLAY
TP603	1B	0.10	0.10	61.6	BXE	4	100	37	63	Dark brown slightly gravelly slightly sandy silty CLAY with rare rootlets
TP603	4B	2.00	2.00	38	BXD	0	78	25	53	Light brown slightly sandy silty CLAY
TP605	3B	0.50	0.50	28.4	BXE	14	56	25	31	Brown slightly sandy slightly gravelly clayey SILT
TP619	1B	0.30	0.30	33.6	BXE	2	74	27	47	Brown slightly sandy silty CLAY with rare rootlets
TP619	2B	0.90	0.90	27.9	BXE	1	67	21	46	Orangish brown slightly gravelly slightly sandy silty CLAY with rare rootlets
TP619	3B	1.90	1.90	30.7	BXE	4	75	26	49	Orangish brown slightly gravelly slightly sandy silty CLAY
TP619	4B	2.50	2.50	30.6	BXE	6	70	25	45	Light greyish brown slightly sandy slightly gravelly silty CLAY
TP634	3B	0.50	0.50	15.6	E					Brown very clayey very gravelly SAND
TP637	4B	1.00	1.00	27.7	BXE	1	74	22	52	Orangish brown mottled grey slightly sandy silty CLAY

## general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

specimen preparation		test method	CONTRACT	CHECKED
A - as received	D - oven dried (60oC)	X - cone penetrometer (test 4.3)	<b>35560/06</b>	<b>TB</b>
B - washed on 0.425mm sieve	E - oven dried (105oC)	Y - cone penetrometer (test 4.4)		
C - air dried	F - not known	Z - casagrande apparatus (test 4.5)		

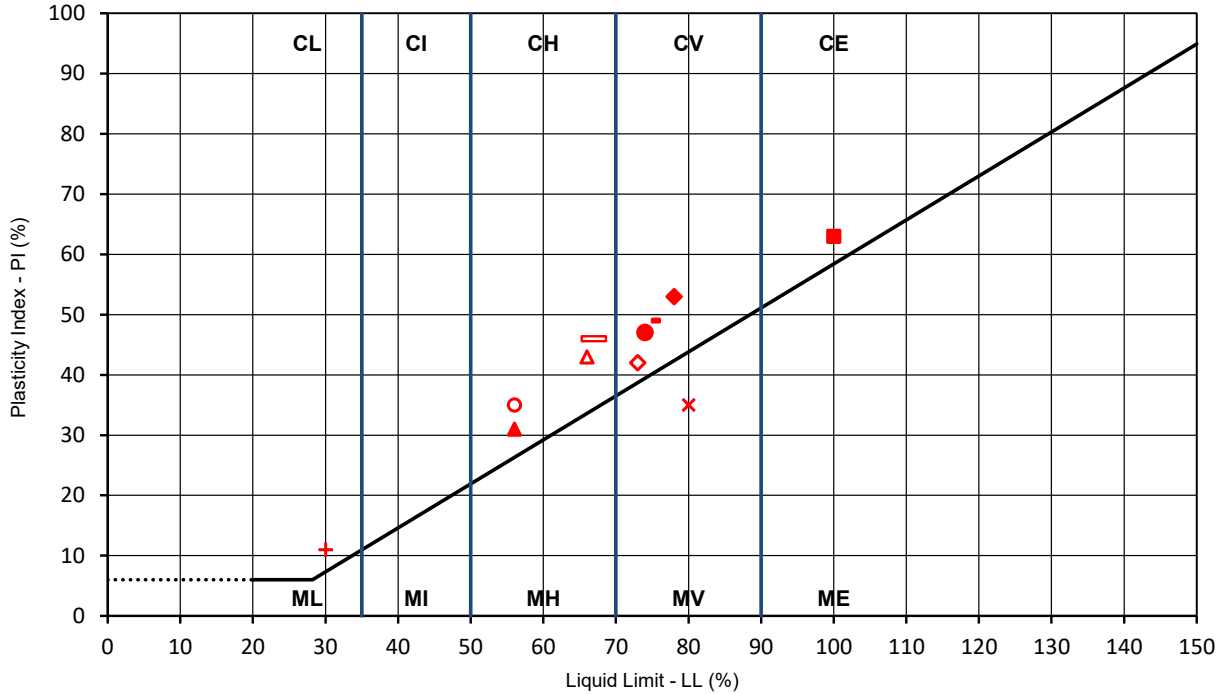


Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A  
 (1158)



BH/TP No.	depth (m)	LL	PL	PI	remarks	
DSRC310	1.20	27	NP			
◇	DSRC311	0.95	73	31	42	
△	RC520	16.05	66	23	43	
×	TP210	0.10	80	45	35	
+	TP210	1.00	30	19	11	
○	TP210	2.90	56	21	35	
■	TP603	0.10	100	37	63	
◆	TP603	2.00	78	25	53	
▲	TP605	0.50	56	25	31	
●	TP619	0.30	74	27	47	
▢	TP619	0.90	67	21	46	
▪	TP619	1.90	75	26	49	

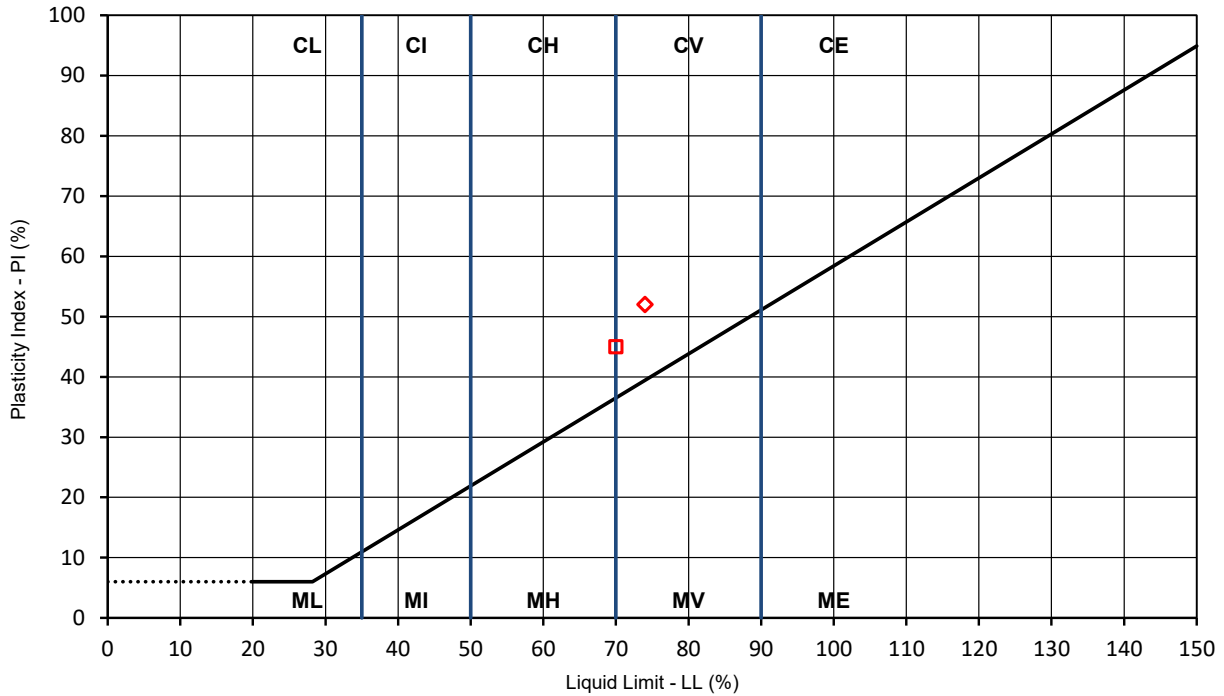
CONTRACT	CHECKED
<b>35560/06</b>	<b>TB</b>

Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A  
 (1158)



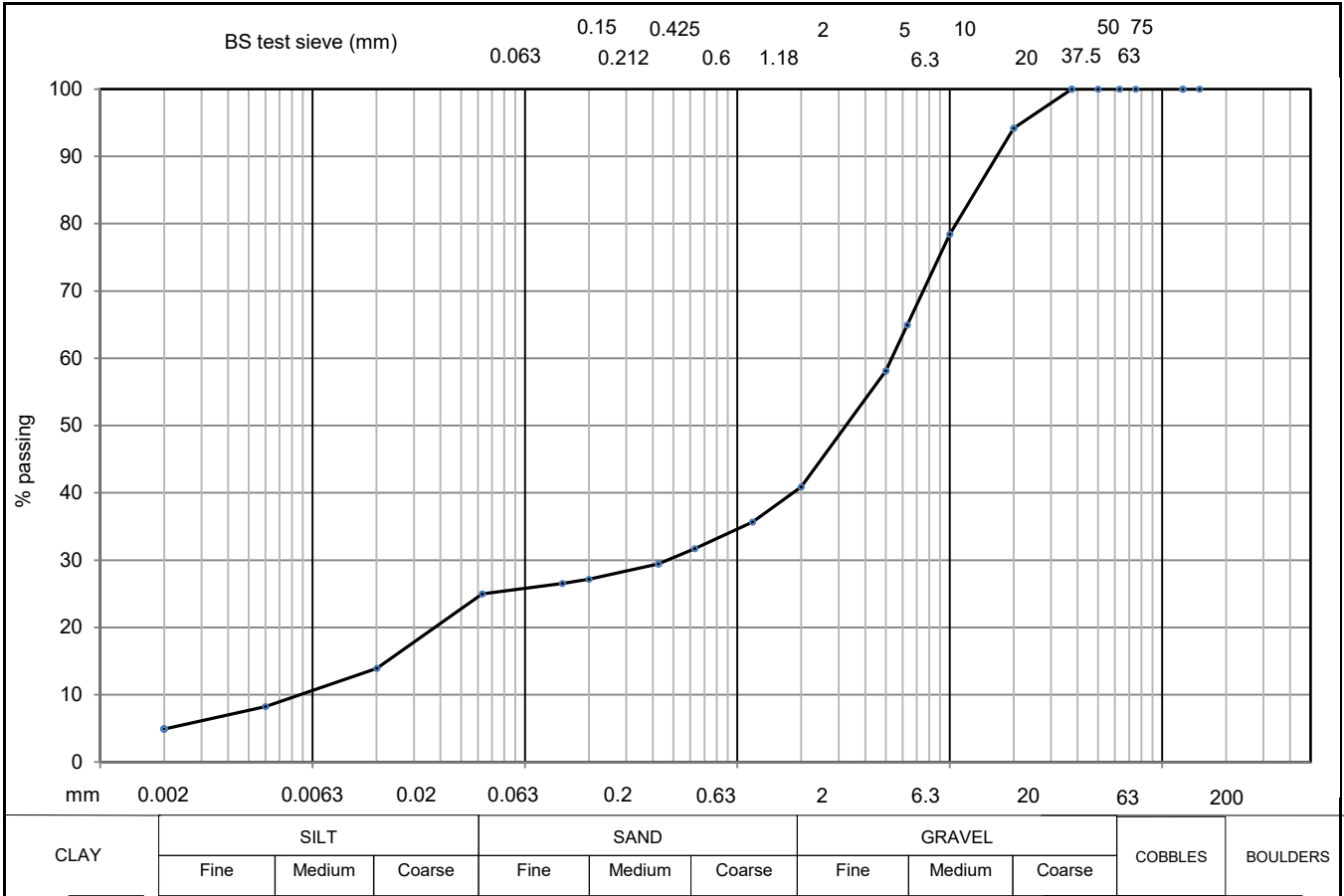
BH/TP No.	depth (m)	LL	PL	PI	remarks
□ TP619	2.50	70	25	45	
◇ TP637	1.00	74	22	52	

CONTRACT	CHECKED
<b>35560/06</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC310
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)	SAMPLE No./TYPE	7B
DESCRIPTION	Brown sandy very silty GRAVEL	SAMPLE DEPTH (m)	1.00
		SPECIMEN TOP (m)	1.00
		SPECIMEN BASE (m)	1.20



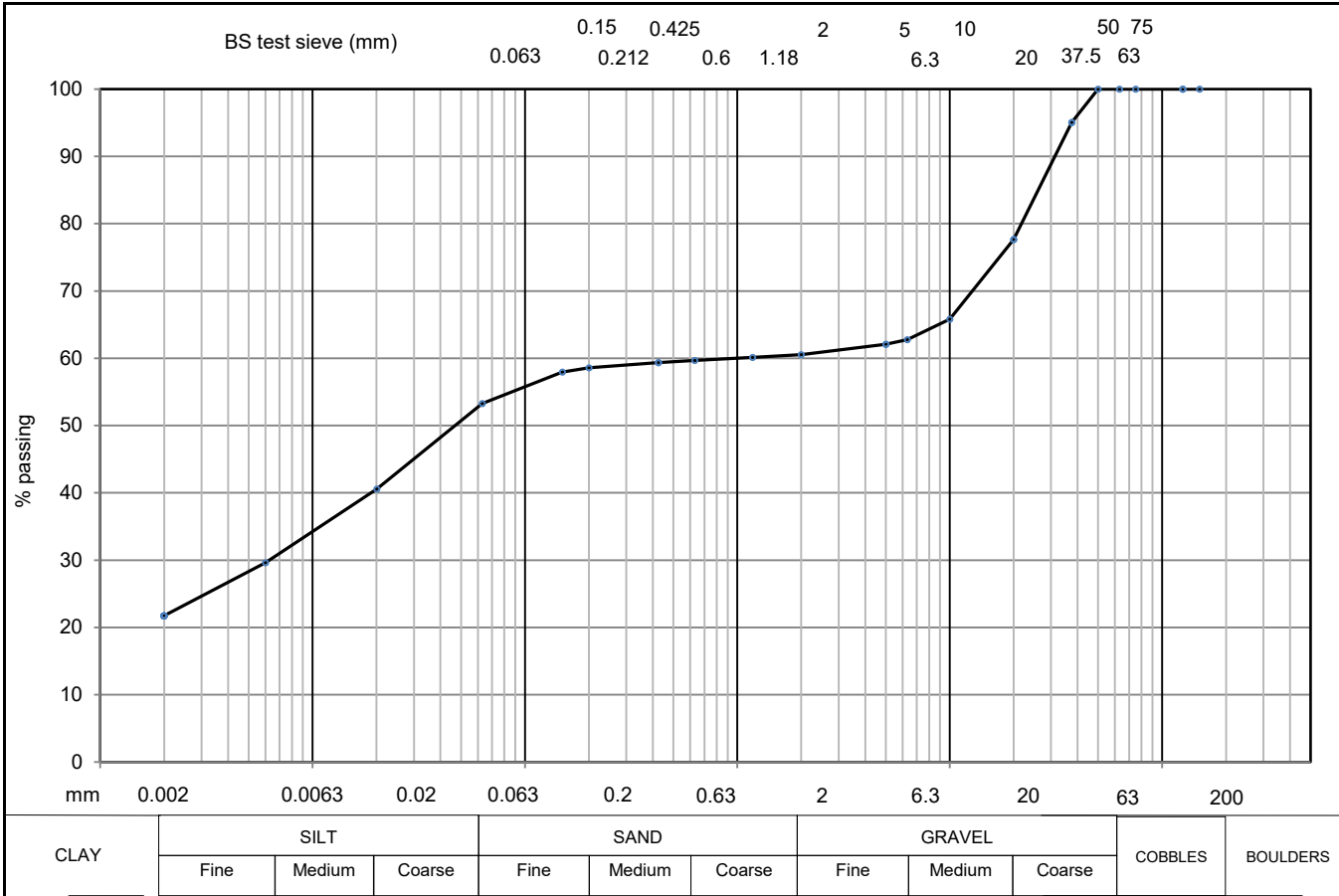
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	5			5	58	20	14
SILT	20	150		2	41	6	8
SILT & CLAY	25	75		1.18	36	2	5
SAND	16						
GRAVEL	59						
COBBLE & BOULDER	0	63					
test method(s)	5.2 & 5.4	50		0.63	32		
test method		37.5	100	0.425	29		
5.2 - sieving		20	94	0.2	27		
5.3 - sedimentation by hydrometer		10	78	0.15	27		
5.4 - sedimentation by pipette		6.3	65	0.063	25		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35560/06</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC311
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)	SAMPLE No./TYPE	7B
DESCRIPTION	Brown slightly sandy gravelly silty CLAY	SAMPLE DEPTH (m)	0.95
		SPECIMEN TOP (m)	0.95
		SPECIMEN BASE (m)	1.20



CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		

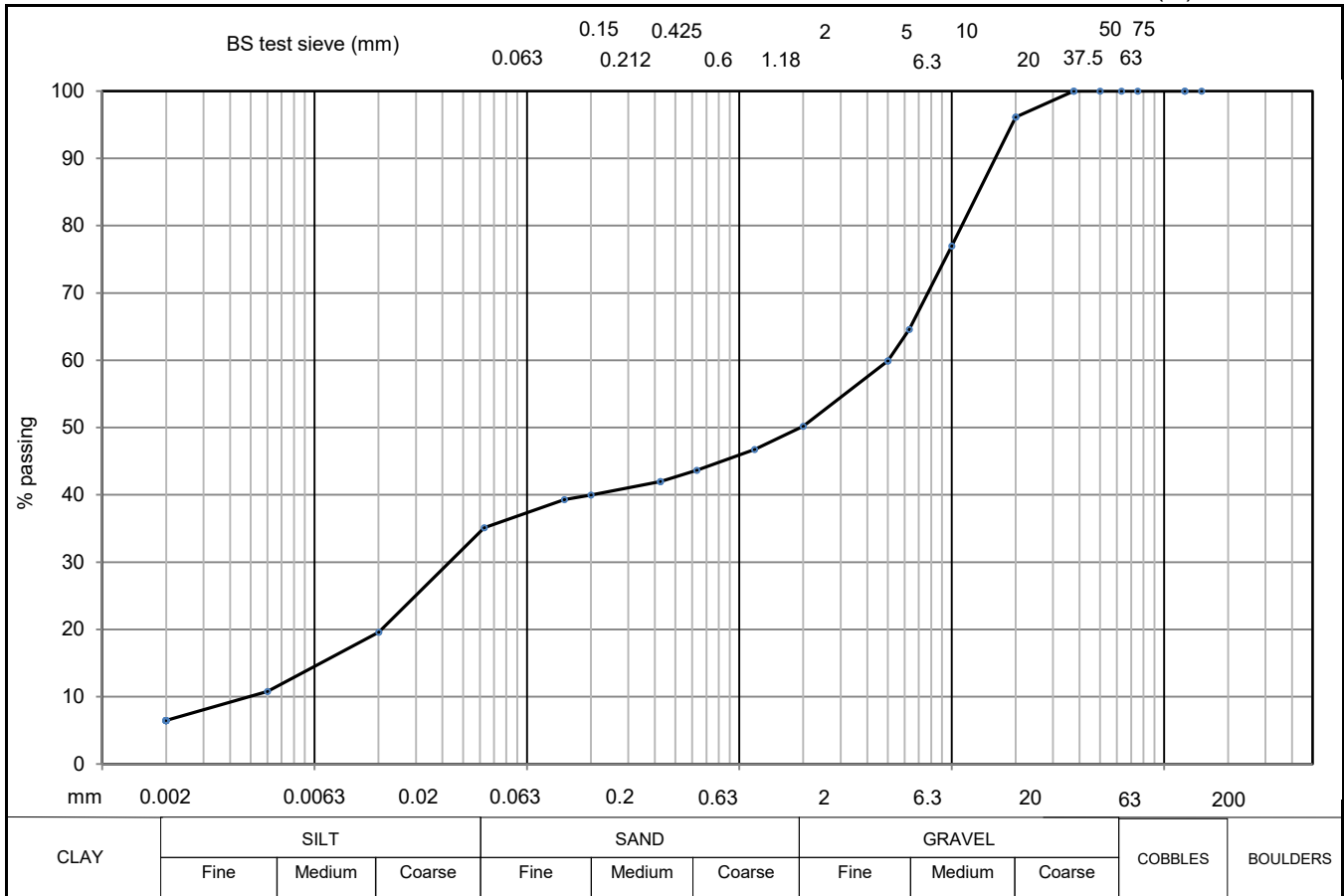
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	22						
SILT	32	150		5	62	20	41
SILT & CLAY	53						
SAND	7	75		2	61	6	30
GRAVEL	39						
COBBLE & BOULDER	0	63		1.18	60	2	22
test method(s)	5.2# & 5.4	50	100	0.63	60		
test method		37.5	95	0.425	59		
5.2 - sieving		20	78	0.2	59		
5.3 - sedimentation by hydrometer		10	66	0.15	58		
5.4 - sedimentation by pipette		6.3	63	0.063	53		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35560/06</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP210
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)	SAMPLE No./TYPE	4B
DESCRIPTION	Brown slightly sandy gravelly clayey SILT	SAMPLE DEPTH (m)	1.00
		SPECIMEN TOP (m)	1.00
		SPECIMEN BASE (m)	1.10



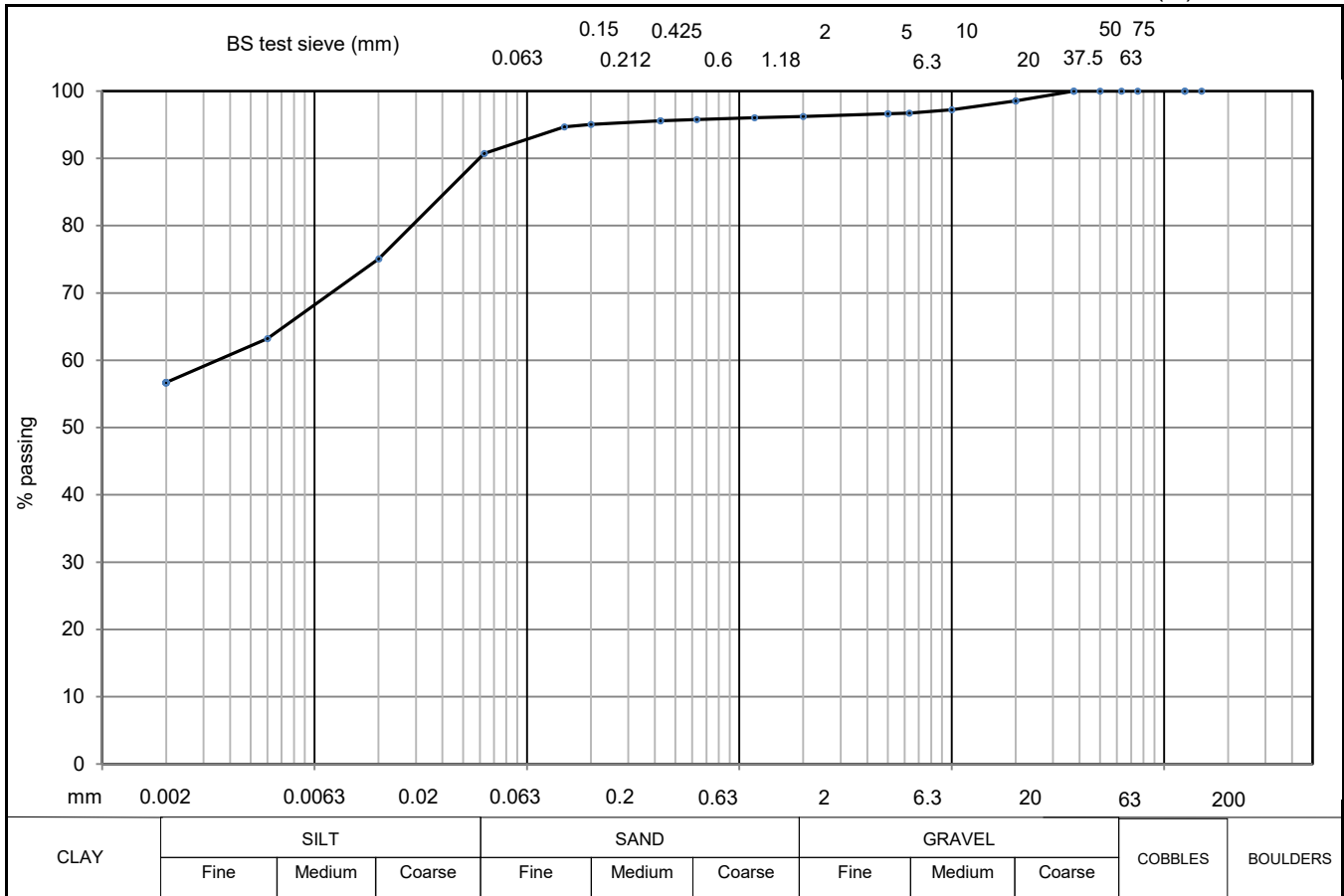
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	7						
SILT	29	150		5	60	20	20
SILT & CLAY	35						
SAND	15	75		2	50	6	11
GRAVEL	50						
COBBLE & BOULDER	0	63		1.18	47	2	6
test method(s)	5.2 & 5.4	50		0.63	44		
test method		37.5	100	0.425	42		
5.2 - sieving		20	96	0.2	40		
5.3 - sedimentation by hydrometer		10	77	0.15	39		
5.4 - sedimentation by pipette		6.3	65	0.063	35		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35560/06</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP603
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)	SAMPLE No./TYPE	3B
DESCRIPTION	Orangish brown mottled grey slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	1.00
		SPECIMEN TOP (m)	1.00
		SPECIMEN BASE (m)	1.50



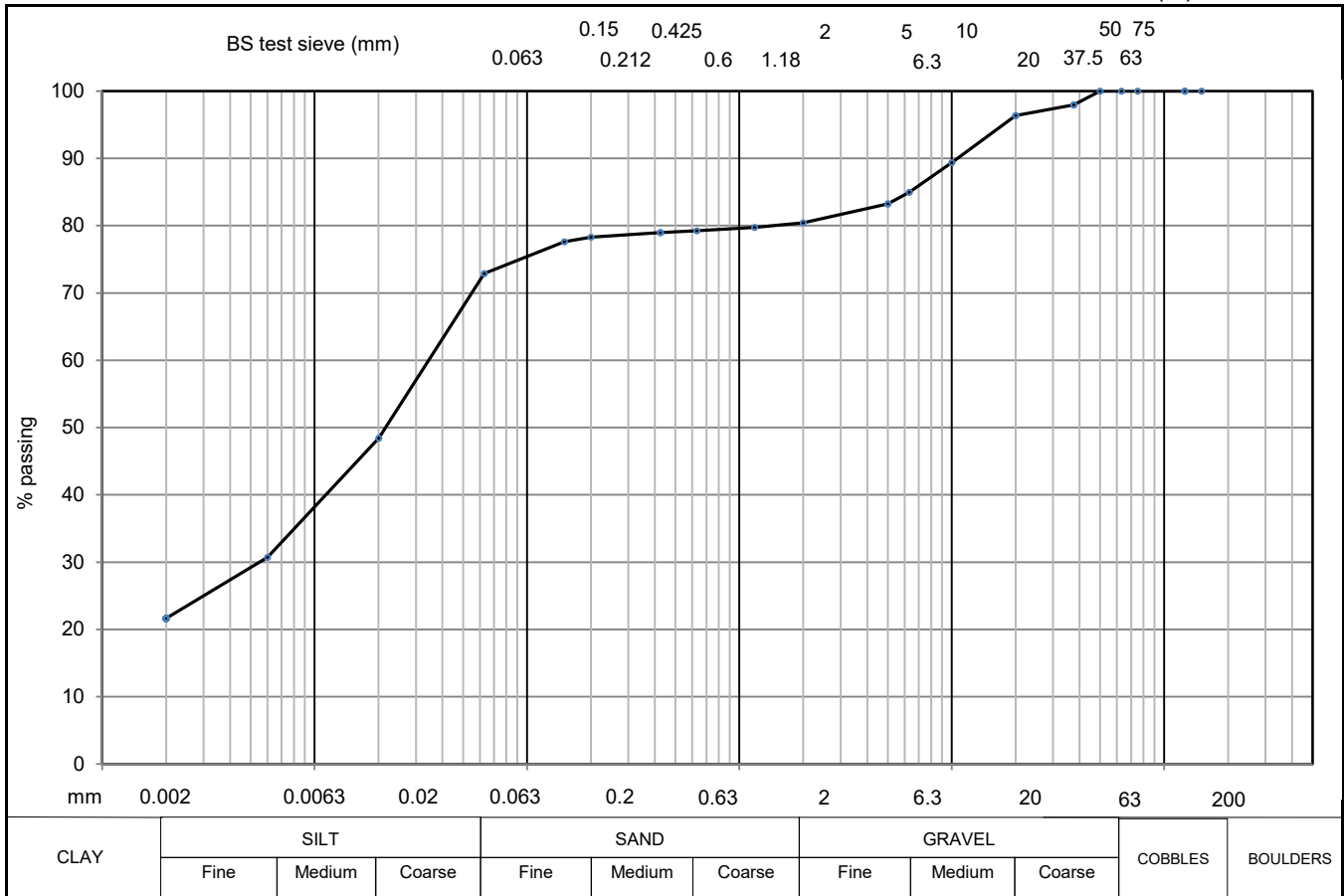
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	57						
SILT	34	150		5	97	20	75
SILT & CLAY	91						
SAND	5	75		2	96	6	63
GRAVEL	4						
COBBLE & BOULDER	0	63		1.18	96	2	57
test method(s)	5.2 & 5.4	50		0.63	96		
test method		37.5	100	0.425	96		
5.2 - sieving		20	99	0.2	95		
5.3 - sedimentation by hydrometer		10	97	0.15	95		
5.4 - sedimentation by pipette		6.3	97	0.063	91		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35560/06</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP605
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)	SAMPLE No./TYPE	3B
DESCRIPTION	Brown slightly sandy slightly gravelly clayey SILT	SAMPLE DEPTH (m)	0.50
		SPECIMEN TOP (m)	0.50
		SPECIMEN BASE (m)	0.60



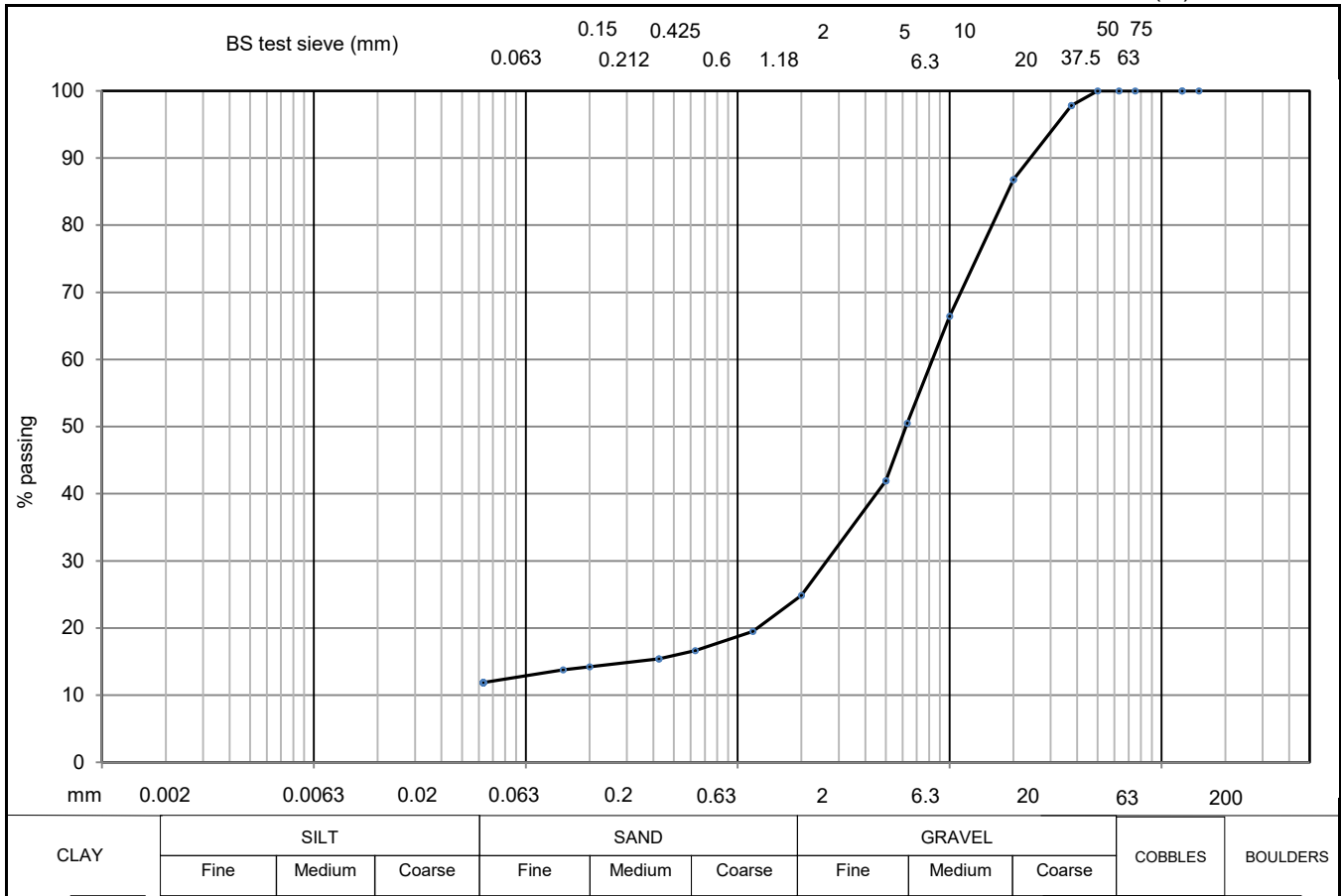
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	22						
SILT	51	150		5	83	20	48
SILT & CLAY	73						
SAND	8	75		2	80	6	31
GRAVEL	20						
COBBLE & BOULDER	0	63		1.18	80	2	22
test method(s)	5.2 & 5.4	50	100	0.63	79		
test method		37.5	98	0.425	79		
5.2 - sieving		20	96	0.2	78		
5.3 - sedimentation by hydrometer		10	89	0.15	78		
5.4 - sedimentation by pipette		6.3	85	0.063	73		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35560/06</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP605
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)	SAMPLE No./TYPE	4B
DESCRIPTION	Brown clayey sandy GRAVEL	SAMPLE DEPTH (m)	1.50
		SPECIMEN TOP (m)	1.50
		SPECIMEN BASE (m)	1.60



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY							
SILT		150		5	42	20	
SILT & CLAY	12						
SAND	13	75		2	25	6	
GRAVEL	75						
COBBLE & BOULDER	0	63		1.18	19	2	
test method(s)	5.2#	50	100	0.63	17		
test method		37.5	98	0.425	15		
5.2 - sieving		20	87	0.2	14		
5.3 - sedimentation by hydrometer		10	66	0.15	14		
5.4 - sedimentation by pipette		6.3	51	0.063	12		

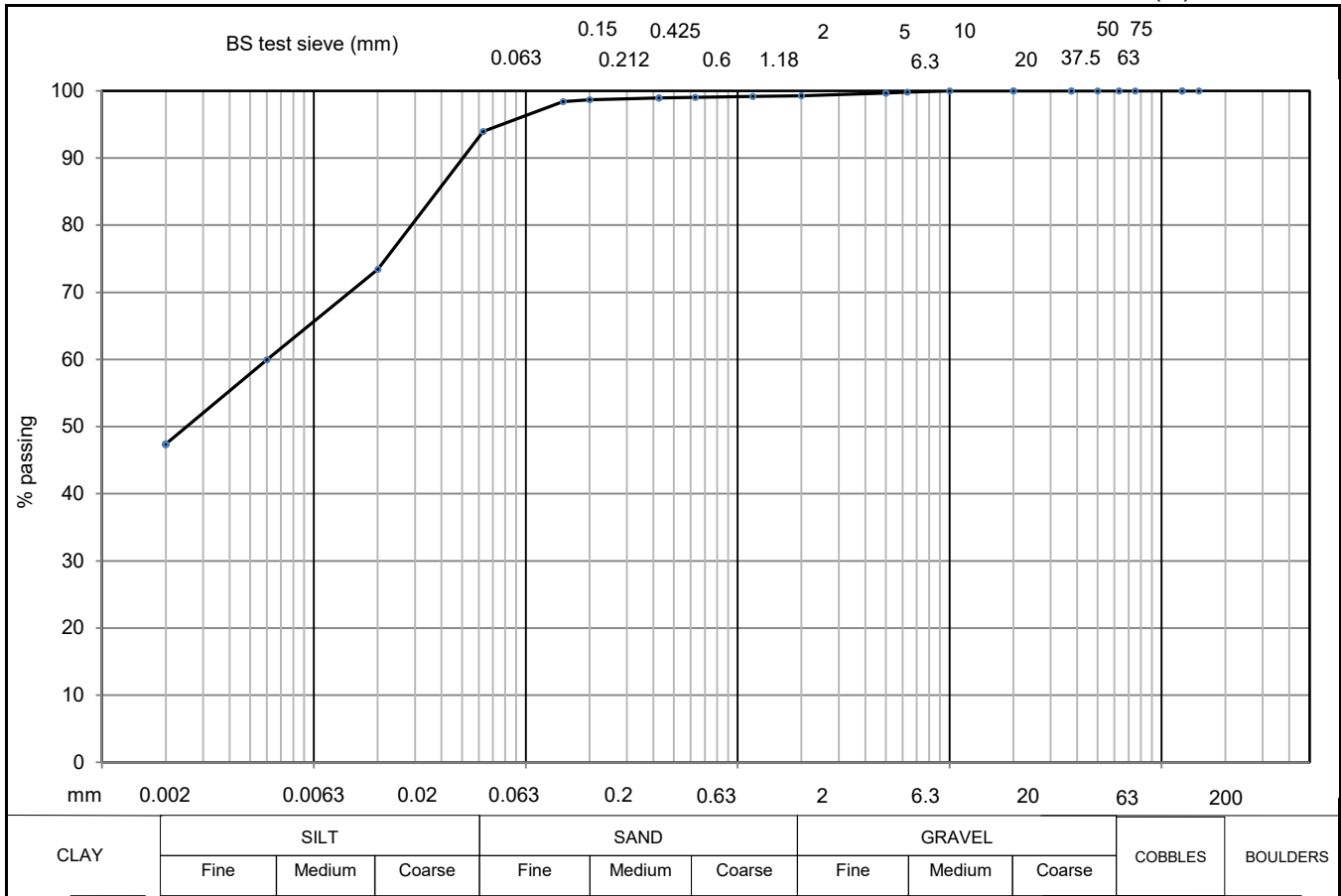
remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35560/06</b>	<b>CHECKED</b> <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP619
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)	SAMPLE No./TYPE	2B
DESCRIPTION	Orangish brown slightly gravelly slightly sandy silty CLAY with rare rootlets	SAMPLE DEPTH (m)	0.90
		SPECIMEN TOP (m)	0.90
		SPECIMEN BASE (m)	1.00



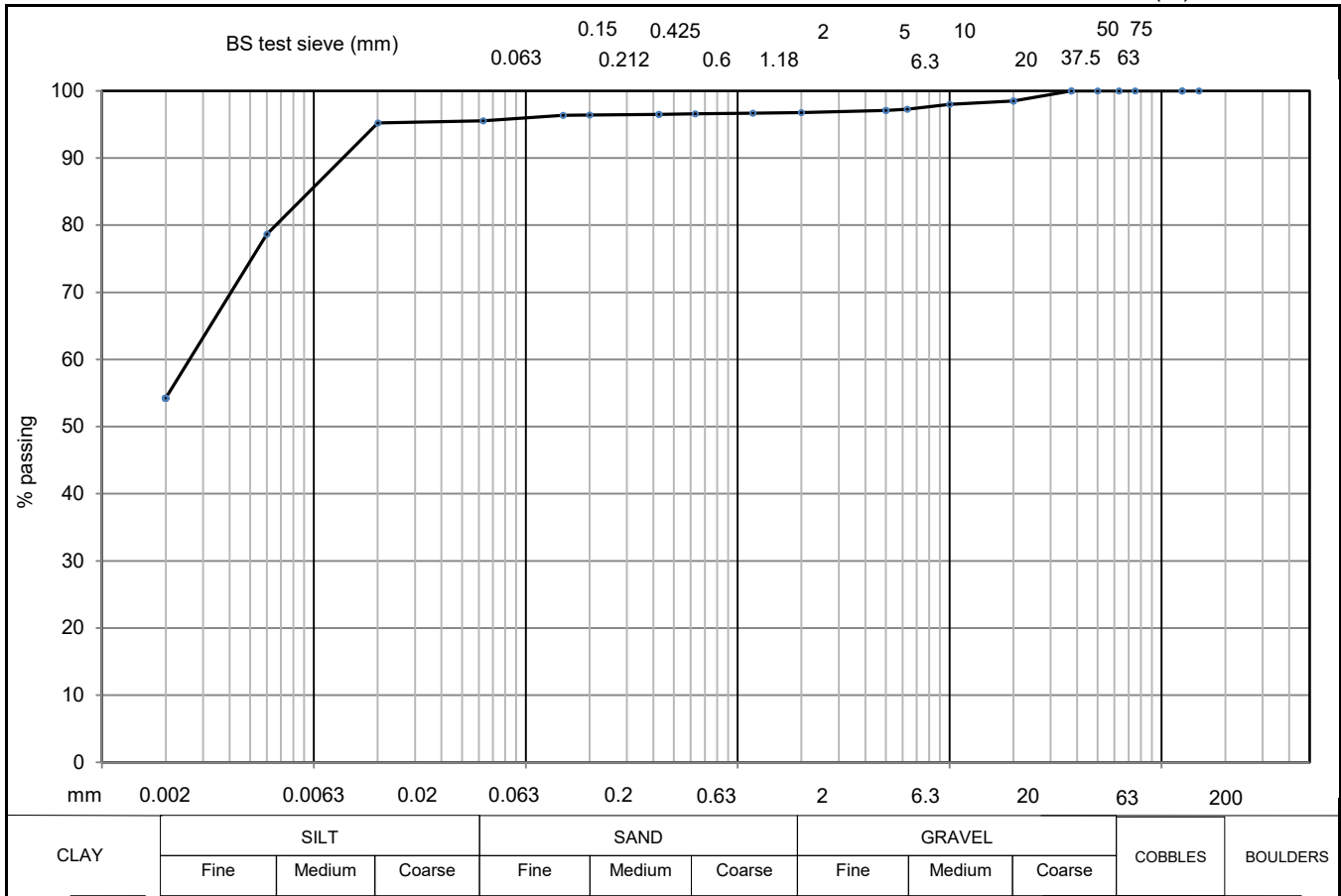
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	47						
SILT	47	150		5	100	20	73
SILT & CLAY	94						
SAND	5	75		2	99	6	60
GRAVEL	1						
COBBLE & BOULDER	0	63		1.18	99	2	47
test method(s)	5.2 & 5.4	50		0.63	99		
test method		37.5		0.425	99		
5.2 - sieving		20		0.2	99		
5.3 - sedimentation by hydrometer		10	100	0.15	98		
5.4 - sedimentation by pipette		6.3	100	0.063	94		

remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35560/06</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP619
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)	SAMPLE No./TYPE	4B
DESCRIPTION	Light greyish brown slightly sandy slightly gravelly silty CLAY	SAMPLE DEPTH (m)	2.50
		SPECIMEN TOP (m)	2.50
		SPECIMEN BASE (m)	2.60



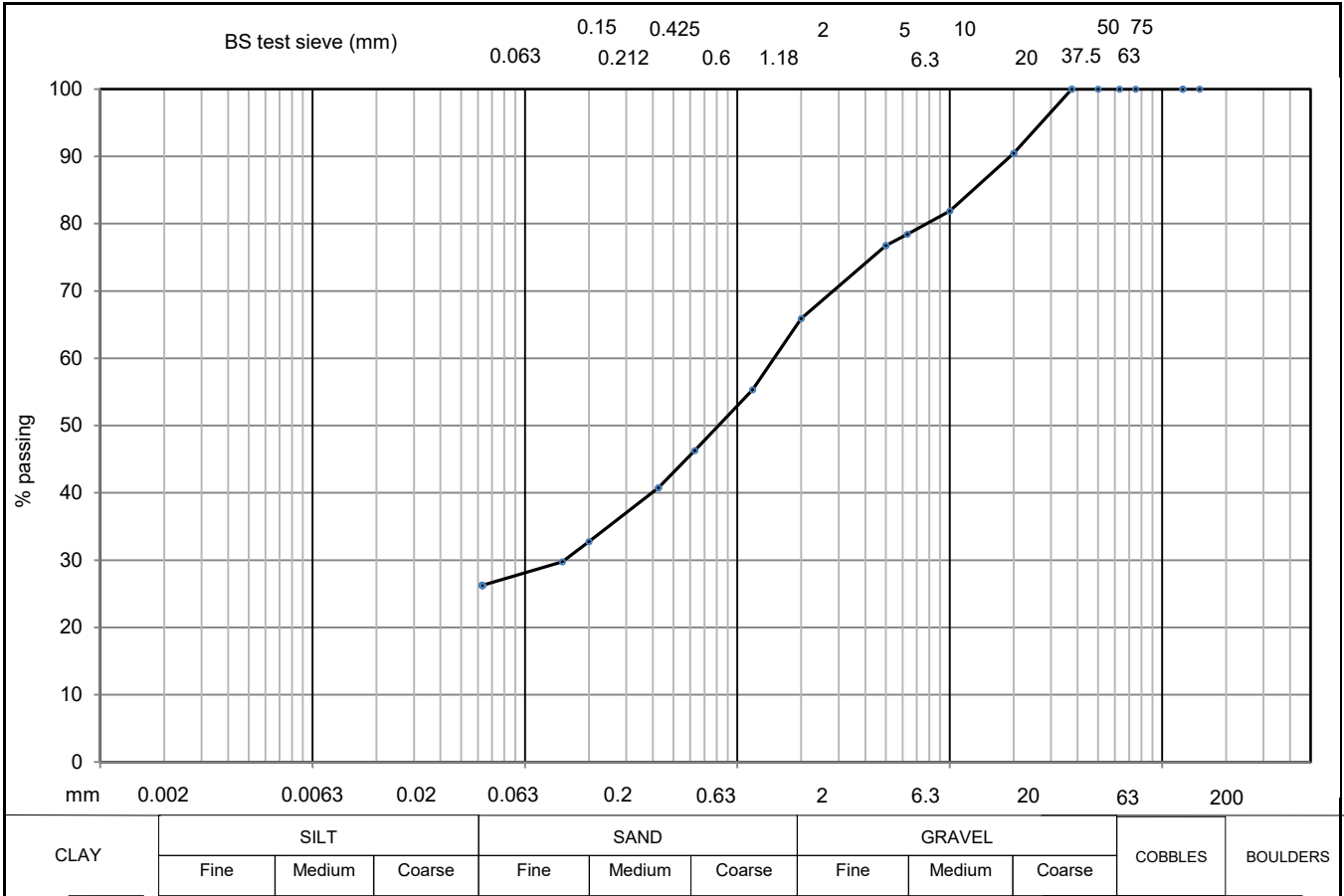
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	54						
SILT	41	150		5	97	20	95
SILT & CLAY	96						
SAND	1	75		2	97	6	79
GRAVEL	3						
COBBLE & BOULDER	0	63		1.18	97	2	54
test method(s)	5.2 & 5.4	50		0.63	97		
test method		37.5	100	0.425	97		
5.2 - sieving		20	99	0.2	96		
5.3 - sedimentation by hydrometer		10	98	0.15	96		
5.4 - sedimentation by pipette		6.3	97	0.063	96		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>CONTRACT</b> <b>35560/06</b>	<b>CHECKED</b> <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP634
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)	SAMPLE No./TYPE	3B
DESCRIPTION	Brown very clayey very gravelly SAND	SAMPLE DEPTH (m)	0.50
		SPECIMEN TOP (m)	0.50
		SPECIMEN BASE (m)	0.60



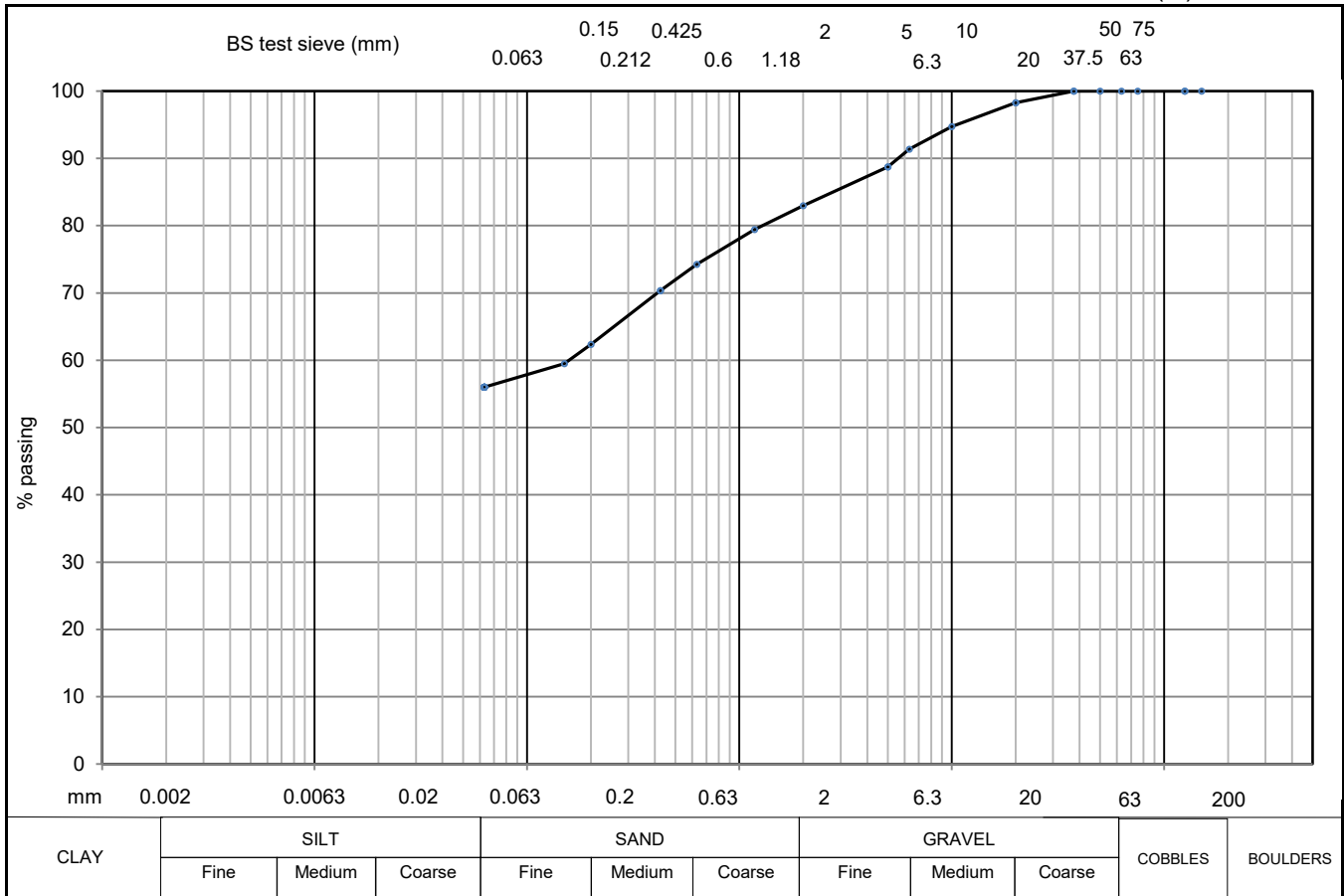
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY							
SILT		150		5	77	20	
SILT & CLAY	26						
SAND	40	75		2	66	6	
GRAVEL	34						
COBBLE & BOULDER	0	63		1.18	55	2	
test method(s)	5.2	50		0.63	46		
test method		37.5	100	0.425	41		
5.2 - sieving		20	90	0.2	33		
5.3 - sedimentation by hydrometer		10	82	0.15	30		
5.4 - sedimentation by pipette		6.3	78	0.063	26		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35560/06</b>	<b>CHECKED</b> <b>TB</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP637
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)	SAMPLE No./TYPE	5B
DESCRIPTION	Brown slightly gravelly slightly sandy clayey SILT with rare rootlets	SAMPLE DEPTH (m)	1.90
		SPECIMEN TOP (m)	1.90
		SPECIMEN BASE (m)	2.00



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY							
SILT		150		5	89	20	
SILT & CLAY	56						
SAND	27	75		2	83	6	
GRAVEL	17						
COBBLE & BOULDER	0	63		1.18	79	2	
test method(s)	5.2	50		0.63	74		
test method		37.5	100	0.425	70		
5.2 - sieving		20	98	0.2	62		
5.3 - sedimentation by hydrometer		10	95	0.15	60		
5.4 - sedimentation by pipette		6.3	91	0.063	56		

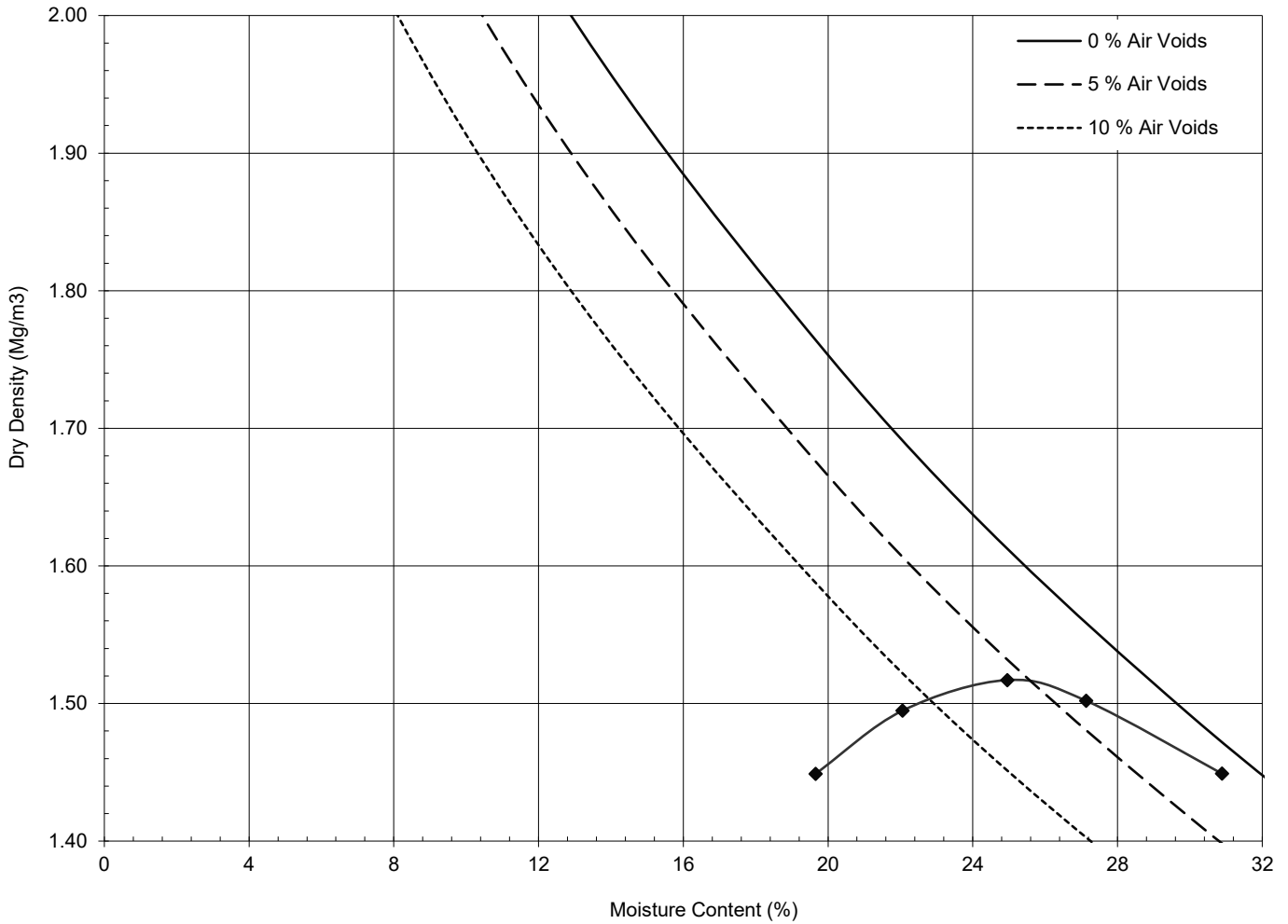
remarks	CONTRACT	CHECKED
# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	<b>35560/06</b>	<b>TB</b>

# DRY DENSITY/MOISTURE CONTENT RELATIONSHIP



BS. 1377 : Part 4 : 1990 : 3

CLIENT	OSBORNE	BH/TP No.	TP619
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)	SAMPLE No./TYPE	3B
DESCRIPTION	Orangish brown slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	1.90
		SPECIMEN DEPTH (m)	1.90



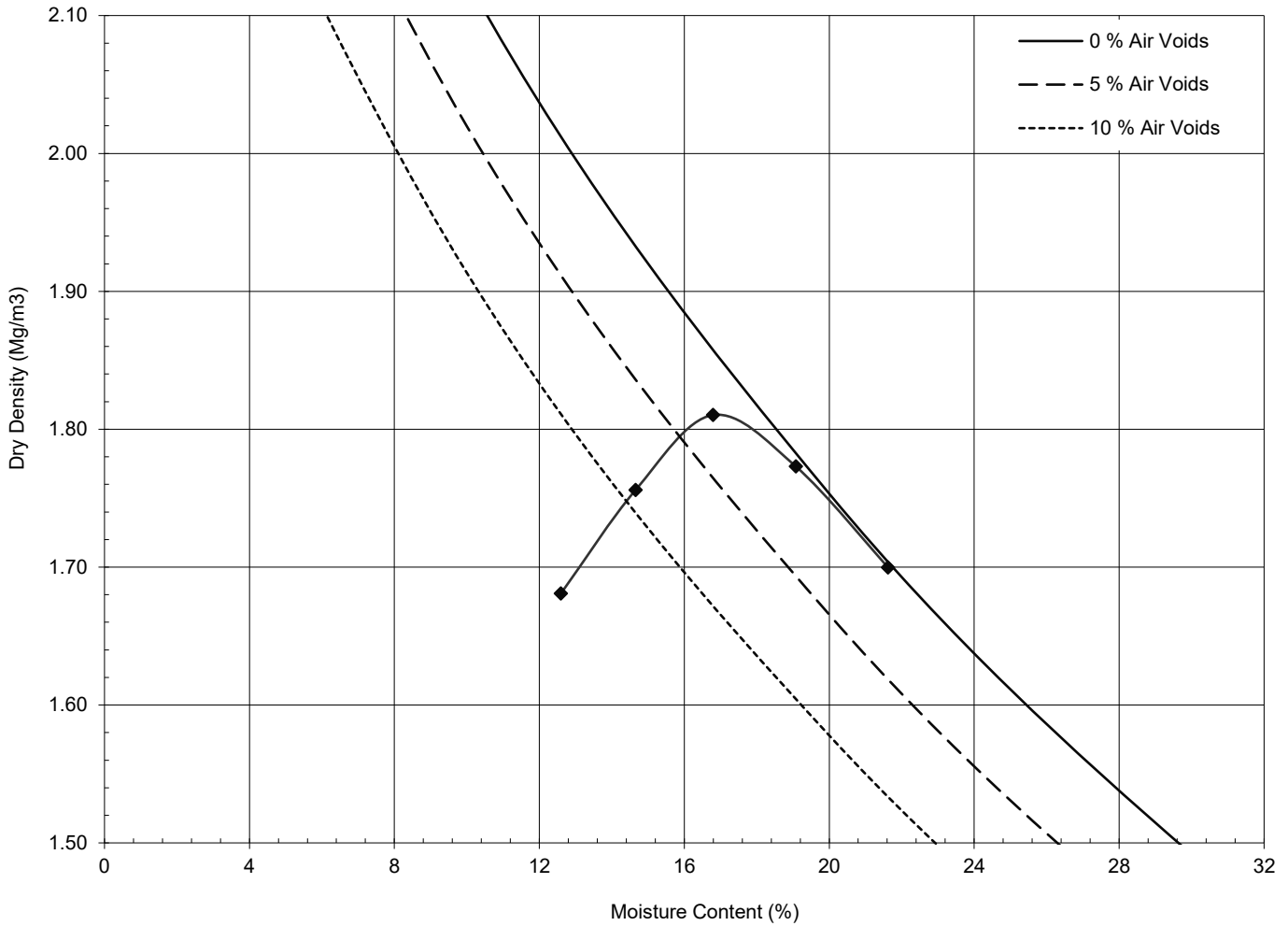
test method		3.3.4.1 2.5kg dynamic compaction - 1L mould			
preparation procedure		3.2.4.1 (grading zone 1)			
sample preparation		C R			
proportion retained on 37.5mm sieve	%	0	initial moisture content	%	31
proportion retained on 20mm sieve	%	0	maximum dry density	(Mg/m <sup>3</sup> )	1.52
particle density	(Mg/m <sup>3</sup> )	#2.70	optimum moisture content	%	25
remarks # denotes particle density has been assigned an assumed value C denotes sample has been chopped to pass 20mm sieve S denotes sample has been shredded to pass 20mm sieve R denotes sample material has been recycled between/for points					
				CONTRACT	CHECKED
				<b>35560/06</b>	<b>TB</b>

# DRY DENSITY/MOISTURE CONTENT RELATIONSHIP



BS. 1377 : Part 4 : 1990 : 3

CLIENT	OSBORNE	BH/TP No.	TP619
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)	SAMPLE No./TYPE	2B
DESCRIPTION	Greyish brown slightly gravelly slightly sandy silty CLAY with rare rootlets	SAMPLE DEPTH (m)	0.90
		SPECIMEN DEPTH (m)	0.90

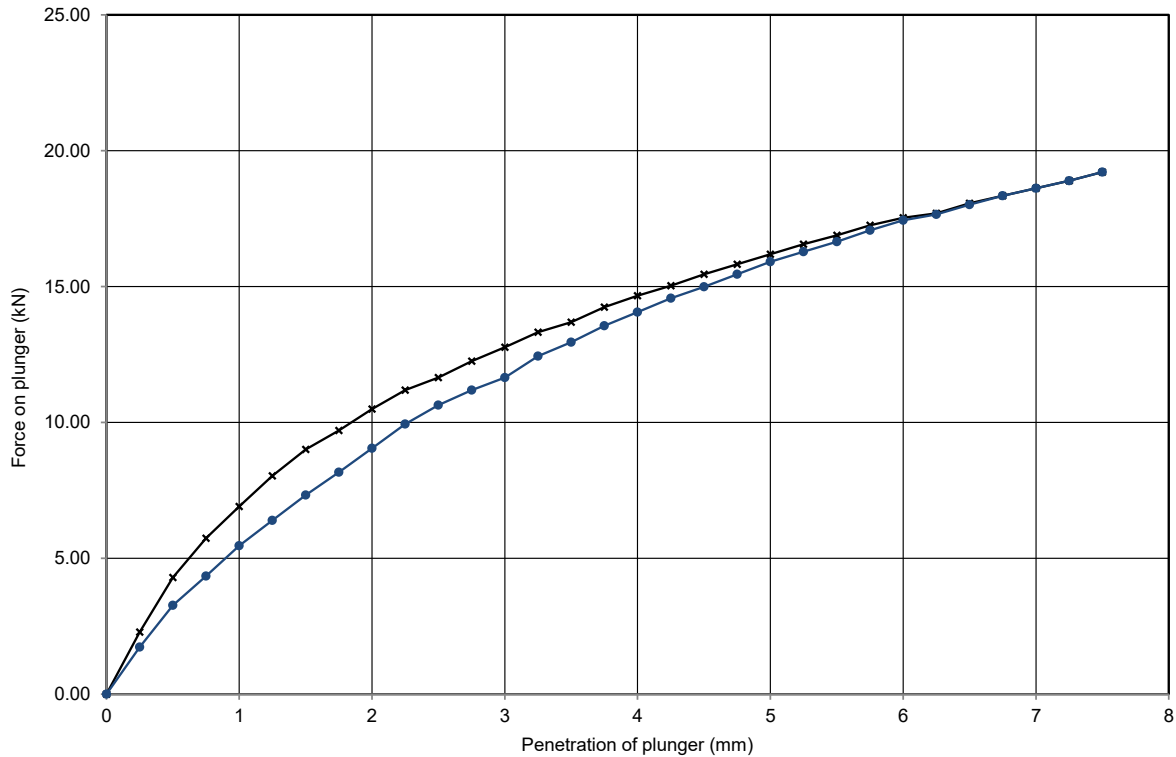


test method	3.5.4.1 4.5kg dynamic compaction - 1L mould				
preparation procedure	3.2.4.1 (grading zone 1)				
sample preparation	C R				
proportion retained on 37.5mm sieve	%	0	initial moisture content	%	29
proportion retained on 20mm sieve	%	0	maximum dry density	(Mg/m <sup>3</sup> )	1.81
particle density	(Mg/m <sup>3</sup> )	#2.70	optimum moisture content	%	17
remarks	# denotes particle density has been assigned an assumed value C denotes sample has been chopped to pass 20mm sieve S denotes sample has been shredded to pass 20mm sieve R denotes sample material has been recycled between/for points				
				CONTRACT	CHECKED
				<b>35560/06</b>	<b>TB</b>

Geotechnical Engineering Limited  
**CALIFORNIA BEARING RATIO**  
 BS. 1377 : Part 4 : 1990 : 7



CLIENT	OSBORNE	BH/TP No.	TP619
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)	SAMPLE No./TYPE	2B
DESCRIPTION	Orangish brown slightly gravelly slightly sandy silty CLAY with rare rootlets	SAMPLE DEPTH (m)	0.90
		SPECIMEN DEPTH (m)	0.90

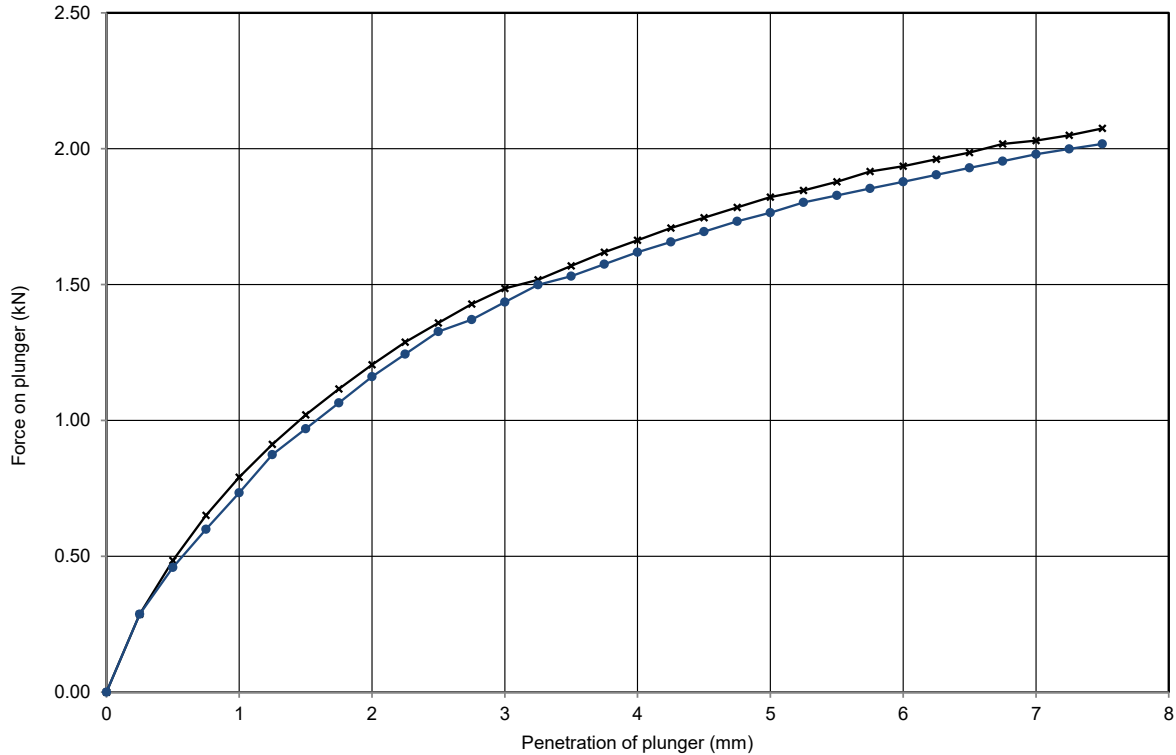


sample preparation:		Dynamic compaction - 4.5kg rammer with specified effort	
proportion > 20mm removed (%)	0.0	sample condition	Unsoaked
surcharge mass (kg)	10	amount of swell (mm)	
INITIAL CONDITIONS		FINAL CONDITIONS	
moisture content (%)	14	moisture content top (%)	15
bulk density (Mg/m3)	2.04	moisture content base (%)	14
dry density (Mg/m3)	1.79		
remarks		results	
CBR Set of 3= OMC -3%		CBR value top (%)	88
		CBR value base (%)	81
		average CBR value (%)	84
— x — x — Top — o — o — Base		CONTRACT	CHECKED
		<b>35560/06</b>	<b>TB</b>

Geotechnical Engineering Limited  
**CALIFORNIA BEARING RATIO**  
 BS. 1377 : Part 4 : 1990 : 7



CLIENT	OSBORNE	BH/TP No.	TP619
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)	SAMPLE No./TYPE	2B
DESCRIPTION	Orangish brown slightly gravelly slightly sandy silty CLAY with rare rootlets	SAMPLE DEPTH (m)	0.90
		SPECIMEN DEPTH (m)	0.90



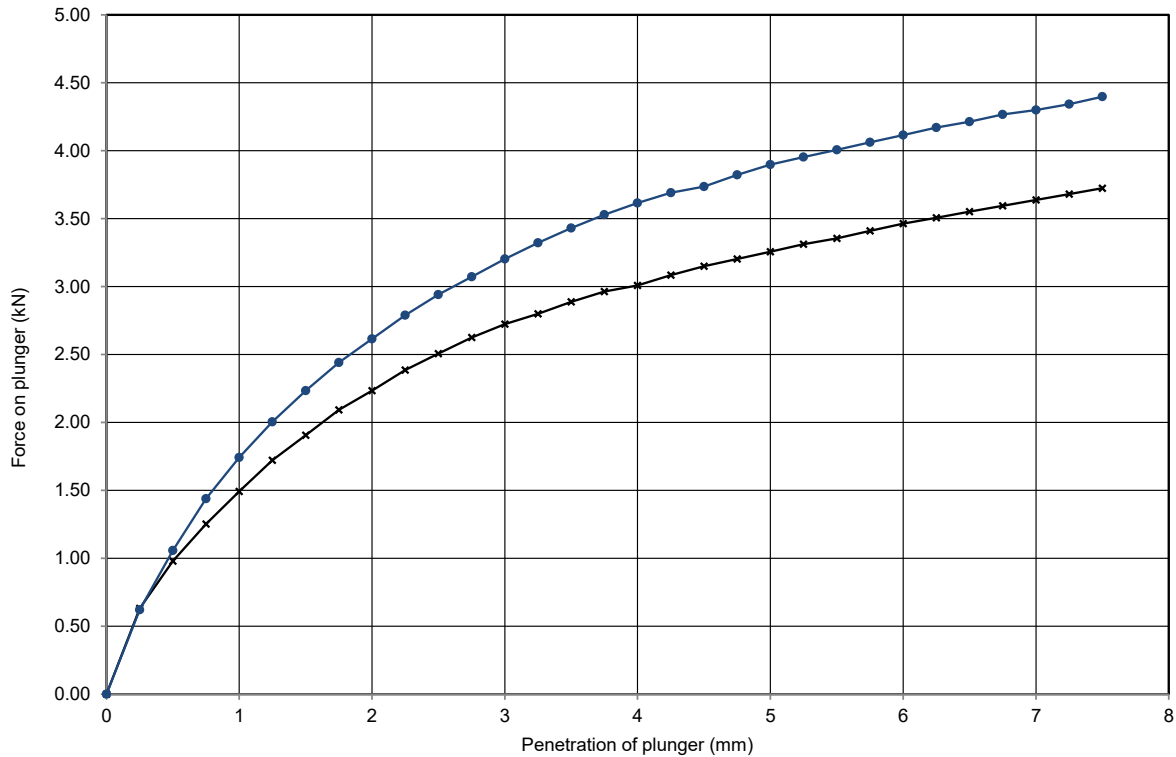
sample preparation:		Dynamic compaction - 4.5kg rammer with specified effort	
proportion > 20mm removed (%)	0.0	sample condition	Unsoaked
surcharge mass (kg)	10	amount of swell (mm)	
INITIAL CONDITIONS		FINAL CONDITIONS	
moisture content (%)	21	moisture content top (%)	20
bulk density (Mg/m3)	2.08	moisture content base (%)	21
dry density (Mg/m3)	1.72		
remarks		results	
CBR Set of 3= OMC +3%		CBR value top (%)	10
		CBR value base (%)	10
		average CBR value (%)	10
<p> <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; border-radius: 50%; background-color: black; margin-right: 5px;"></span> <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; border-radius: 50%; background-color: blue; margin-right: 5px;"></span> </p> <p> <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; border-radius: 50%; background-color: black; margin-right: 5px;"></span> <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; border-radius: 50%; background-color: blue; margin-right: 5px;"></span> </p> <p> <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; border-radius: 50%; background-color: black; margin-right: 5px;"></span> <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; border-radius: 50%; background-color: blue; margin-right: 5px;"></span> </p> <p> <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; border-radius: 50%; background-color: black; margin-right: 5px;"></span> <span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; border-radius: 50%; background-color: blue; margin-right: 5px;"></span> </p>		CONTRACT	CHECKED
		<b>35560/06</b>	<b>TB</b>



Geotechnical Engineering Limited  
**CALIFORNIA BEARING RATIO**  
 BS. 1377 : Part 4 : 1990 : 7



CLIENT	OSBORNE	BH/TP No.	TP619
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)	SAMPLE No./TYPE	2B
DESCRIPTION	Orangish brown slightly gravelly slightly sandy silty CLAY with rare rootlets	SAMPLE DEPTH (m)	0.90
		SPECIMEN DEPTH (m)	0.90



sample preparation:		Dynamic compaction - 4.5kg rammer with specified effort	
proportion > 20mm removed (%)	0.0	sample condition	Unsoaked
surcharge mass (kg)	10	amount of swell (mm)	
INITIAL CONDITIONS		FINAL CONDITIONS	
moisture content (%)	17	moisture content top (%)	18
bulk density (Mg/m3)	2.12	moisture content base (%)	18
dry density (Mg/m3)	1.81		
remarks		results	
CBR Set of 3= OMC		CBR value top (%)	19
		CBR value base (%)	22
		average CBR value (%)	21
		CONTRACT	CHECKED
		<b>35560/06</b>	<b>TB</b>

# SHEAR STRENGTH BY DIRECT SHEAR



**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No.

TP637

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2 (1158)

SAMPLE No./TYPE

4B

SAMPLE DEPTH (m)

1.00-1.10

DESCRIPTION Brown mottled orange and grey slightly gravelly sandy CLAY

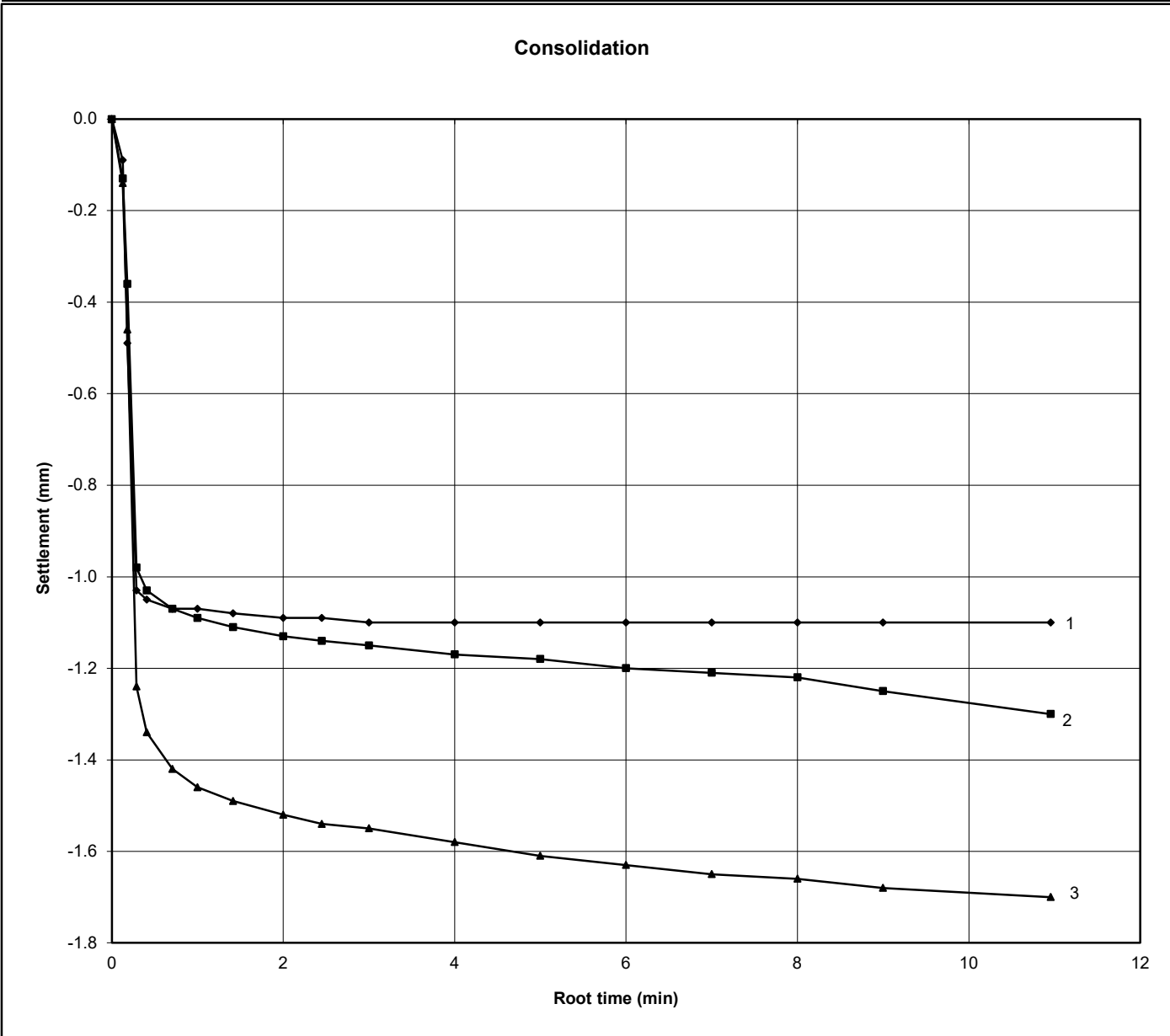
SPECIMEN DEPTH (m)

1.00-1.10

PREPARATION DETAILS Remoulded using a tamping rod - 2% removed (retained on 2mm sieve).

**CONSOLIDATION STAGE RESULTS**

Specimen	1	2	3
t100 (min)	1.00	1.10	0.70
t <sub>f</sub> (min)	12.70	13.97	8.89
Machine speed (mm/min)	0.0100	0.0100	0.0100
Normal Stress (kPa)	50	100	150
Initial height (mm)	19.99	19.99	19.99
Final height (mm)	18.89	18.69	18.29



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remarks: Specimens are submerged throughout the test.	CONTRACT <b>35560</b>	CHECKED <b>NP</b>
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# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

TP637

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2 (1158)

SAMPLE No./TYPE

4B

SAMPLE DEPTH (m)

1.00-1.10

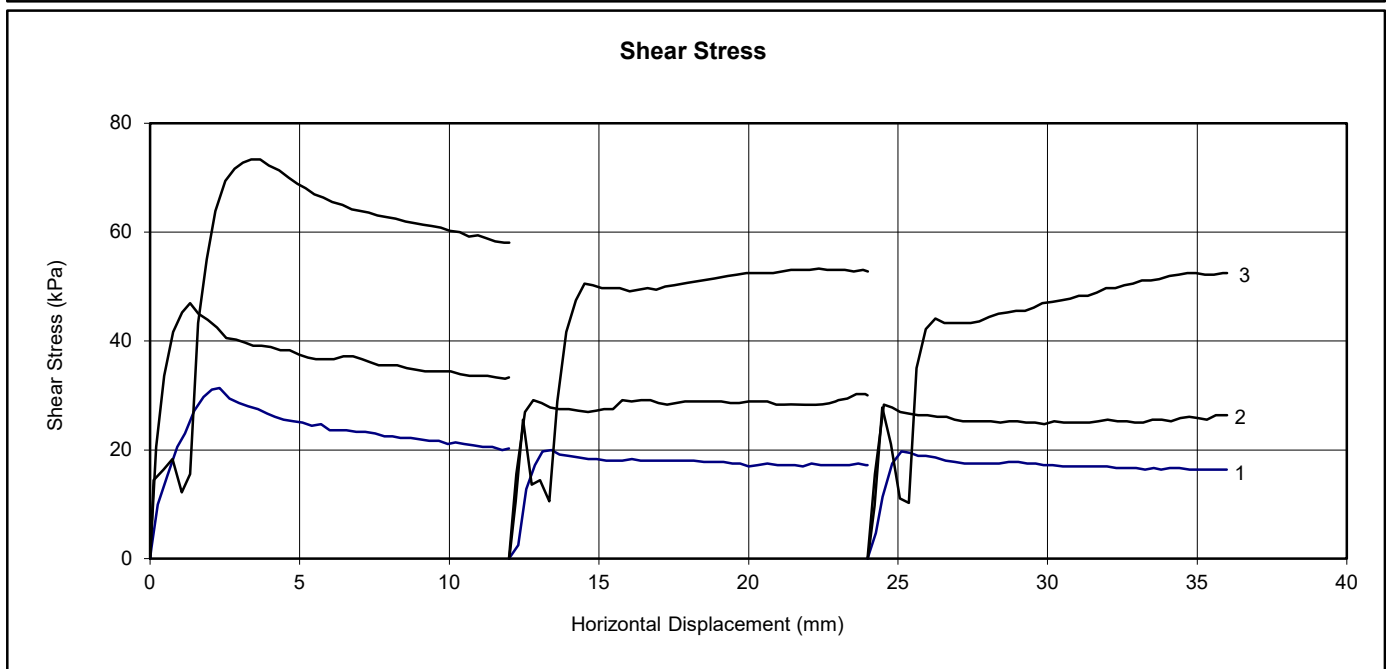
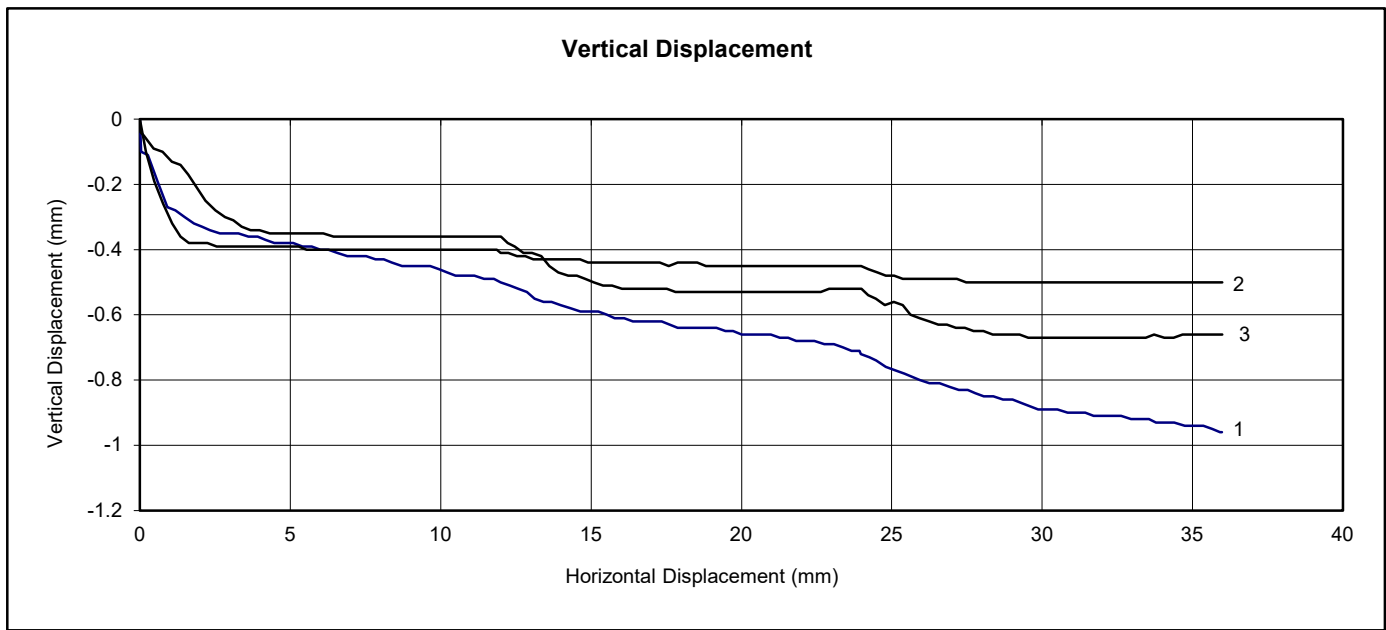
SPECIMEN DEPTH (m)

1.00-1.10

DESCRIPTION Brown mottled orange and grey slightly gravelly sandy CLAY

**SHEAR STAGE RESULTS**

Specimen	1	2	3
Peak Shear Strength (kPa)	31.4	46.9	73.3
Residual Shear Strength (kPa)	16.4	25.0	47.2
Cum. Vertical Displ. (mm)	-0.960	-0.500	-0.660
Cum. Forward Displ. (mm)	35.980	35.990	35.990
Normal Stress (kPa)	50	100	150



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remarks:

slow machine reversal

CONTRACT

**35560**

CHECKED

**NP**



# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

TP637

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2 (1158)

SAMPLE No./TYPE

4B

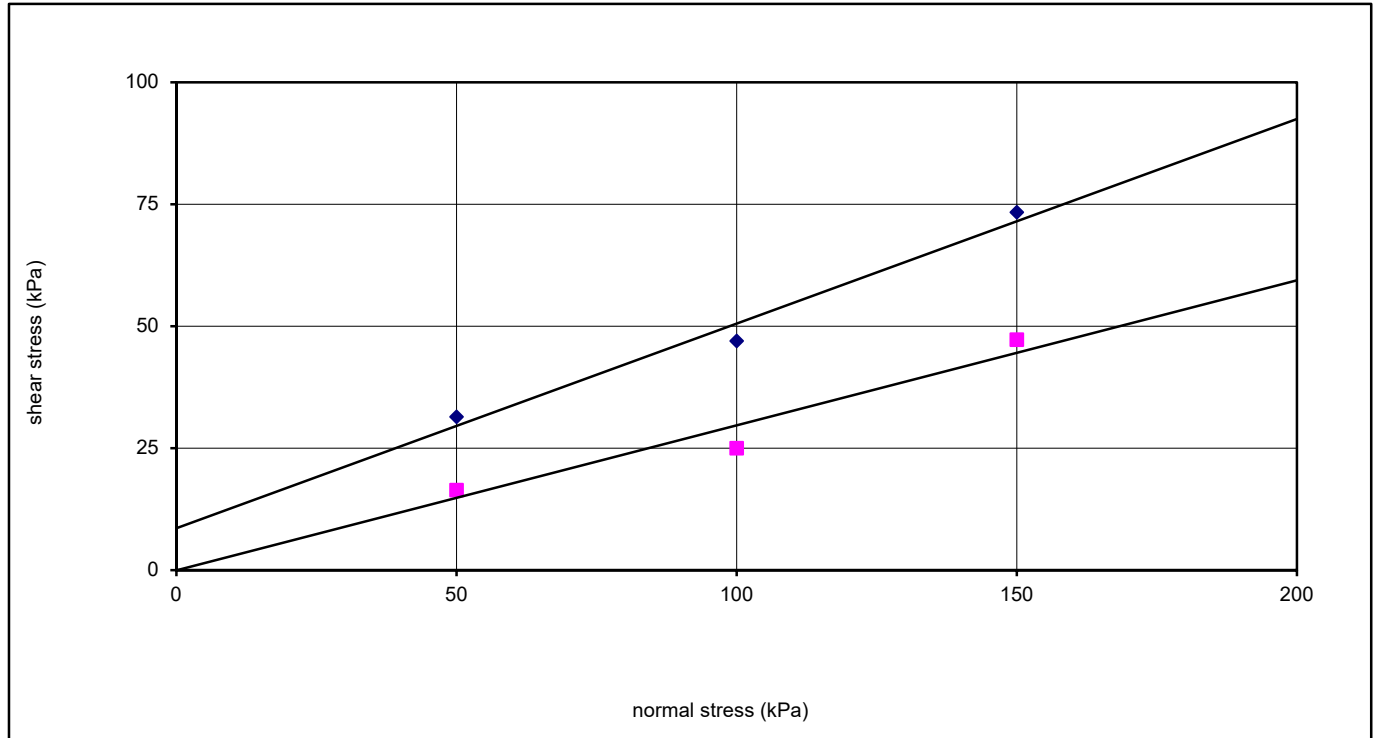
DESCRIPTION Brown mottled orange and grey slightly gravelly sandy CLAY

SAMPLE DEPTH (m)

1.00-1.10

SPECIMEN DEPTH (m)

1.00-1.10



## INITIAL CONDITIONS

		specimen 1	specimen 2	specimen 3
specimen size (mm)	60 Square	33.6	29.2	30.6
specimen height (mm)	19.99	1.86	1.87	1.88
particle density (Mg/m <sup>3</sup> )	2.70 #	1.39	1.45	1.44
		0.941	0.866	0.878
		96	91	94
		0.01	0.01	0.01

## SHEARING STAGES

specimen	normal stress (kPa)	peak shear stress (kPa)	horizontal displacement (mm)	residual shear stress (kPa)	traverses (No.)	total forward displacement (mm)
1	50	31.4	2.320	16.4	3	35.980
2	100	46.9	1.340	25.0	3	35.990
3	150	73.3	3.380	47.2	3	35.990

## SHEAR STRENGTH PARAMETERS

peak angle of shearing resistance $\phi'$	23	residual angle of shearing resistance $\phi'_r$	17
peak effective cohesion intercept, $c'$ (kPa)	9	residual effective cohesion intercept, $c'_r$ (kPa)	0

remarks: # denotes particle density has been assigned an assumed value.

CONTRACT

CHECKED

**35560**

**NP**

◆ peak ■ residual

**UNIAXIAL COMPRESSIVE STRENGTH OF ROCK**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)

borehole /trial pit no.	sample		specimen depth (m)	diameter D (mm)	height H (mm)	H/D	moisture content (%)	bulk density (Mg/m3)	loading rate (kN/min)	time to failure (min:sec)	UCS (MPa)	description, codes and remarks
	no./type	depth (m)										
DSRC310	21Cs	12.48	12.18	100.6	238.0	2.36	4	2.45	40	03:50	16.34	Yellowish brown LIMESTONE, N, Ax. H/D ratio falls outside ISRM specification Yellowish brown LIMESTONE, N, Ax. Light brown LIMESTONE, N, Ax. Light brown LIMESTONE, N, Ax. Yellowish brown LIMESTONE, N, Ot. H/D ratio falls outside ISRM specification Yellowish brown LIMESTONE, N, Ot.
DSRC310	36Cs	27.40	27.40	101.5	279.4	2.75	4.9	2.40	40	05:10	24.46	
DSRC311	18Cs	6.34	6.34	101.2	284.0	2.81	7.8	2.32	40	01:45	5.36	
DSRC311	44Cs	32.70	32.70	100.9	274.9	2.72	5.4	2.41	40	04:06	19.40	
DSRCOH3 08	15Cs	6.22	6.25	100.8	241.7	2.40	7.3	2.39	30	05:10	19.99	
DSRCOH3 08	25Cs	13.74	13.80	101.5	301.3	2.97	8.6	2.35	30	05:13	17.44	

## general remarks

sample obtained from vertically drilled core (unless specified), test machine - VJT6000

coding:	moisture condition	sample storage	failure mode
	N - natural moisture content	U - not wrapped	Ax - axial cleavage
	F - fully saturated	F - wrapped in cling film/foil	Ca - cataclasis
	S - soaked	W - waxed	Sh - shear
	P - air/partially dried	G - contained in sealed Geoline	Ex - explosive
			Ot - other

**CONTRACT**  
**35560/06**
**CHECKED**  
**TB**

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)	L (mm)						
DSRC310	3.46	A	X	N	100		40		9.37	71.36	1.84	1.17	2.16	Light brown LIMESTONE
DSRC310	3.46	D	Y	N		40	100		9.30	100.00	0.93	1.37	1.27	Light brown LIMESTONE
DSRC310	7.47	A	X	N	100		50		10.19	79.79	1.60	1.23	1.98	Light grey and orange LIMESTONE
DSRC310	7.47	D	Y	N		80	100		14.10	100.00	1.41	1.37	1.93	Light grey and orange LIMESTONE
DSRC310	9.20	A	X	N	100		50		22.02	79.79	3.46	1.23	4.27	Light brown LIMESTONE
DSRC310	9.20	D	Y	N		80	100		32.39	100.00	3.24	1.37	4.42	Light brown LIMESTONE
DSRC310	12.48	I	X	N	100	130	50		7.54	79.79	1.18	1.23	1.46	Yellowish brown LIMESTONE
DSRC310	15.25	A	X	N	100		60		7.15	87.40	0.94	1.29	1.20	Yellowish brown LIMESTONE
DSRC310	15.25	D	Y	N		80	100		2.53	100.00	0.25	1.37	0.35	Yellowish brown LIMESTONE
DSRC310	19.42	A	X	N	90		60		13.34	82.92	1.94	1.26	2.44	Yellowish brown LIMESTONE
DSRC310	19.42	D	Y	N		80	90		9.07	90.00	1.12	1.30	1.46	Yellowish brown LIMESTONE
DSRC310	22.10	A	X	N	100		60		3.41	87.40	0.45	1.29	0.57	Yellowish brown LIMESTONE
DSRC310	22.10	D	Y	N		70	100		8.67	100.00	0.87	1.37	1.18	Yellowish brown LIMESTONE
DSRC310	25.37	A	X	N	100		60		5.09	87.40	0.67	1.29	0.86	Yellowish brown LIMESTONE
DSRC310	25.37	D	Y	N		70	100		7.84	100.00	0.78	1.37	1.07	Yellowish brown LIMESTONE
DSRC310	27.40	I	X	N	100	140	60		4.78	87.40	0.63	1.29	0.80	Yellowish brown LIMESTONE
DSRC311	5.20	A	X	N	100		60		4.49	87.40	0.59	1.29	0.76	Grey and brown LIMESTONE
DSRC311	5.20	D	Y	N		70	100		6.40	100.00	0.64	1.37	0.87	Grey and brown LIMESTONE
DSRC311	6.34	I	X	N	100	130	50		1.35	79.79	0.21	1.23	0.26	Light brown LIMESTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35560/06</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)	L (mm)						
DSRC311	10.73	A	X	N	100		60		19.52	87.40	2.56	1.29	3.29	Light brown and grey LIMESTONE
DSRC311	10.73	D	Y	N		80	100		15.50	100.00	1.55	1.37	2.12	Light brown and grey LIMESTONE
DSRC311	14.48	A	C	N	100		60		5.87	87.40	0.77	1.29	0.99	Light brown LIMESTONE
DSRC311	14.48	D	Y	N		60	100		15.88	100.00	1.59	1.37	2.17	Light brown LIMESTONE
DSRC311	17.54	A	X	N	100		40		5.58	71.36	1.10	1.17	1.29	Yellowish brown LIMESTONE
DSRC311	17.54	D	Y	N		65	100		10.98	100.00	1.10	1.37	1.50	Yellowish brown LIMESTONE
DSRC311	19.83	A	X	N	100		60		1.21	87.40	0.16	1.29	0.20	Yellowish brown LIMESTONE
DSRC311	19.83	D	Y	N		90	100		3.42	100.00	0.34	1.37	0.47	Yellowish brown LIMESTONE
DSRC311	22.79	A	X	N	100		40		4.01	71.36	0.79	1.17	0.92	Light brown LIMESTONE
DSRC311	22.79	D	Y	N		70	100		8.68	100.00	0.87	1.37	1.19	Light brown LIMESTONE
DSRC311	26.30	A	X	N	100		40		6.38	71.36	1.25	1.17	1.47	Light brown LIMESTONE
DSRC311	26.30	D	Y	N		60	100		9.93	100.00	0.99	1.37	1.36	Light brown LIMESTONE
DSRC311	29.58	A	X	N	100		60		5.28	87.40	0.69	1.29	0.89	Yellowish brown LIMESTONE
DSRC311	29.58	D	Y	N		60	100		8.95	100.00	0.90	1.37	1.22	Yellowish brown LIMESTONE
DSRC311	32.70	I	X	N	100	180	65		5.15	90.97	0.62	1.31	0.81	Light brown LIMESTONE
DSRC311	34.88	A	X	N	100		40		2.41	71.36	0.47	1.17	0.56	Yellowish brown LIMESTONE
DSRC311	34.88	D	Y	N		80	100		6.59	100.00	0.66	1.37	0.90	Yellowish brown LIMESTONE
DSRC311	38.38	A	X	N	100		65		2.47	90.97	0.30	1.31	0.39	Yellowish brown LIMESTONE
DSRC311	38.38	D	Y	N		70	100		9.87	100.00	0.99	1.37	1.35	Yellowish brown LIMESTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35560/06</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)								
DSRCHO3 08	1.50	I	X	N	100	110	45	11.04	75.69	1.93	1.21	2.32	Yellowish brown LIMESTONE	
DSRCHO3 08	3.29	A	X	N	100		55	10.50	83.68	1.50	1.26	1.89	Light brown LIMESTONE	
DSRCHO3 08	3.29	D	Y	N		50	100	17.45	100.00	1.75	1.37	2.38	Light brown LIMESTONE	
DSRCHO3 08	5.15	A	X	N	100		60	21.94	87.40	2.87	1.29	3.69	Orangish brown LIMESTONE	
DSRCHO3 08	5.15	D	Y	N		55	100	25.35	100.00	2.54	1.37	3.46	Orangish brown LIMESTONE	
DSRCHO3 08	6.25	A	X	N	100		40	5.77	71.36	1.13	1.17	1.33	Yellowish brown LIMESTONE	
DSRCHO3 08	6.25	D	Y	N		55	100	10.69	100.00	1.07	1.37	1.46	Yellowish brown LIMESTONE	
DSRCHO3 08	7.40	A	X	N	100		70	9.15	94.41	1.03	1.33	1.37	Yellowish brown LIMESTONE	
DSRCHO3 08	7.40	D	Y	N		60	100	7.27	100.00	0.73	1.37	0.99	Yellowish brown LIMESTONE	
DSRCHO3 08	8.45	A	X	N	100		50	3.20	79.79	0.50	1.23	0.62	Yellowish brown LIMESTONE	
DSRCHO3 08	8.45	D	Y	N		60	100	4.40	100.00	0.44	1.37	0.60	Yellowish brown LIMESTONE	
DSRCHO3 08	10.40	A	X	N	100		50	14.79	79.79	2.32	1.23	2.87	Orangish brown LIMESTONE	
DSRCHO3 08	10.40	D	Y	N		60	100	2.98	100.00	0.30	1.37	0.41	Orangish brown LIMESTONE	
DSRCHO3 08	13.80	A	X	N	100		60	3.36	87.40	0.44	1.29	0.57	Yellowish brown LIMESTONE	
DSRCHO3 08	13.80	D	Y	N		70	100	3.47	100.00	0.35	1.37	0.47	Yellowish brown LIMESTONE	
DSRCHO3 08	16.67	A	X	N	100		55	5.68	83.68	0.81	1.26	1.02	Yellowish brown LIMESTONE	
DSRCHO3 08	16.67	D	Y	N		60	100	9.60	100.00	0.96	1.37	1.31	Yellowish brown LIMESTONE	
DSRCHO3 08	19.40	A	X	N	100		40	4.27	71.36	0.84	1.17	0.98	Light brown LIMESTONE	
DSRCHO3 08	19.40	D	Y	N		50	100	4.87	100.00	0.49	1.37	0.67	Light brown LIMESTONE	

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35560/06</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		



**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)	L (mm)						
DSRCOH3 08	23.16	A	X	N	100		70		7.50	94.41	0.84	1.33	1.12	Light brown LIMESTONE
DSRCOH3 08	23.16	D	Y	N		65	100		6.34	100.00	0.63	1.37	0.87	Light brown LIMESTONE
DSRCOH3 08	25.65	A	X	N	100		45		0.22	75.69	0.04	1.21	0.05	Light brown LIMESTONE
DSRCOH3 08	25.65	D	Y	N		60	100		1.61	100.00	0.16	1.37	0.22	Light brown LIMESTONE
RC504	4.55	A	X	N	100		70		11.00	94.41	1.23	1.33	1.64	Orangish brown LIMESTONE
RC504	4.55	D	Y	N		80	100		13.67	100.00	1.37	1.37	1.87	Orangish brown LIMESTONE
RC504	6.65	A	X	N	100		55		19.41	83.68	2.77	1.26	3.49	Orangish brown LIMESTONE
RC504	6.65	D	Y	N		65	100		21.78	100.00	2.18	1.37	2.98	Orangish brown LIMESTONE
RC504	12.75	I	Y	N	95	70	60		9.12	85.19	1.26	1.27	1.60	Yellowish brown LIMESTONE
RC504	16.10	A	X	N	100		40		3.32	71.36	0.65	1.17	0.77	Orangish brown LIMESTONE
RC504	16.10	D	Y	N		80	100		12.83	100.00	1.28	1.37	1.75	Orangish brown LIMESTONE
RC504	18.65	A	X	N	100		100		13.01	112.84	1.02	1.44	1.47	Yellowish brown LIMESTONE
RC504	18.65	D	Y	N		150	100		9.65	100.00	0.97	1.37	1.32	Yellowish brown LIMESTONE
RC504	19.35	A	X	N	100		50		4.12	79.79	0.65	1.23	0.80	Yellowish brown LIMESTONE
RC504	19.35	D	Y	N		75	100		7.34	100.00	0.73	1.37	1.00	Yellowish brown LIMESTONE
RC504	20.80	A	X	N	100		100		5.71	112.84	0.45	1.44	0.65	Yellow and white LIMESTONE
RC504	20.80	D	Y	N		150	100		1.31	100.00	0.13	1.37	0.18	Yellow and white LIMESTONE
RC504	22.00	A	X	N	100		75		3.72	97.72	0.39	1.35	0.53	Yellowish brown LIMESTONE
RC504	22.00	D	Y	N		80	100		8.02	100.00	0.80	1.37	1.10	Yellowish brown LIMESTONE
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02														
test type		test orientation relative to discontinuities				moisture condition				CONTRACT		CHECKED		
A - axial		X - perpendicular		U - unknown		N - natural moisture content				35560/06		TB		
D - diametral		Y - parallel		P - partially air dried										
I - irregular lump		Z - oblique		S - soaked										

# POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)

borehole /trial pit no.	sample depth (m)	test type	test orientation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)	D (mm)	L (mm)						
RC504	27.60	A	X	N	100		50		5.59	79.79	0.88	1.23	1.08	Light brown LIMESTONE
RC504	27.60	D	Y	N		80	100		4.25	100.00	0.43	1.37	0.58	Light brown LIMESTONE
RC504	30.70	A	X	N	100		70		6.02	94.41	0.68	1.33	0.90	Yellowish brown LIMESTONE
RC504	30.70	D	Y	N		80	100		9.62	100.00	0.96	1.37	1.31	Yellowish brown LIMESTONE
RC514	10.30	A	X	N	100		70		14.46	94.41	1.62	1.33	2.16	Yellowish brown LIMESTONE
RC514	10.30	D	Y	N		70	100		15.52	100.00	1.55	1.37	2.12	Yellowish brown LIMESTONE
RC514	12.20	A	X	N	100		40		5.82	71.36	1.14	1.17	1.34	Orangish brown LIMESTONE
RC514	12.20	D	Y	N		70	100		5.85	100.00	0.59	1.37	0.80	Orangish brown LIMESTONE
RC514	14.65	A	X	N	100		60		8.00	87.40	1.05	1.29	1.35	Yellowish brown LIMESTONE
RC514	14.65	D	Y	N		50	100		12.61	100.00	1.26	1.37	1.72	Yellowish brown LIMESTONE
RC514	16.20	A	X	N	100		40		10.42	71.36	2.05	1.17	2.40	Orangish brown LIMESTONE
RC514	16.20	D	Y	N		50	100		11.70	100.00	1.17	1.37	1.60	Orangish brown LIMESTONE
RC514	17.40	A	X	N	100		70		5.71	94.41	0.64	1.33	0.85	Yellowish brown LIMESTONE
RC514	17.40	D	Y	N		65	100		3.51	100.00	0.35	1.37	0.48	Yellowish brown LIMESTONE
RC514	20.75	A	X	N	100		70		3.36	94.41	0.38	1.33	0.50	Yellowish brown LIMESTONE
RC514	20.75	D	Y	N		80	100		6.67	100.00	0.67	1.37	0.91	Yellowish brown LIMESTONE
RC514	24.90	A	X	N	100		55		1.02	83.68	0.15	1.26	0.18	Yellowish brown LIMESTONE
RC514	24.90	D	Y	N		60	100		6.03	100.00	0.60	1.37	0.82	Yellowish brown LIMESTONE
RC520	4.85	A	X	N	100		50		20.14	79.79	3.16	1.23	3.90	Light brown LIMESTONE

general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35560/06</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1158)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length		failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks	
					W (mm)	L (mm)	D (mm)	L (mm)							
RC520	4.85	D	Y	N		40	100	19.42	100.00	1.94	1.37	2.65	Light brown LIMESTONE		
RC520	9.15	A	X	N	100		40	7.86	71.36	1.54	1.17	1.81	Yellowish brown LIMESTONE		
RC520	9.15	D	Y	N		50	100	3.94	100.00	0.39	1.37	0.54	Yellowish brown LIMESTONE		
RC520	16.10	A	X	N	100		65	0.12	90.97	0.01	1.31	0.02	Grey MUDSTONE		
RC520	16.10	D	Y	N		70	100	0.40	100.00	0.04	1.37	0.05	Grey MUDSTONE		
RC520	17.50	A	X	N	100		50	0.21	79.79	0.03	1.23	0.04	Grey LIMESTONE		
RC520	17.50	D	Y	N		50	100	0.38	100.00	0.04	1.37	0.05	Grey LIMESTONE		
RC520	20.55	A	X	N	100		40	0.23	71.36	0.05	1.17	0.05	Grey SILTSTONE		
RC520	20.55	D	Y	N		60	100	0.14	100.00	0.01	1.37	0.02	Grey SILTSTONE		
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02															
test type		test orientation relative to discontinuities				moisture condition				CONTRACT	CHECKED				
A - axial		X - perpendicular		U - unknown		N - natural moisture content				<b>35560/06</b>	<b>TB</b>				
D - diametral		Y - parallel		P - partially air dried											
I - irregular lump		Z - oblique		S - soaked											

Geotechnical Engineering Limited  
Centurion House  
Olympus Park, Quedgeley  
Gloucester  
GL2 4NF

Date: 02 July 2020  
Test Report Ref: TR 737372

Page 1 of 1

Contract: HE55105 - A417 Missing Link.

**LABORATORY TEST REPORT**

**TEST REQUIREMENTS:**

To determine the Fragmentation of Aggregate - Los Angeles  
Test Method in accordance with **BS EN 1097-2: 2010**

**SAMPLE DETAILS:**

Certificate of sampling received:	<b>No</b>
Laboratory Ref. No:	<b>S88139</b>
Client Ref. No:	<b>RC504 - 8C</b>
Date and Time of Sampling:	<b>Unknown</b>
Date of Receipt at Lab:	<b>12/06/2020</b>
Date of Start of Test:	<b>30/06/2020</b>
Sampling Location:	<b>Depth - 4.0 - 7.0m</b>
Name of Source:	<b>A417 Missing Link</b>
Method of Sampling:	<b>Unknown</b>
Sampled By:	<b>Client</b>
Tested By:	<b>WK</b>
Material Description:	<b>Chalky Rock Core</b>
Target Specification:	<b>N/A</b>

**RESULTS:**

**Size fraction from which the test portion was obtained:**                  **14mm to 12.5mm**  
   **12.5mm to 10.0mm**

**Los Angeles Coefficient (LA) =**    **38**

This test report shall not be reproduced, except in full, without the written approval of Celtest Company Limited.

These results relate only to the items tested.

<p><b><u>Comments:</u></b> None</p>	<p>Report checked and approved by:  <div style="background-color: black; width: 150px; height: 40px; margin: 5px 0;"></div> Dyrea Jones Aggregate Team Coordinator</p>
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Geotechnical Engineering Limited  
Centurion House  
Olympus Park, Quedgeley  
Gloucester  
GL2 4NF

Date: 02 July 2020  
Test Report Ref: TR 737374

Page 1 of 1

Contract: HE55105 - A417 Missing Link.

**LABORATORY TEST REPORT**

**TEST REQUIREMENTS:**

To determine the Fragmentation of Aggregate - Los Angeles  
Test Method in accordance with **BS EN 1097-2: 2010**

**SAMPLE DETAILS:**

Certificate of sampling received:	<b>No</b>
Laboratory Ref. No:	<b>S88139</b>
Client Ref. No:	<b>RC520 - 7C</b>
Date and Time of Sampling:	<b>Unknown</b>
Date of Receipt at Lab:	<b>12/06/2020</b>
Date of Start of Test:	<b>30/06/2020</b>
Sampling Location:	<b>Depth - 4.5 - 6.0m</b>
Name of Source:	<b>A417 Missing Link</b>
Method of Sampling:	<b>Unknown</b>
Sampled By:	<b>Client</b>
Tested By:	<b>WK</b>
Material Description:	<b>Chalky Rock Core</b>
Target Specification:	<b>N/A</b>

**RESULTS:**

<b>Size fraction from which the test portion was obtained:</b>	<b>14mm to 12.5mm</b> <b>12.5mm to 10.0mm</b>
<b>Los Angeles Coefficient (LA) =</b>	<b>26</b>

This test report shall not be reproduced, except in full, without the written approval of Celtest Company Limited.

These results relate only to the items tested.

<p><b><u>Comments:</u></b> None</p>	<p>Report checked and approved by:  Dyfed Jones Aggregate Team Coordinator</p>
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# Final Report

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**Report No.:** 20-16386-1  
**Initial Date of Issue:** 02-Jul-2020  
**Client** Geotechnical Engineering Ltd  
**Client Address:** Centurion House  
Olympus Park  
Quedgeley  
Gloucester  
Gloucestershire  
GL2 4NF

**Contact(s):** GEL  
Tom Best

**Project** 35560-06/B A417 Missing Link

**Quotation No.:** **Date Received:** 29-Jun-2020

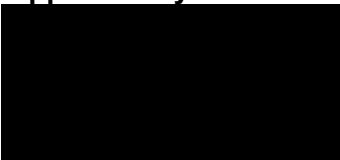
**Order No.:** 35560/LAB **Date Instructed:** 29-Jun-2020

**No. of Samples:** 4

**Turnaround (Wkdays):** 5 **Results Due:** 03-Jul-2020

**Date Approved:** 02-Jul-2020

**Approved By:**



**Details:** Glynn Harvey, Technical Manager

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## Results - Soil

**Project: 35560-06/B A417 Missing Link**

<b>Client: Geotechnical Engineering Ltd</b>	<b>Chemtest Job No.:</b>				20-16386	20-16386	20-16386	20-16386
Quotation No.:	<b>Chemtest Sample ID.:</b>				1023375	1023376	1023377	1023378
	Client Sample ID.:				12Cs	15Cs	16Cs	22Cs
	Sample Location:				DSRC310	DSRC310	DSRC311	DSRC311
	Sample Type:				SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				3.46	7.47	5.20	10.73
	Bottom Depth (m):				3.57	7.68	5.46	11.02
	Date Sampled:				22-Jun-2020	22-Jun-2020	22-Jun-2020	22-Jun-2020
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>				
Moisture	N	2030	%	0.020	4.9	2.3	7.2	4.3
pH	U	2010		4.0	8.3	8.1	8.1	8.3
Sulphate (2:1 Water Soluble) as SO <sub>4</sub>	U	2120	g/l	0.010	< 0.010	0.074	0.034	< 0.010
Total Sulphur	U	2175	%	0.010	0.040	0.060	0.22	0.060
Sulphate (Acid Soluble)	U	2430	%	0.010	0.062	0.058	0.061	0.060



## Test Methods

<b>SOP</b>	<b>Title</b>	<b>Parameters included</b>	<b>Method summary</b>
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

## **Report Information**

### **Key**

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- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

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- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



2718

GEOTECHNICAL ENGINEERING LIMITED



For the attention of Dave Owen/ Ed Crimp

Version No. 2  
Page No. 1 of 18  
Date of Issue 21/07/2020

**TEST REPORT**

PROJECT/SITE	HE551505 A417 Missing Link Ground Investigation- Phase 2A (1098)	Samples received	15/05/2020
GEL REPORT NUMBER	35560/07	Schedule received	15/05/2020
Test report refers to	Schedule 1	Testing commenced	02/06/2020
		Status	Final

**SUMMARY OF RESULTS ATTACHED**

TEST METHOD & DESCRIPTION	QUANTITY	ACCREDITED TEST
BS EN ISO 17892-1: 2014:5. Water Content	9	YES
BS1377: Part 2: 1990:4.2-4.4&5.2-5.4, Liquid & Plastic Limits	9	YES
BS EN ISO 17892-4: 2016: 5.2, Particle Size Distribution - Wet Sieve	1	YES
BS EN ISO 17892-4: 2016: 5.4, Particle Size Distribution - Pipette	1	YES
ISRM: 2007: Water Content of Rock	14	NO
ISRM: 2007: Point Load Strength Test	39	YES
BRE SD1 Reduced Suite: pH, Sulphate - water and acid soluble, sulphur (Subcontracted)	10	YES
BS EN 1097-2:2010, Fragmentation of Aggregate- Los Angeles Method (Subcontracted)	3	YES

Remarks This report may not be partially reproduced without written permission from this laboratory.  The results reported relate to samples received in the laboratory	Approved Signatories: <b>T Best (Deputy Laboratory Manager)</b> E Crimp (Senior Engineer) J Hanson (Director) N Parry (Director)
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Doc TR01 Rev No. 22 Revision date 02/01/20 DC:JH

**Geotechnical Engineering Ltd**  
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Sort code: 16-22-11 Bank account: 11125135

**LIQUID AND PLASTIC LIMITS**

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1098)

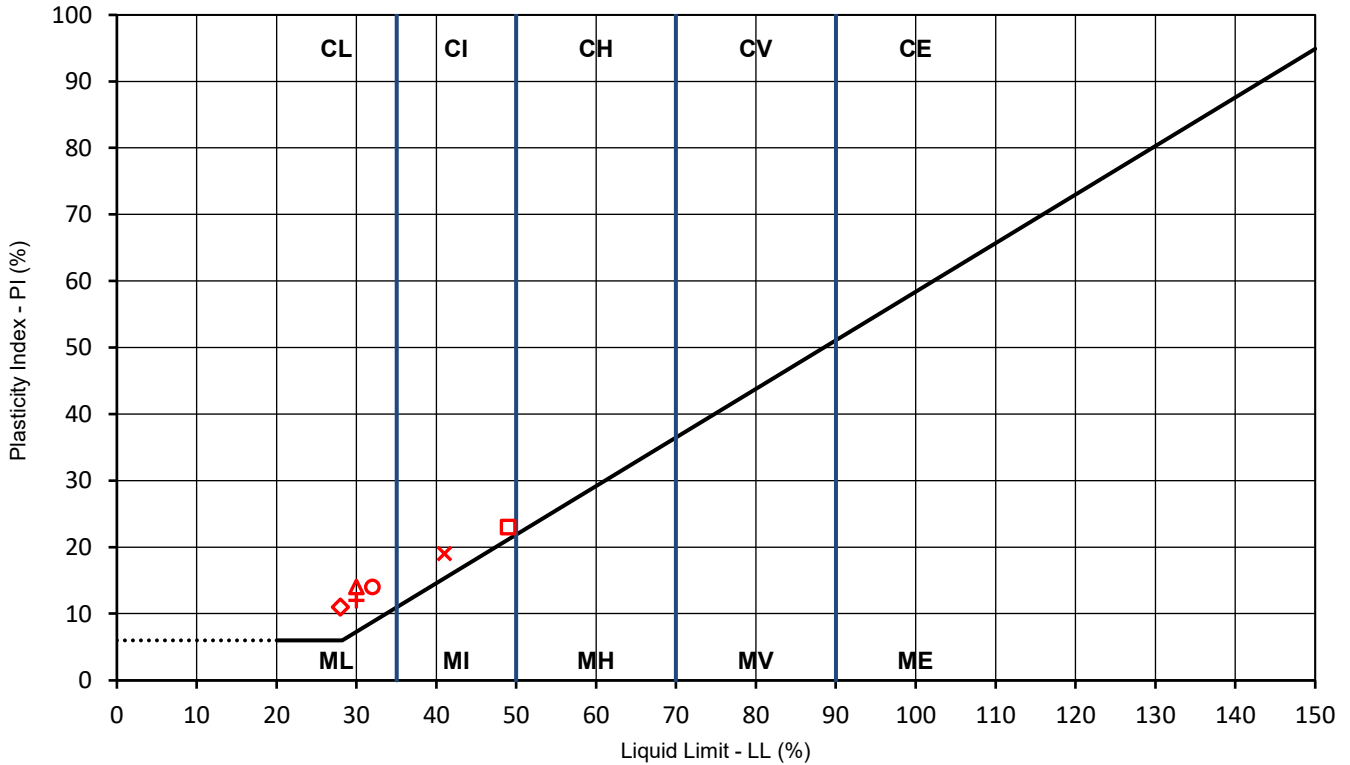
borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks	
	no./type	depth (m)									
DSCROH304	6D	0.45	0.45	15.5	BXE	56	49	26	23	Brown slightly sandy gravelly CLAY	
DSCROH304	9D	1.20	1.20	9.4	BYE	58	28	17	11	Light brown slightly sandy gravelly CLAY	
DSCROH304	12D	2.20	2.20	7.8	BYE	60	30	16	14	Light brown slightly sandy gravelly CLAY	
DSRC325	6D	0.45	0.45	14.5	BXE	63	41	22	19	Light brown slightly sandy gravelly CLAY	
DSRC325	13D	2.70	2.70	14.6	BYE	50	30	18	12	Brown slightly sandy slightly gravelly CLAY	
DSRC325	16D	3.50	3.50	14.4	BXE	56	32	18	14	Orangish brown slightly sandy gravelly CLAY	
DSRC325	53Cs	30.30	30.30	15.3	BYE	0	34	NP		Grey slightly sandy SILT	
DSRC325	55Cs	32.00	32.00	15.5	BYE	0	33	NP		Grey slightly sandy SILT	
DSRC325	59Cs	35.30	35.30	11.8	BYE	0	36	NP		Grey slightly sandy SILT	
<p>general remarks</p> <p>natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)</p> <p>NP denotes non plastic</p> <p># denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892</p>											
specimen preparation						test method				CONTRACT	CHECKED
A - as received			D - oven dried (60°C)			X - cone penetrometer (test 4.3)				<b>35560/07</b>	<b>TB</b>
B - washed on 0.425mm sieve			E - oven dried (105°C)			Y - cone penetrometer (test 4.4)					
C - air dried			F - not known			Z - casagrande apparatus (test 4.5)					

Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1098)



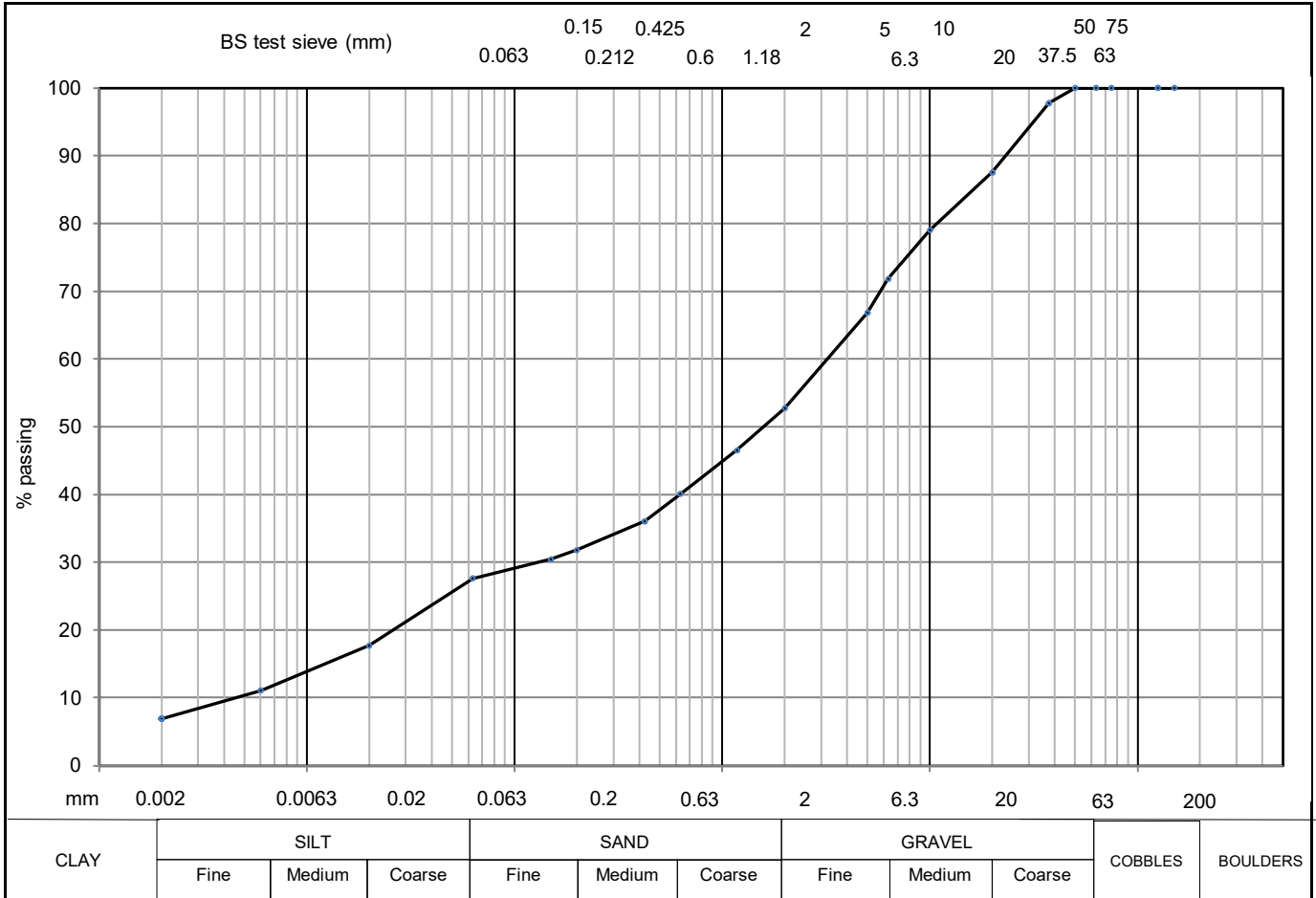
BH/TP No.	depth (m)	LL	PL	PI	remarks
□	DSCROH304 0.45	49	26	23	
◇	DSCROH304 1.20	28	17	11	
△	DSCROH304 2.20	30	16	14	
×	DSRC325 0.45	41	22	19	
+	DSRC325 2.70	30	18	12	
○	DSRC325 3.50	32	18	14	
	DSRC325 30.30	34	NP		
	DSRC325 32.00	33	NP		
	DSRC325 35.30	36	NP		

CONTRACT	CHECKED
<b>35560/07</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSCROH304
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1098)	SAMPLE No./TYPE	10L
DESCRIPTION	Light brown slightly sandy gravelly silty CLAY	SAMPLE DEPTH (m)	1.20
		SPECIMEN TOP (m)	1.40
		SPECIMEN BASE (m)	1.80



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	7						
SILT	21	150		5	67	20	18
SILT & CLAY	28			2	53	6	11
SAND	25	75					
GRAVEL	47			1.18	47	2	7
COBBLE & BOULDER	0	63					
test method(s)	5.2 & 5.4	50	100	0.63	40		
test method		37.5	98	0.425	36		
5.2 - sieving		20	88	0.2	32		
5.3 - sedimentation by hydrometer		10	79	0.15	30		
5.4 - sedimentation by pipette		6.3	72	0.063	28		
remarks	# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>					CONTRACT	CHECKED
						<b>35560/07</b>	<b>TB</b>

**ROCK WATER CONTENT**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1098)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	description and remarks
	no./type	depth (m)			
DSCROH304	54Cs	30.60	30.60	15	Grey SILTSTONE
DSCROH304	59Cs	36.00	36.00	8.8	Grey SILTSTONE
DSCROH304	67Cs	41.20	41.20	13	Grey SILTSTONE
DSRC319	33Cs	21.80	21.80	7.6	Grey SILTSTONE
DSRC319	37Cs	25.40	25.40	6.8	Grey SILTSTONE
DSRC319	44Cs	31.10	31.10	15	Grey SILTSTONE
DSRC319	48Cs	34.00	34.00	15	Grey SILTSTONE
DSRC319	56Cs	39.65	39.65	12	Grey SILTSTONE
DSRC319	58Cs	41.30	41.30	12	Grey SILTSTONE
DSRC319	62Cs	44.60	44.60	12	Grey SILTSTONE
DSRC319	66Cs	47.90	47.90	12	Grey SILTSTONE
DSRC319	73Cs	53.10	53.10	11	Grey SILTSTONE
DSRC319	79Cs	60.40	60.40	12	Grey SILTSTONE
DSRC319	82Cs	63.40	63.40	13	Grey SILTSTONE
general remarks natural water content determined unless otherwise specified					
test method samples oven dried at 105°C				CONTRACT <b>35560/07</b>	
				CHECKED <b>TB</b>	

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1098)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
DSCROH304	4.50	A	X	N	100		60	8.78	87.40	1.15	1.29	1.48	Yellowish brown LIMESTONE
DSCROH304	4.50	D	Y	N		50	100	3.36	100.00	0.34	1.37	0.46	Yellowish brown LIMESTONE
DSCROH304	7.00	A	X	N	100		70	6.72	94.41	0.75	1.33	1.00	Yellowish brown LIMESTONE
DSCROH304	7.00	D	Y	N		80	100	12.28	100.00	1.23	1.37	1.68	Yellowish brown LIMESTONE
DSCROH304	8.40	A	X	N	100		60	13.90	87.40	1.82	1.29	2.34	Yellowish brown LIMESTONE
DSCROH304	8.40	D	Y	N		60	100	14.42	100.00	1.44	1.37	1.97	Yellowish brown LIMESTONE
DSCROH304	10.80	A	X	N	100		50	2.91	79.79	0.46	1.23	0.56	Yellowish brown LIMESTONE
DSCROH304	10.80	D	Y	N		50	100	7.86	100.00	0.79	1.37	1.07	Yellowish brown LIMESTONE
DSCROH304	12.35	A	X	N	100	9	65	11.02	90.97	1.33	1.31	1.74	Yellowish brown LIMESTONE
DSCROH304	12.35	D	Y	N		50	100	7.74	100.00	0.77	1.37	1.06	Yellowish brown LIMESTONE
DSCROH304	14.70	A	X	N	100		80	3.07	100.93	0.30	1.37	0.41	Yellowish brown LIMESTONE
DSCROH304	14.70	D	Y	N		90	100	3.72	100.00	0.37	1.37	0.51	Yellowish brown LIMESTONE
DSCROH304	17.00	A	X	N	100		60	4.07	87.40	0.53	1.29	0.68	Light brown LIMESTONE
DSCROH304	17.00	D	Y	N		70	100	9.62	100.00	0.96	1.37	1.31	Light brown LIMESTONE
DSCROH304	20.75	A	X	N	100		70	11.14	94.41	1.25	1.33	1.66	Light brown LIMESTONE
DSCROH304	20.75	D	Y	N		70	100	6.57	100.00	0.66	1.37	0.90	Light brown LIMESTONE
DSCROH304	24.50	A	X	N	100		50	2.50	79.79	0.39	1.23	0.48	Orangish brown LIMESTONE
DSCROH304	24.50	D	Y	N		60	100	3.24	100.00	0.32	1.37	0.44	Orangish brown LIMESTONE
DSCROH304	27.10	A	X	N	100		70	5.34	94.41	0.60	1.33	0.80	Grey SILTSTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type A - axial D - diametral I - irregular lump	test orientation relative to discontinuities X - perpendicular Y - parallel Z - oblique	U - unknown	moisture condition N - natural moisture content P - partially air dried S - soaked	CONTRACT <b>35560/07</b>	CHECKED <b>TB</b>
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**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1098)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)								
DSCROH304	27.10	D	Y	N			50	100	6.37	100.00	0.64	1.37	0.87	Grey SILTSTONE
DSCROH304	30.60	A	X	N	100			70	0.11	94.41	0.01	1.33	0.02	Grey SILTSTONE
DSCROH304	30.60	D	Y	N			60	100	0.07	100.00	0.01	1.37	0.01	Grey SILTSTONE
DSCROH304	36.00	A	X	N	100			60	1.30	87.40	0.17	1.29	0.22	Grey SILTSTONE
DSCROH304	36.00	D	Y	N			50	100	1.20	100.00	0.12	1.37	0.16	Grey SILTSTONE
DSCROH304	41.20	A	X	N	100			50	0.20	79.79	0.03	1.23	0.04	Grey SILTSTONE
DSCROH304	41.20	D	Y	N			50	100	0.14	100.00	0.01	1.37	0.02	Grey SILTSTONE
DSRC319	9.40	A	X	N	100			60	0.04	87.40	0.01	1.29	0.01	Orangish brown LIMESTONE
DSRC319	9.40	D	Y	N			55	100	0.53	100.00	0.05	1.37	0.07	Orangish brown LIMESTONE
DSRC319	12.75	A	X	N	100			60	4.85	87.40	0.64	1.29	0.82	Yellowish brown LIMESTONE
DSRC319	12.75	D	Y	N			50	100	8.16	100.00	0.82	1.37	1.12	Yellowish brown LIMESTONE
DSRC319	15.45	A	X	N	100			60	3.62	87.40	0.47	1.29	0.61	Yellowish brown LIMESTONE
DSRC319	15.45	D	Y	N			60	100	8.54	100.00	0.85	1.37	1.17	Yellowish brown LIMESTONE
DSRC319	19.10	A		N	100			60	0.96	87.40	0.13	1.29	0.16	Grey SILTSTONE
DSRC319	19.10	D		N			60	100	0.47	100.00	0.05	1.37	0.06	Grey SILTSTONE
DSRC319	21.80	A		N	100			70	3.85	94.41	0.43	1.33	0.58	Grey LIMESTONE
DSRC319	21.80	D		N			70	100	7.36	100.00	0.74	1.37	1.01	Grey LIMESTONE
DSRC319	25.40	A		N	100			65	1.37	90.97	0.17	1.31	0.22	Grey SILTSTONE
DSRC319	25.40	D		N			55	100	1.73	100.00	0.17	1.37	0.24	Grey SILTSTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type A - axial D - diametral I - irregular lump	test orientation relative to discontinuities X - perpendicular Y - parallel Z - oblique	U - unknown	moisture condition N - natural moisture content P - partially air dried S - soaked	CONTRACT <b>35560/07</b>	CHECKED <b>TB</b>
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**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1098)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
DSRC319	31.10	A		N	100		50	0.11	79.79	0.02	1.23	0.02	Grey SILTSTONE
DSRC319	31.10	D		N		40	100	0.04	100.00	0.00	1.37	0.01	Grey SILTSTONE
DSRC319	34.00	A		N	100		60	0.26	87.40	0.03	1.29	0.04	Grey SILTSTONE
DSRC319	34.00	D		N		70	100	0.09	100.00	0.01	1.37	0.01	Grey SILTSTONE
DSRC319	39.65	A		N	100		70	0.34	94.41	0.04	1.33	0.05	Grey SILTSTONE
DSRC319	39.65	D		N		50	100	0.21	100.00	0.02	1.37	0.03	Grey SILTSTONE
DSRC319	41.30	A		N	100		65	0.55	90.97	0.07	1.31	0.09	Grey SILTSTONE
DSRC319	41.30	D		N		70	100	0.29	100.00	0.03	1.37	0.04	Grey SILTSTONE
DSRC319	44.60	A		N	100		45	0.45	75.69	0.08	1.21	0.09	Grey SILTSTONE
DSRC319	44.60	D		N		45	100	0.38	100.00	0.04	1.37	0.05	Grey SILTSTONE
DSRC319	47.90	A	X	N	100		60	0.59	87.40	0.08	1.29	0.10	Grey weak SILTSTONE
DSRC319	47.90	D	Y	N		60	100	0.30	100.00	0.03	1.37	0.04	Grey weak SILTSTONE
DSRC319	53.10	A	X	N	100		70	0.95	94.41	0.11	1.33	0.14	Grey weak SILTSTONE
DSRC319	53.10	D	Y	N		60	100	0.12	100.00	0.01	1.37	0.02	Grey weak SILTSTONE
DSRC319	60.40	A	X	N	100		55	0.95	83.68	0.14	1.26	0.17	Grey SILTSTONE
DSRC319	60.40	D	Y	N		65	100	0.87	100.00	0.09	1.37	0.12	Grey SILTSTONE
DSRC319	63.40	A	X	N	100		60	1.74	87.40	0.23	1.29	0.29	Grey SILTSTONE
DSRC319	63.40	D	Y	N		45	100	0.85	100.00	0.08	1.37	0.12	Grey SILTSTONE
DSRC325	8.30	A	X	N	100		45	4.52	75.69	0.79	1.21	0.95	Light brown LIMESTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type A - axial D - diametral I - irregular lump	test orientation relative to discontinuities X - perpendicular Y - parallel Z - oblique	U - unknown	moisture condition N - natural moisture content P - partially air dried S - soaked	CONTRACT <b>35560/07</b>	CHECKED <b>TB</b>
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**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1098)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		length L (mm)	platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)								
DSRC325	8.30	D	Y	N			55	100	6.01	100.00	0.60	1.37	0.82	Light brown LIMESTONE
DSRC325	11.10	A	X	N	100			60	3.22	87.40	0.42	1.29	0.54	Yellowish brown LIMESTONE
DSRC325	11.10	D	Y	N			50	100	6.85	100.00	0.68	1.37	0.94	Yellowish brown LIMESTONE
DSRC325	12.55	A	X	N	100			70	4.01	94.41	0.45	1.33	0.60	Yellowish brown LIMESTONE
DSRC325	12.55	D	Y	N			70	100	14.39	100.00	1.44	1.37	1.97	Yellowish brown LIMESTONE
DSRC325	15.20	A	X	N	100			50	1.33	79.79	0.21	1.23	0.26	Yellowish brown LIMESTONE
DSRC325	15.20	D	Y	N			50	100	8.61	100.00	0.86	1.37	1.18	Yellowish brown LIMESTONE
DSRC325	17.00	A	X	N	100			65	9.39	90.97	1.13	1.31	1.48	Light brown LIMESTONE
DSRC325	17.00	D	Y	N			60	100	10.85	100.00	1.08	1.37	1.48	Light brown LIMESTONE
DSRC325	19.75	A	X	N	100			60	1.78	87.40	0.23	1.29	0.30	Orangish brown LIMESTONE
DSRC325	19.75	D	Y	N			50	100	2.91	100.00	0.29	1.37	0.40	Orangish brown LIMESTONE
DSRC325	21.40	A	X	N	100			80	14.83	100.93	1.46	1.37	2.00	Orangish brown LIMESTONE
DSRC325	21.40	D	Y	N			60	100	10.56	100.00	1.06	1.37	1.44	Orangish brown LIMESTONE
DSRC325	25.02	A	X	N	100			65	2.04	90.97	0.25	1.31	0.32	Orangish brown LIMESTONE
DSRC325	25.02	D	Y	N			50	100	10.96	100.00	1.10	1.37	1.50	Orangish brown LIMESTONE
DSRC325	27.60	A	X	N	100			60	1.38	87.40	0.18	1.29	0.23	Grey SILTSTONE
DSRC325	27.60	D	Y	N			50	100	0.03	100.00	0.00	1.37	0.00	Grey SILTSTONE
DSRC325	32.00	A	X	N	100			50	0.11	79.79	0.02	1.23	0.02	Grey SILTSTONE
DSRC325	32.00	D	Y	N			50	100	0.05	100.00	0.00	1.37	0.01	Grey SILTSTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type A - axial D - diametral I - irregular lump	test orientation relative to discontinuities X - perpendicular Y - parallel Z - oblique	U - unknown	moisture condition N - natural moisture content P - partially air dried S - soaked	<b>CONTRACT</b> <b>35560/07</b>	<b>CHECKED</b> <b>TB</b>
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# POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1098)

borehole /trial pit no.	sample depth (m)	test type	test orientation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
DSRC325	35.30	A	X	N	100		65	0.83	90.97	0.10	1.31	0.13	Grey SILTSTONE
DSRC325	35.30	D	Y	N		45	100	0.12	100.00	0.01	1.37	0.02	Grey SILTSTONE

general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35560/07</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		



2183

## Final Report

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**Report No.:** 20-14391-1  
**Initial Date of Issue:** 15-Jun-2020  
**Client** Geotechnical Engineering Ltd  
**Client Address:** Centurion House  
Olympus Park  
Quedgeley  
Gloucester  
Gloucestershire  
GL2 4NF  
**Contact(s):** GEL  
Tom Best  
**Project** 35560/07 A417 Missing Link - Phase  
2A (1098)

**Quotation No.:** **Date Received:** 09-Jun-2020

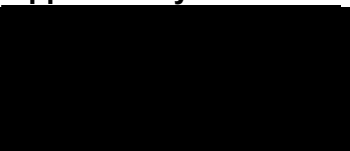
**Order No.:** 35560/07/TB **Date Instructed:** 09-Jun-2020

**No. of Samples:** 10

**Turnaround (Wkdays):** 5 **Results Due:** 15-Jun-2020

**Date Approved:** 15-Jun-2020

**Approved By:**



**Details:** Glynn Harvey, Technical Manager

---

**Project: 35560/07 A417 Missing Link - Phase 2A (1098)**

Client: Geotechnical Engineering Ltd		Chemtest Job No.:											
Quotation No.:		Chemtest Sample ID.:											
Order No.: 35560/07/TB		Client Sample Ref.:											
		Sample Location:											
		Sample Type:											
		Top Depth (m):											
		Bottom Depth (m):											
		Date Sampled:											
Determinand	Accred.	SOP	Units	LOD									
Moisture	N	2030	%	0.020	12	19	6.8	15	12	12	5.8	11	6.4
pH	U	2010		4.0	7.9	8.1	8.7	7.9	7.6	7.9	8.3	8.2	8.5
Sulphate (2:1 Water Soluble) as SO <sub>4</sub>	U	2120	g/l	0.010	0.24	< 0.010	< 0.010	0.50	0.84	0.51	0.20	0.41	0.77
Total Sulphur	U	2175	%	0.010	1.1	0.035	0.027	0.58	1.4	1.2	0.39	0.61	2.0
Sulphate (Acid Soluble)	U	2430	%	0.010	0.056	0.016	0.055	0.094	0.15	0.11	0.041	0.075	0.24

<b>Client: Geotechnical Engineering Ltd</b>	<b>Chemtest Job No.:</b> 20-14391				
Quotation No.:	<b>Chemtest Sample ID.:</b> 1014436				
Order No.: 35560/07/TB	Client Sample Ref.: 45D				
	Sample Location: DSRC325				
	Sample Type: SOIL				
	Top Depth (m): 25.90				
	Bottom Depth (m): 26.00				
	Date Sampled: 02-Jun-2020				
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>	
Moisture	N	2030	%	0.020	14
pH	U	2010		4.0	7.0
Sulphate (2:1 Water Soluble) as SO <sub>4</sub>	U	2120	g/l	0.010	0.44
Total Sulphur	U	2175	%	0.010	1.3
Sulphate (Acid Soluble)	U	2430	%	0.010	0.12

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.



## Report Information

### **Key**

---

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

---

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

---

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



Geotechnical Engineering Limited  
Centurion House  
Olympus Park, Quedgeley  
Gloucester  
GL2 4NF

Date: 02 July 2020  
Test Report Ref: TR 737375

Page 1 of 1

Contract: HE55105 - A417 Missing Link.

**LABORATORY TEST REPORT**

**TEST REQUIREMENTS:**

To determine the Fragmentation of Aggregate - Los Angeles  
Test Method in accordance with **BS EN 1097-2: 2010**

**SAMPLE DETAILS:**

Certificate of sampling received:	<b>No</b>
Laboratory Ref. No:	<b>S88139</b>
Client Ref. No:	<b>DSRCOH304 - 22C</b>
Date and Time of Sampling:	<b>Unknown</b>
Date of Receipt at Lab:	<b>12/06/2020</b>
Date of Start of Test:	<b>30/06/2020</b>
Sampling Location:	<b>Depth - 6.9 - 8.9m</b>
Name of Source:	<b>A417 Missing Link</b>
Method of Sampling:	<b>Unknown</b>
Sampled By:	<b>Client</b>
Tested By:	<b>WK</b>
Material Description:	<b>Chalky Rock Core</b>
Target Specification:	<b>N/A</b>

**RESULTS:**

<b>Size fraction from which the test portion was obtained:</b>	<b>14mm to 12.5mm</b> <b>12.5mm to 10.0mm</b>
<b>Los Angeles Coefficient (LA) =</b>	<b>56</b>

This test report shall not be reproduced, except in full, without the written approval of Celtest Company Limited.

These results relate only to the items tested.

<b><u>Comments:</u></b> None	Report checked and approved by:  Dyfed Jones Aggregate Team Coordinator
---------------------------------	---





2718

GEOTECHNICAL ENGINEERING LIMITED



For the attention of Dave Owen/ Ed Crimp


Version No. 2  
Page No. 1 of 18  
Date of Issue 22/07/2020

**TEST REPORT**

PROJECT/SITE	HE551505 A417 Missing Link Ground Investigation- Phase 2A (1084)	Samples received	15/05/2020
GEL REPORT NUMBER	35560/09	Schedule received	15/05/2020
Test report refers to	Schedule 1	Testing commenced	02/06/2020
		Status	Final

**SUMMARY OF RESULTS ATTACHED**

TEST METHOD & DESCRIPTION	QUANTITY	ACCREDITED TEST
BS EN ISO 17892-1: 2014:5. Water Content	10	YES
BS1377: Part 2: 1990:4.2-4.4&5.2-5.4, Liquid & Plastic Limits	6	YES
BS EN ISO 17892-4: 2016: 5.2, Particle Size Distribution - Wet Sieve	1	YES
BS EN ISO 17892-4: 2016: 5.4, Particle Size Distribution - Pipette	1	YES
BS1377: Part 7: 1990:4.5, Determination of Shear Strength by Direct Shear	1	YES
BS1377: Part 7: 1990:6, Residual Strength by Ring Shear	1	NO
BS1377: Part 8: 1990: Effective Stress Testing	1	YES
ISRM: 2007: Point Load Strength Test	2	YES
BRE SD1 Reduced Suite: pH, Sulphate - water and acid soluble, sulphur (Subcontracted)	1	YES

<p>Remarks</p> <p>This report may not be partially reproduced without written permission from this laboratory.</p> <p>The results reported relate to samples received in the laboratory</p>	<p>Approved Signatories:</p> <p><b>T Best (Deputy Laboratory Manager)</b> E Crimp (Senior Engineer)</p> <p>J Hanson (Director) N Parry (Director)</p> 
---	--

Doc TR01 Rev No. 22 Revision date 02/01/20 DC:JH

**Geotechnical Engineering Ltd**  
Centurion House  
Olympus Park, Quedgeley  
Gloucester GL2 4NF

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Registered number: 00700739  
VAT Number: 682 5857 89

Payments: Geotechnical Engineering Limited  
Sort code: 16-22-11 Bank account: 11125135

**LIQUID AND PLASTIC LIMITS**

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1084)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
DSRC229	4D	0.45	0.45	22.1	BXE	14	39	23	16	Yellowish brown slightly sandy slightly gravelly clayey SILT
DSRC229	6D	0.95	0.95	20.6	BXE	1	35	23	12	Yellowish brown slightly sandy clayey SILT
DSRC229	13Ls	2.90	2.90	24.2	AXE	0	38	24	14	Brown mottled orange sandy clayey SILT
DSRC229	20UT	5.20	5.30	21.0	AXE	0	37	23	14	Light brown mottled orange slightly sandy clayey SILT
DSRC229	28D	7.20	7.20	23.9	BXE	1	35	23	12	Yellowish brown mottled orange slightly sandy clayey SILT
DSRC229	35Cs	10.40	10.40	17.3	BXE	2	38	22	16	Brown and grey slightly sandy clayey SILT
DSRC229	43Cs	14.50	14.55	19.5	E					Greyish brown slightly sandy clayey SILT
DSRC229	49Cs	17.50	17.50	14.8	E					Grey slightly sandy SILT
DSRC229	54Cs	20.45	20.45	14.4	E					Grey slightly sandy SILT
DSRC229	58Cs	23.81	23.81	17.3	E					Dark grey slightly sandy clayey SILT

## general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

## specimen preparation

A - as received

B - washed on 0.425mm sieve

C - air dried

D - oven dried (60°C)

E - oven dried (105°C)

F - not known

## test method

X - cone penetrometer (test 4.3)

Y - cone penetrometer (test 4.4)

Z - casagrande apparatus (test 4.5)

CONTRACT

**35560/09**

CHECKED

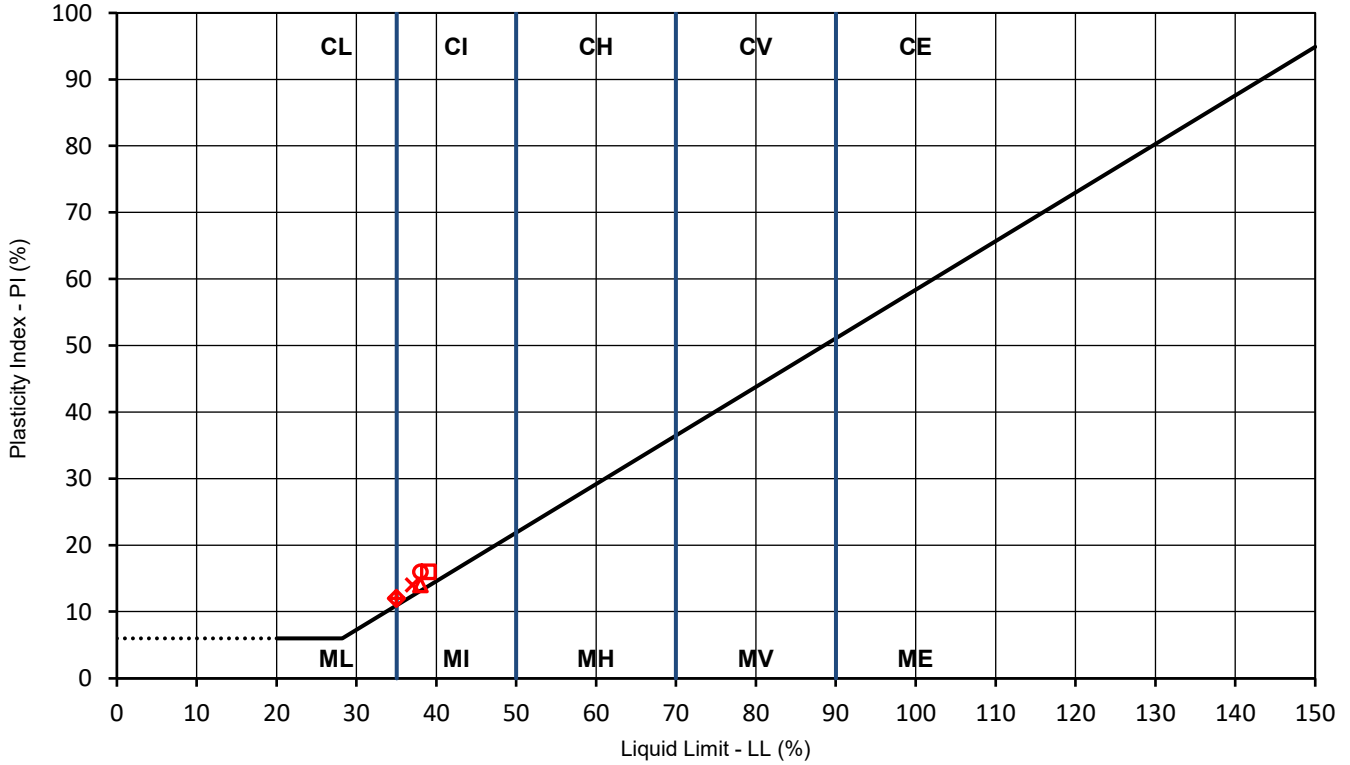
**TB**

Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1084)



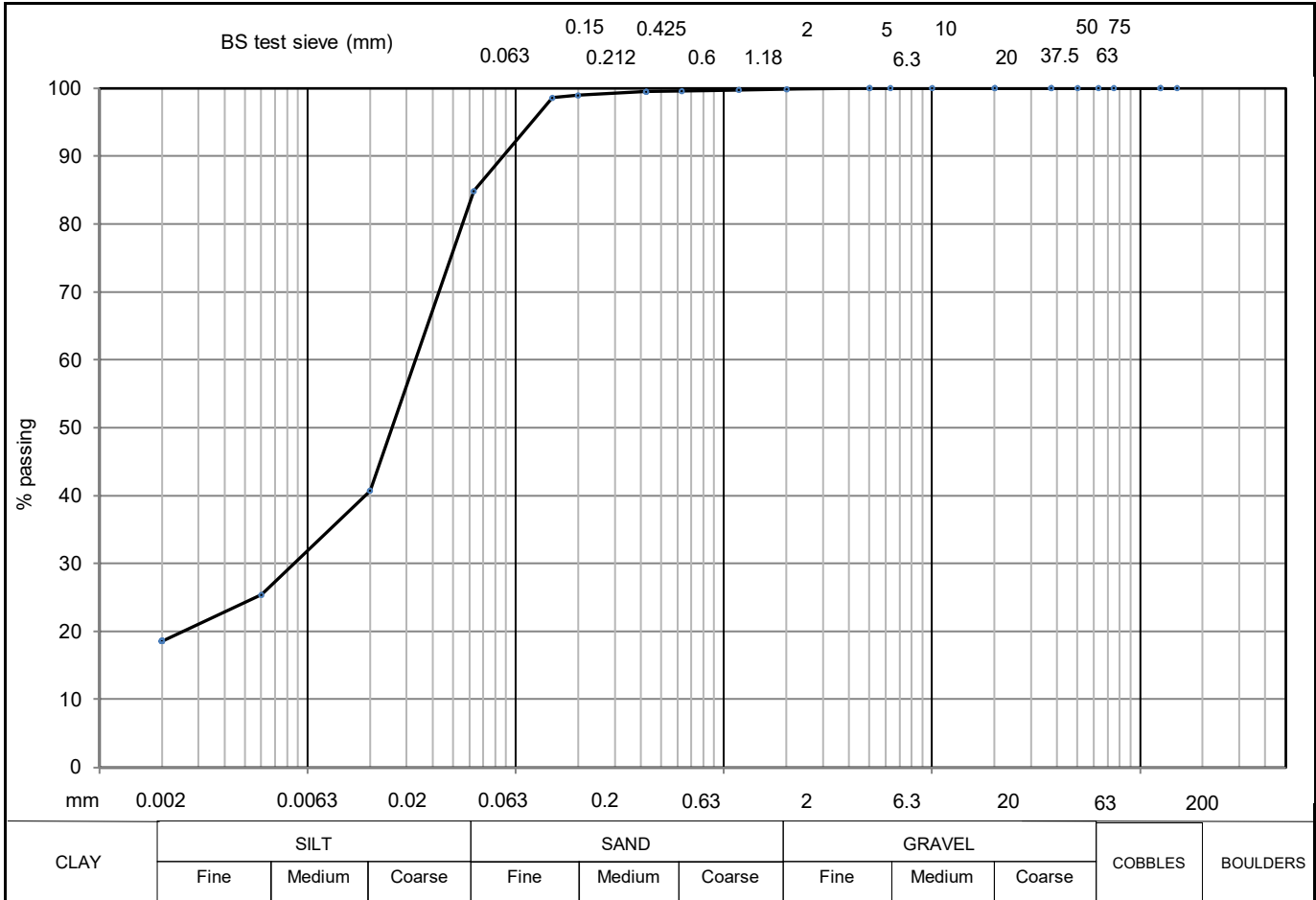
	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	DSRC229	0.45	39	23	16	
◇	DSRC229	0.95	35	23	12	
△	DSRC229	2.90	38	24	14	
×	DSRC229	5.30	37	23	14	
+	DSRC229	7.20	35	23	12	
○	DSRC229	10.40	38	22	16	

CONTRACT	CHECKED
<b>35560/09</b>	<b>TB</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC229
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1084)	SAMPLE No./TYPE	18L
DESCRIPTION	Yellowish brown slightly sandy clayey SILT	SAMPLE DEPTH (m)	4.20
		SPECIMEN TOP (m)	4.20
		SPECIMEN BASE (m)	4.50



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	19						
SILT	66	150		5	100	20	41
SILT & CLAY	85	75		2	100	6	25
SAND	15	75		1.18	100	2	19
GRAVEL	0						
COBBLE & BOULDER	0						
test method(s)	5.2 & 5.4	50		0.63	100		
test method		37.5		0.425	100		
5.2 - sieving		20		0.2	99		
5.3 - sedimentation by hydrometer		10		0.15	99		
5.4 - sedimentation by pipette		6.3		0.063	85		
remarks	# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>					CONTRACT	CHECKED
						<b>35560/09</b>	<b>TB</b>



# SHEAR STRENGTH BY DIRECT SHEAR



BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE

BH/TP No.

DSRC229

SAMPLE No./TYPE

29L

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1084)

SAMPLE DEPTH (m)

7.20-8.00

SPECIMEN DEPTH (m)

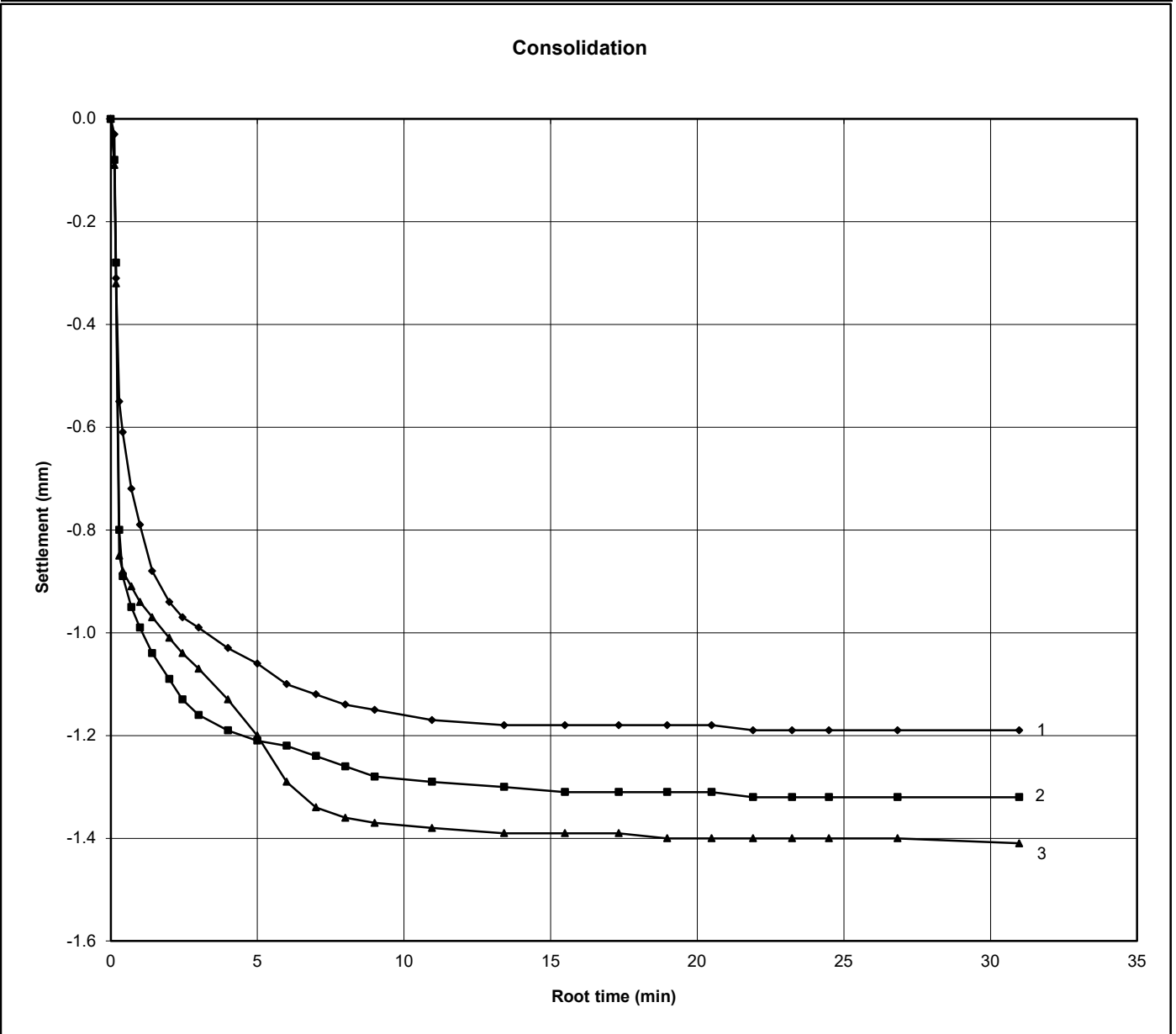
7.50-7.70

DESCRIPTION Greenish brown slightly sandy clayey SILT

PREPARATION DETAILS remoulded using a tamping rod - 2% removed (retained on 2mm sieve).

CONSOLIDATION STAGE RESULTS

Specimen	1	2	3
t100 (min)	7.50	15.10	63.70
t <sub>f</sub> (min)	95.25	191.77	808.99
Machine speed (mm/min)	0.0060	0.0060	0.0060
Normal Stress (kPa)	50	100	200
Initial height (mm)	19.99	19.99	19.99
Final height (mm)	18.80	18.67	18.58



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remarks: Specimens are submerged throughout the test.	CONTRACT <b>35560/09</b>	CHECKED <b>NP</b>
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# SHEAR STRENGTH BY DIRECT SHEAR

**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No.

DSRC229

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1084)

SAMPLE No./TYPE

29L

SAMPLE DEPTH (m)

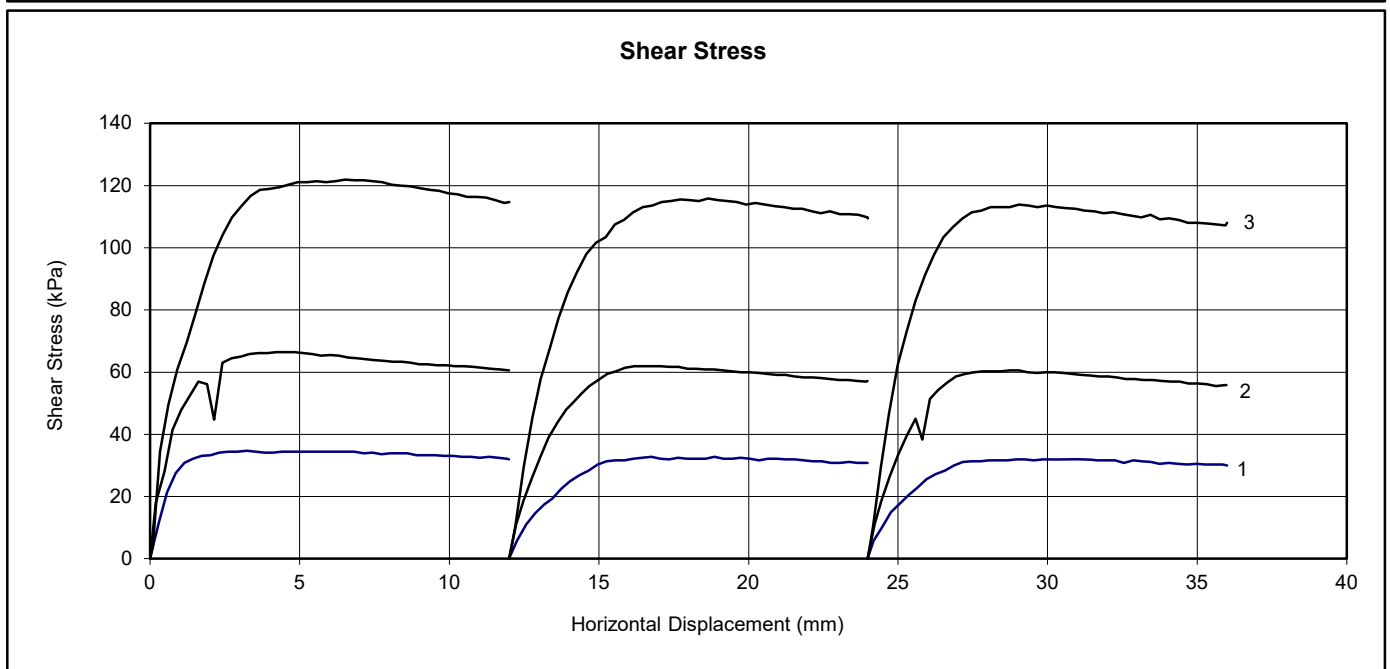
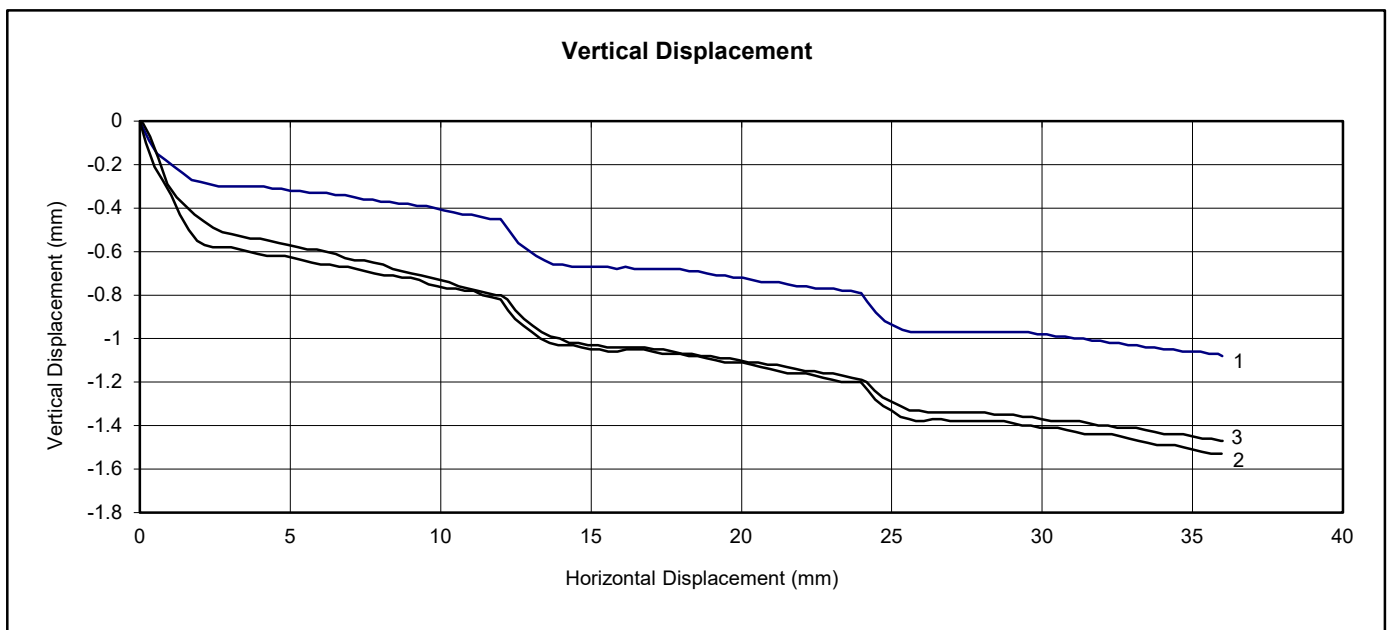
7.20-8.00

SPECIMEN DEPTH (m)

7.50-7.70

DESCRIPTION Greenish brown slightly sandy clayey SILT

SHEAR STAGE RESULTS			
Specimen	1	2	3
Peak Shear Strength (kPa)	34.7	66.4	121.9
Residual Shear Strength (kPa)	30.0	55.6	107.2
Cum. Vertical Displ. (mm)	-1.080	-1.530	-1.470
Cum. Forward Displ. (mm)	35.990	35.970	36.000
Normal Stress (kPa)	50	100	200



Geotechnical Engineering Ltd, Centurion House, Olympus Park, Gloucester, GL2 4NF, Tel. 01452 527743

remarks:  
slow machine reversal

CONTRACT	CHECKED
<b>35560/09</b>	<b>NP</b>

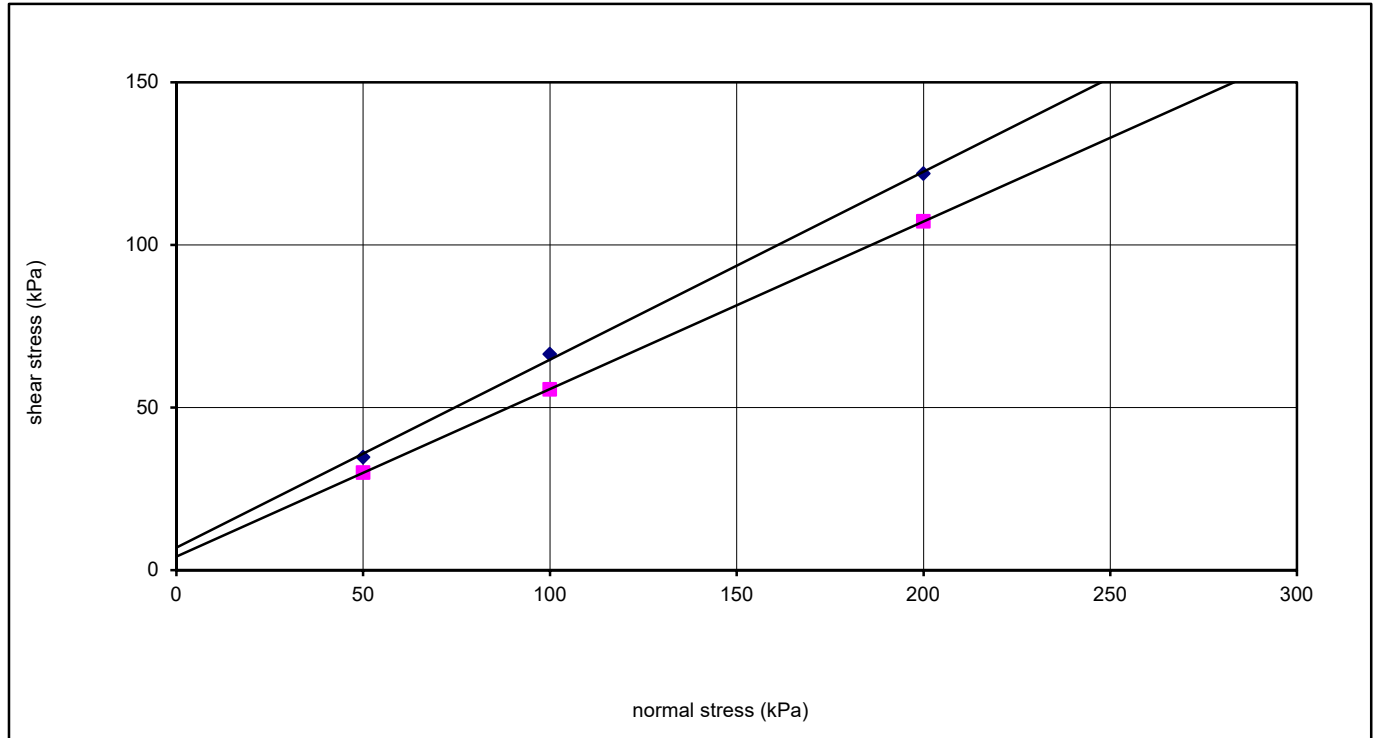


# SHEAR STRENGTH BY DIRECT SHEAR

BS1377:Part 7:1990:4 (Small Shear Box)

CLIENT OSBORNE  
 SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1084)  
 DESCRIPTION Greenish brown slightly sandy clayey SILT

BH/TP No. DSRC229  
 SAMPLE No./TYPE 29L  
 SAMPLE DEPTH (m) 7.20-8.00  
 SPECIMEN DEPTH (m) 7.50-7.70



INITIAL CONDITIONS						
				specimen 1	specimen 2	specimen 3
specimen size (mm)	60	moisture content (%)		24.4	23.1	22.2
	Square	bulk density Mg/m <sup>3</sup>		1.86	1.88	1.89
specimen height (mm)	19.99	dry density Mg/m <sup>3</sup>		1.49	1.53	1.54
		voids ratio		0.809	0.770	0.749
particle density (Mg/m <sup>3</sup> )	2.70 #	degree of saturation (%)		82	81	80
		strain rate (mm/min)		0.006	0.006	0.006

SHEARING STAGES						
specimen	normal stress (kPa)	peak shear stress (kPa)	horizontal displacement (mm)	residual shear stress (kPa)	traverses (No.)	total forward displacement (mm)
1	50	34.7	3.230	30.0	3	35.990
2	100	66.4	4.220	55.6	3	35.970
3	200	121.9	6.510	107.2	3	36.000

SHEAR STRENGTH PARAMETERS			
peak angle of shearing resistance $\phi'$	30	residual angle of shearing resistance $\phi'_r$	27
peak effective cohesion intercept, $c'$ (kPa)	7	residual effective cohesion intercept, $c'_r$ (kPa)	4

remarks: # denotes particle density has been assigned an assumed value.	CONTRACT	CHECKED
	<b>35560/09</b>	<b>NP</b>

◆ peak ■ residual

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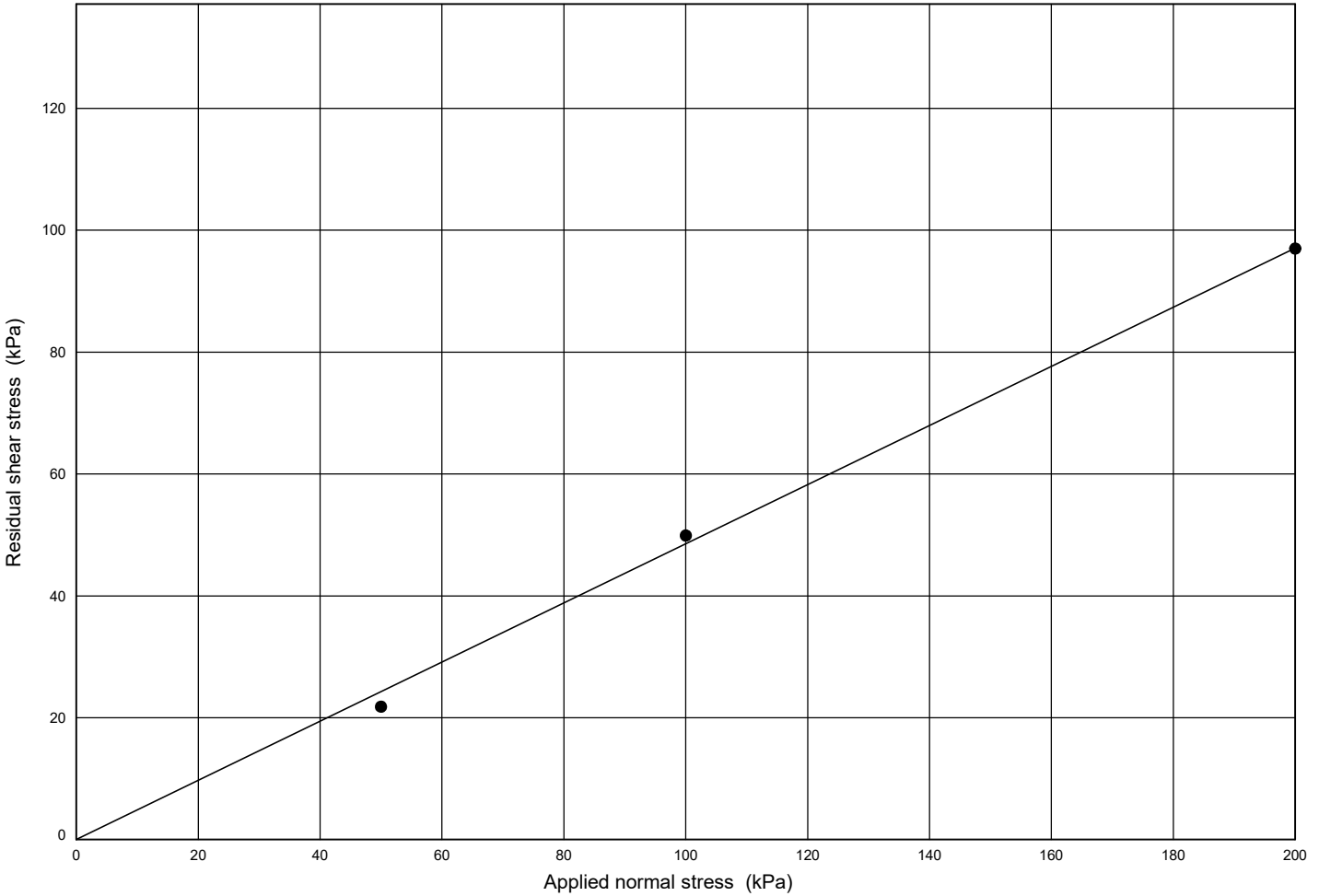
# RESIDUAL STRENGTH BY RING SHEAR



BS.1377 : Part 7 : 1990 : 6

CLIENT OSBORNE  
 SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1084)  
 DESCRIPTION Orangish brown slightly sandy clayey SILT

BH/TP No. DSRC229  
 SAMPLE No./TYPE 13Ls  
 SAMPLE DEPTH (m) 2.90  
 SPECIMEN DEPTH (m) 2.90



Geotechnical Engineering Ltd, Centurion House, Olympus Park, Quevedley, Gloucester, GL2 4NF. Tel. 01452 527743 35560-09 1084 MASTER.GPJ 22/07/2020 09:16:44

GENERAL DETAILS			SHEARING STAGES															
inner radius of specimen (mm)	35	<table border="1"> <thead> <tr> <th>stage</th> <th>normal stress (kPa)</th> <th>residual shear stress (kPa)</th> <th>cumulative angular displacement (degrees)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>50</td> <td>21.8</td> <td>65</td> </tr> <tr> <td>2</td> <td>100</td> <td>49.9</td> <td>139</td> </tr> <tr> <td>3</td> <td>200</td> <td>97.0</td> <td>194</td> </tr> </tbody> </table>	stage	normal stress (kPa)	residual shear stress (kPa)	cumulative angular displacement (degrees)	1	50	21.8	65	2	100	49.9	139	3	200	97.0	194
stage	normal stress (kPa)		residual shear stress (kPa)	cumulative angular displacement (degrees)														
1	50		21.8	65														
2	100		49.9	139														
3	200		97.0	194														
outer radius of specimen (mm)	50																	
initial thickness of specimen (mm)	5																	
initial moisture content (%)	24.2																	
final moisture content (%)	20.4																	
rate of angular displacement (mm/min)	0.052																	
SHEAR STRENGTH PARAMETERS																		
residual angle of shearing resistance $\phi_r'$ (deg)	29.5																	
residual cohesion intercept $c_r'$ (kPa)	0																	
remarks:			CONTRACT <b>35560/09</b>		CHECKED <b>TB</b>													



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC229
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1084)	SAMPLE No./TYPE	20UT
		SAMPLE DEPTH (m)	5.20-5.63
DESCRIPTION	Light brown mottled orange slightly sandy clayey SILT	SPECIMEN DEPTH (m)	5.21-5.29

**TYPE OF SPECIMEN** Undisturbed / Vertical  
**TYPE OF TEST** Multi Specimen Single Stage  
**SIDE DRAINS FITTED** yes  
**DRAINAGE CONDITIONS** One end and radial boundary

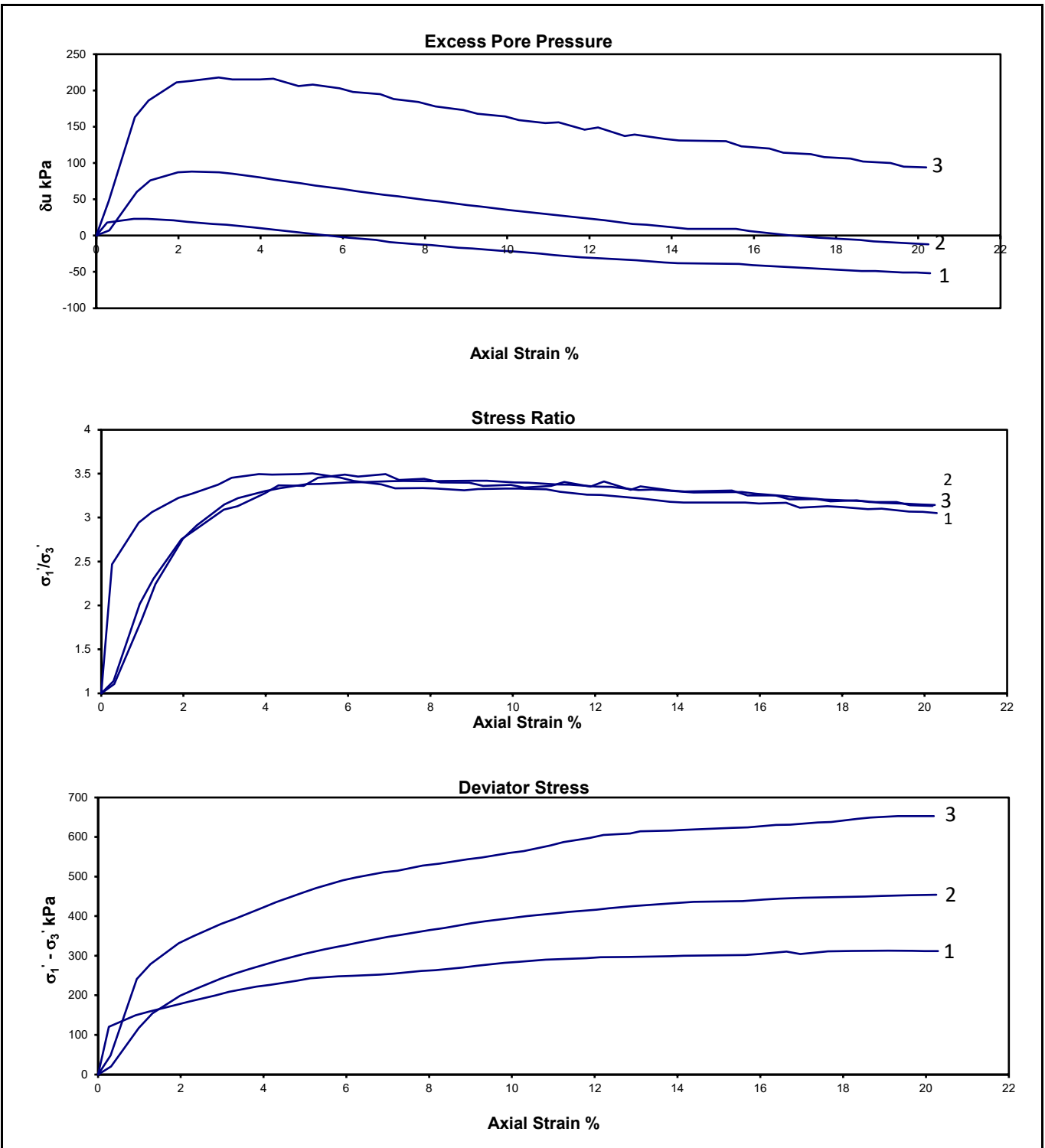
		SPECIMEN	1	2	3
<b>INITIAL CONDITIONS</b>	Length	mm	76.27	76.16	76.1
	Diameter	mm	37.64	37.69	37.57
	Moisture Content	%	23	23	23
	Bulk Density	Mg/m <sup>3</sup>	1.90	2.00	1.94
	Dry Density	Mg/m <sup>3</sup>	1.55	1.63	1.58
<b>FINAL CONDITIONS</b>	Moisture Content	%	25	25	23
	Bulk Density	Mg/m <sup>3</sup>	1.99	2.11	2.06
	Dry Density	Mg/m <sup>3</sup>	1.59	1.69	1.68
<b>SATURATION</b> (by cell pressure and back pressure increments)	Initial PWP	kPa	-6	0	0
	Saturated PWP	kPa	277	278	285
	Final Cell Pressure	kPa	300	300	300
	B Value		0.96	0.96	1
<b>CONSOLIDATION</b>	Cell Pressure	kPa	400	500	700
	Back Pressure	kPa	300	300	300
	Initial PWP	kPa	373	477	683
	Final PWP	kPa	288	294	301
<b>COMPRESSION</b>	Cell Pressure	kPa	400	500	700
	Back Pressure	kPa	300	300	300
	$\sigma_3$	kPa	100	200	400
	Rate of Strain	%/hr	2	2	2
<b>FAILURE CONDITIONS</b> (based on maximum deviator stress)	Strain ( $\epsilon$ )	%	19.0	20.2	19.3
	$\delta u$	kPa	-49	-12	100
	$\sigma_{3f}$	kPa	149	212	300
	$(\sigma_1' - \sigma_3')_f$	kPa	313	454	653
Membrane correction of 0.1kPa/% strain applied to the deviator stress. Side drain correction of 10kPa applied to deviator stress (38mm diameter).					
<b>FAILURE MODE</b> (also see photographs)		INTER	INTER	INTER	
		<b>EFFECTIVE STRESS PARAMETERS</b>	<b>c' kPa :</b>	<b><math>\phi'</math> deg :</b>	
			<b>0.0</b>	<b>31.0</b>	
remarks * Calculated values			CONTRACT	CHECKED	
			<b>35560/09</b>	<b>NP</b>	

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC229
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1084)	SAMPLE No./TYPE	20UT
		SAMPLE DEPTH (m)	5.20-5.63
		SPECIMEN DEPTH (m)	5.21-5.29



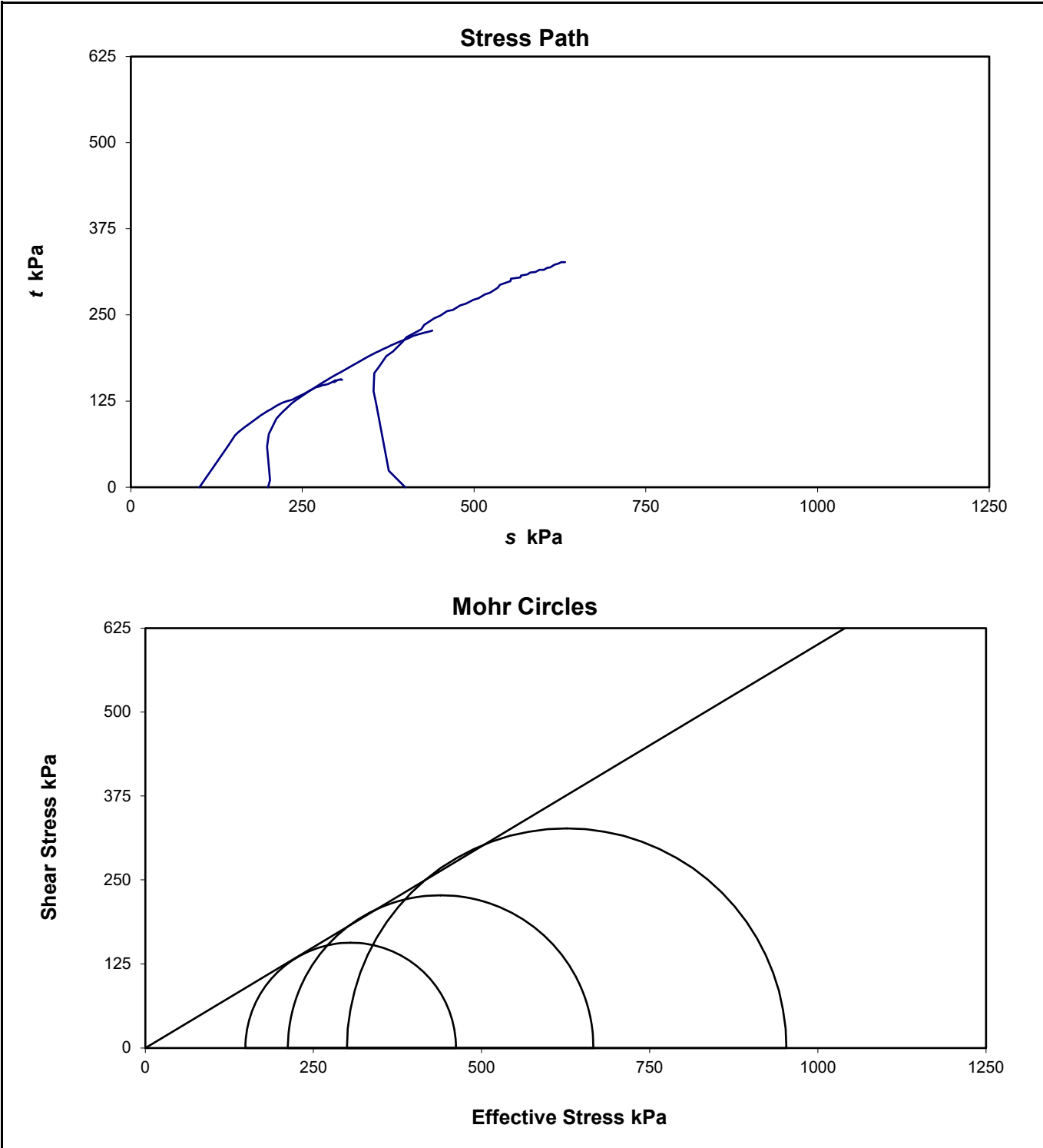
remarks	CONTRACT	CHECKED
	<b>35560/09</b>	<b>NP</b>

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC229
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1084)	SAMPLE No./TYPE	20UT
		SAMPLE DEPTH (m)	5.20-5.63
		SPECIMEN DEPTH (m)	5.21-5.29



remarks	CONTRACT	CHECKED
	<b>35560/09</b>	<b>NP</b>





# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC229
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1084)	SAMPLE No./TYPE	20UT
		SAMPLE DEPTH (m)	5.20-5.63
		SPECIMEN DEPTH (m)	5.21-5.29

Specimen 1		Failure Mode <div style="border: 1px solid black; padding: 2px; display: inline-block;">INTER</div>
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Specimen 2		Failure Mode <div style="border: 1px solid black; padding: 2px; display: inline-block;">INTER</div>
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Specimen 3		Failure Mode <div style="border: 1px solid black; padding: 2px; display: inline-block;">INTER</div>
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remarks Please note the photos are intended to show the mode of failure only.	CONTRACT <b>35560/09</b>	CHECKED <b>NP</b>
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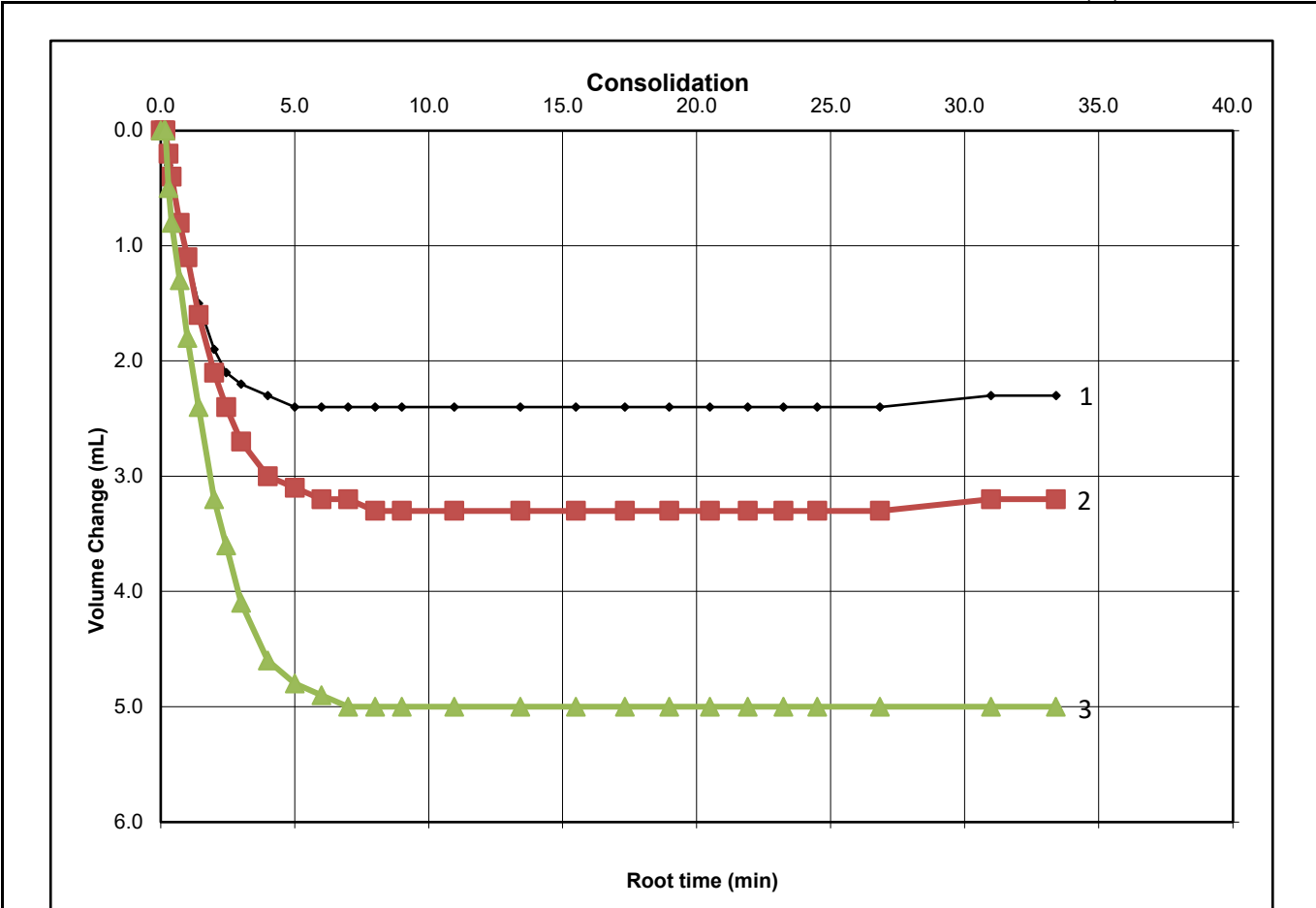




# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	DSRC229
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION	SAMPLE No./TYPE	20UT
	- PHASE 2A (1084)	SAMPLE DEPTH (m)	5.20-5.63
		SPECIMEN DEPTH (m)	5.21-5.29



Specimen 1    Specimen 2    Specimen 3

Cell pressure	kPa	400	500	700
Back pressure	kPa	300	300	300
Effective pressure	kPa	100	200	400
Initial PWP	kPa	373	477	683
Final PWP	kPa	288	294	301
PWP Dissipation	%	116.44	103.39	99.74
Volume change	mL	2.3	3.2	5.0
	t100	3.59	9.8	9.38

remarks	CONTRACT	CHECKED
	<b>35560/09</b>	<b>NP</b>

# POINT LOAD STRENGTH TEST

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1084)

borehole /trial pit no.	sample depth (m)	test type	test orientation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
DSRC229	20.45	A	X	N	110		55	0.24	87.77	0.03	1.29	0.04	Grey SILTSTONE
DSRC229	20.45	D	Y	N		90	110	0.69	110.00	0.06	1.43	0.08	Grey SILTSTONE
DSRC229	23.90	A	X	N	100		50	0.30	79.79	0.05	1.23	0.06	Grey SILTSTONE
DSRC229	23.90	D	Y	N		50	100	0.65	100.00	0.07	1.37	0.09	Grey SILTSTONE

general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35560/09</b>	<b>TB</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		



## Final Report

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**Report No.:** 20-14370-1  
**Initial Date of Issue:** 12-Jun-2020  
**Client** Geotechnical Engineering Ltd  
**Client Address:** Centurion House  
Olympus Park  
Quedgeley  
Gloucester  
Gloucestershire  
GL2 4NF  
**Contact(s):** GEL  
Tom Best  
**Project** 35560/09 A417 Missing Link - Phase  
2A (1098)

<b>Quotation No.:</b>		<b>Date Received:</b>	09-Jun-2020
<b>Order No.:</b>	35560/09/TB	<b>Date Instructed:</b>	09-Jun-2020
<b>No. of Samples:</b>	1		
<b>Turnaround (Wkdays):</b>	5	<b>Results Due:</b>	15-Jun-2020
<b>Date Approved:</b>	12-Jun-2020		

**Approved By:**

**Details:** Glynn Harvey, Technical Manager

---

<b>Client: Geotechnical Engineering Ltd</b>	<b>Chemtest Job No.:</b> 20-14370				
Quotation No.:	<b>Chemtest Sample ID.:</b> 1014243				
	Client Sample ID.: 36D				
	Sample Location: DSRC229				
	Sample Type: SOIL				
	Top Depth (m): 10.70				
	Bottom Depth (m): 11.50				
	Date Sampled: 02-Jun-2020				
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>	
Moisture	N	2030	%	0.020	15
pH	U	2010		4.0	8.1
Sulphate (2:1 Water Soluble) as SO <sub>4</sub>	U	2120	g/l	0.010	0.27
Total Sulphur	U	2175	%	0.010	0.38
Sulphate (Acid Soluble)	U	2430	%	0.010	0.067

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

## **Report Information**

### **Key**

---

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

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- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



2718

GEOTECHNICAL ENGINEERING LIMITED



For the attention of David Owen

Version No. 1  
Page No. 1 of 37  
Date of Issue 04/11/2020**TEST REPORT**

PROJECT/SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)	Samples received	10/06/2020
GEL REPORT NUMBER	35560-10	Schedule received	06/07/2020
Test report refers to	All schedules combined	Testing commenced	03/08/2020
		Status	Final

**SUMMARY OF RESULTS ATTACHED**

TEST METHOD & DESCRIPTION	QUANTITY	ACCREDITED TEST
BS EN ISO 17892-1: 2014:5. Water Content	10	YES
BS1377: Part 2: 1990:4.2-4.4&5.2-5.4, Liquid & Plastic Limits	9	YES
BS EN ISO 17892-4: 2016: 5.2, Particle Size Distribution - Wet Sieve	6	YES
BS EN ISO 17892-4: 2016: 5.4, Particle Size Distribution - Pipette	6	YES
BS1377: Part 4: 1990:3, Dry Density/Moisture Content Relationship	2	YES
BS1377: Part 4: 1990:5.5, MCV/Moisture Content Relationship	1	NO
BS1377: Part 4: 1990:7, California Bearing Ratio (CBR)	6	YES
BS1377: Part 7: 1990:4.5, Determination of Shear Strength by Direct Shear	1	YES
BS1377: Part 8: 1990: Effective Stress Testing	1	YES
ISRM: 2007: Point Load Strength Test	21	YES
BRE SD1 Suite (Subcontracted)	2	YES/NO
BRE SD1 Reduced Suite: pH, Sulphate - water and acid soluble, sulphur (Subcontracted)	6	YES
Carbonate Content (subcontracted)	1	NO

Remarks This report may not be partially reproduced without written permission from this laboratory.  The results reported relate to samples received in the laboratory	Approved Signatories: T Best (Deputy Laboratory Manager) E Crimp (Senior Engineer) J Hanson (Director) N Parry (Director)
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Doc TR01 Rev No. 22 Revision date 02/01/20 DC:JH

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VAT Number: 682 5857 89Payments: Geotechnical Engineering Limited  
Sort code: 16-22-11 Bank account: 11125135

**LIQUID AND PLASTIC LIMITS**

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
DSRC312	6D	0.70	0.70	17.6	BXE	40	63	20	43	Yellowish brown mottled orange slightly sandy slightly gravelly CLAY
OH411	4D	0.30	0.30	14.4	BXE	50	67	33	34	Brown slightly sandy gravelly clayey SILT with rare rootlets
OH411	6D	0.50	0.50	19.5	BXE	43	58	25	33	Orangish brown slightly sandy slightly gravelly silty CLAY
RC516	8D	1.40	1.40	23.1	E					Yellowish brown mottled grey and orange CLAY
RC516	9Ls	2.00	2.20	21.7	BXD	9	52	20	32	Brown mottled orange and grey slightly sandy CLAY with rare gypsum
TP606	4D	0.30	0.30	17.4	BXE	51	66	33	33	Light brown slightly sandy gravelly silty CLAY with rare rootlets
TP606	8D	1.00	1.00	13.9	BYE	79	37	NP		Light brown sandy clayey GRAVEL
TP635	6D	0.50	0.50	53.4	BXE	1	108	34	74	Brown mottled orange and grey slightly sandy slightly organic CLAY with rare rootlets
TP635	10D	1.50	1.50	29.8	BXE	10	73	23	50	Yellowish brown slightly sandy slightly gravelly CLAY
TP635	12D	2.50	2.50	25.6	BXE	2	68	23	45	Light brown mottled grey slightly sandy CLAY

## general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

## specimen preparation

A - as received

B - washed on 0.425mm sieve

C - air dried

D - oven dried (60°C)

E - oven dried (105°C)

F - not known

## test method

X - cone penetrometer (test 4.3)

Y - cone penetrometer (test 4.4)

Z - casagrande apparatus (test 4.5)

CONTRACT

**35560/10**

CHECKED

**EC**

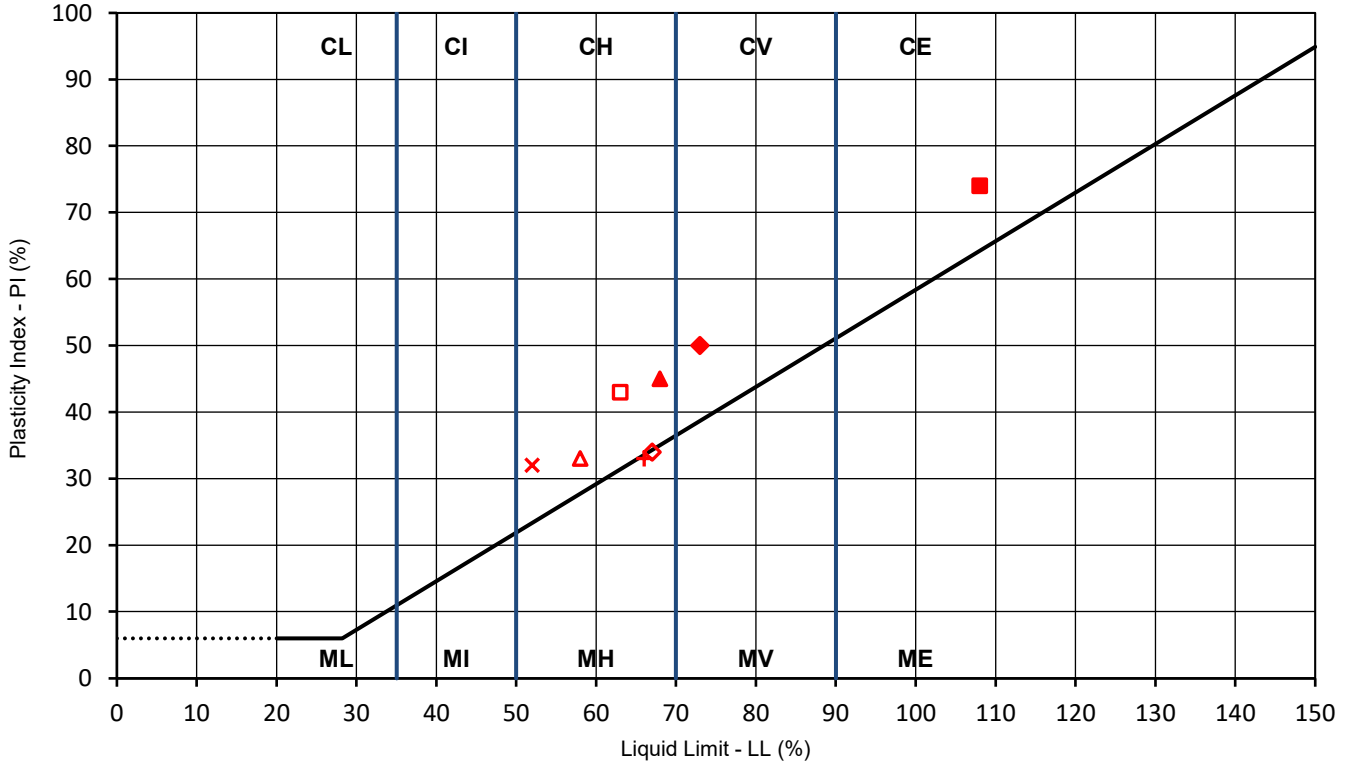


Geotechnical Engineering Limited  
**ATTERBERG LINE PLOT**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)



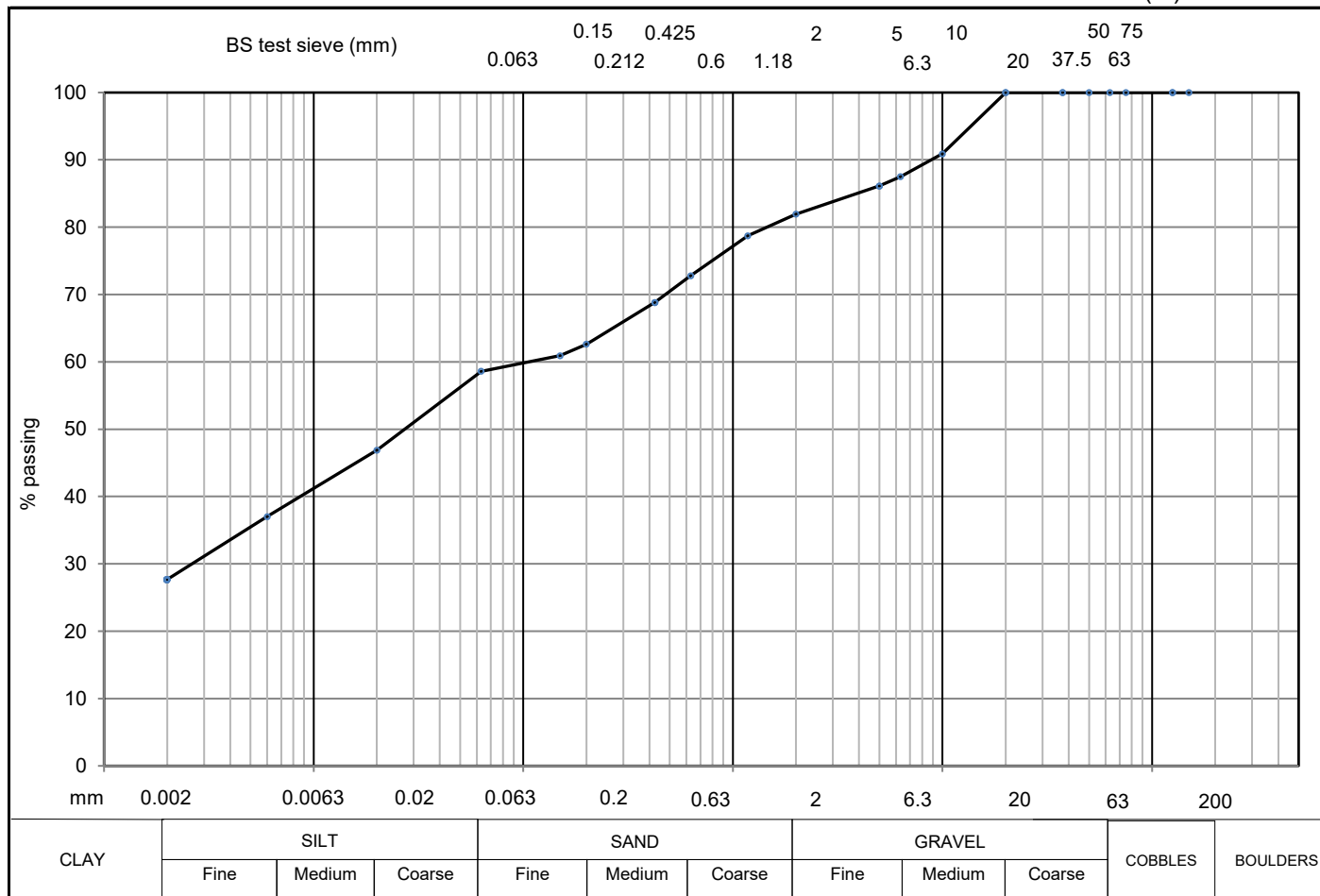
	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	DSRC312	0.70	63	20	43	
◇	OH411	0.30	67	33	34	
△	OH411	0.50	58	25	33	
×	RC516	2.20	52	20	32	
+	TP606	0.30	66	33	33	
	TP606	1.00	37	NP		
■	TP635	0.50	108	34	74	
◆	TP635	1.50	73	23	50	
▲	TP635	2.50	68	23	45	

CONTRACT	CHECKED
<b>35560/10</b>	<b>EC</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	DSRC312
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)	SAMPLE No./TYPE	5B
DESCRIPTION	Brown mottled orangish brown slightly gravelly slightly sandy CLAY	SAMPLE DEPTH (m)	0.70
		SPECIMEN TOP (m)	0.70
		SPECIMEN BASE (m)	1.05



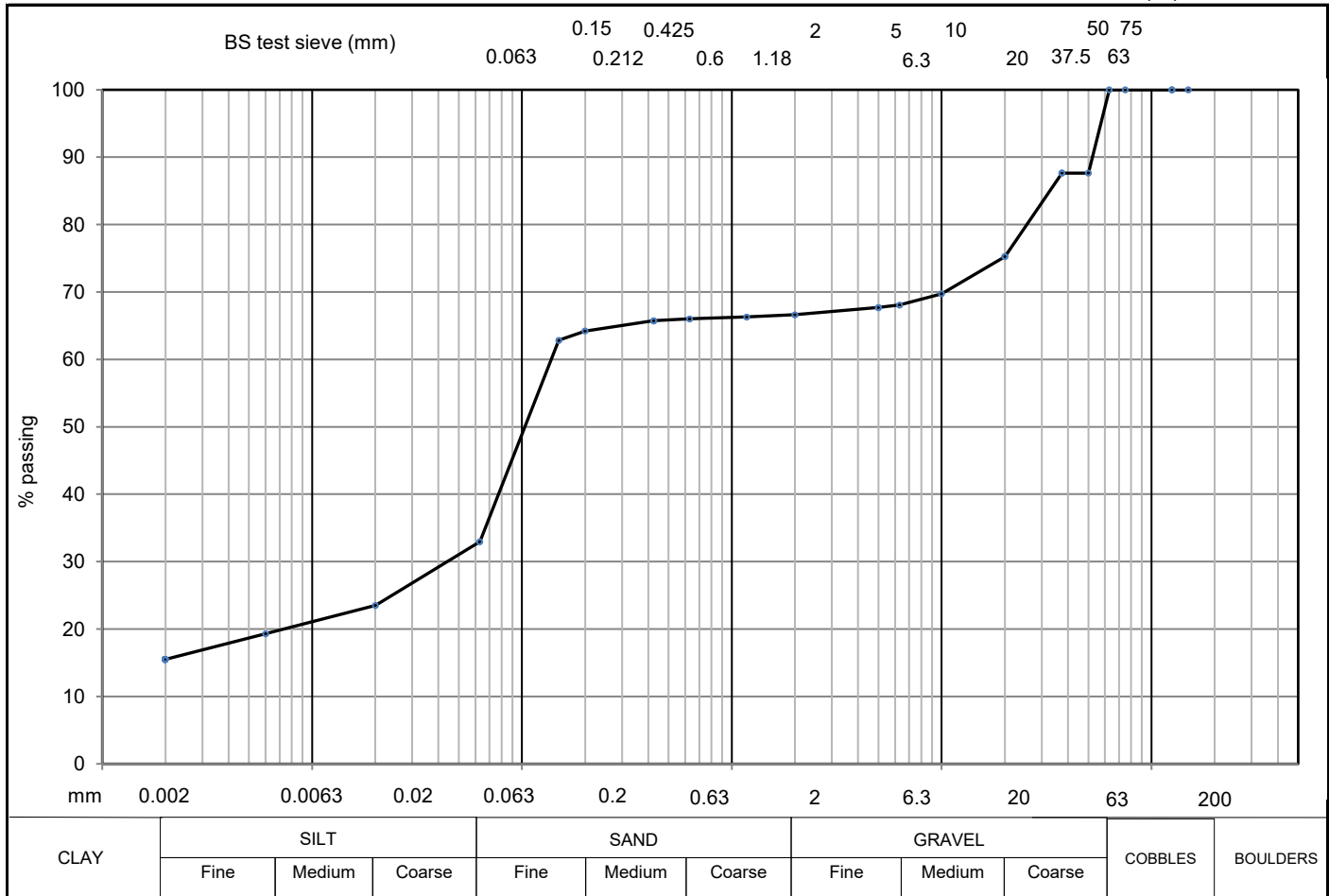
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	28						
SILT	31	150		5	86	20	47
SILT & CLAY	59						
SAND	23	75		2	82	6	37
GRAVEL	18						
COBBLE & BOULDER	0	63		1.18	79	2	28
test method(s)	5.2 & 5.4	50		0.63	73		
test method		37.5		0.425	69		
5.2 - sieving		20	100	0.2	63		
5.3 - sedimentation by hydrometer		10	91	0.15	61		
5.4 - sedimentation by pipette		6.3	88	0.063	59		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35560/10</b>	<b>CHECKED</b> <b>EC</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	OH411
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)	SAMPLE No./TYPE	5B
DESCRIPTION	Orangish brown slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	0.50
		SPECIMEN TOP (m)	0.50
		SPECIMEN BASE (m)	0.60



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	16						
SILT	18	150		5	68	20	24
SILT & CLAY	33						
SAND	34	75		2	67	6	19
GRAVEL	33						
COBBLE & BOULDER	0	63	100	1.18	66	2	15
test method(s)	5.2# & 5.4	50	88	0.63	66		
test method		37.5	88	0.425	66		
5.2 - sieving		20	75	0.2	64		
5.3 - sedimentation by hydrometer		10	70	0.15	63		
5.4 - sedimentation by pipette		6.3	68	0.063	33		

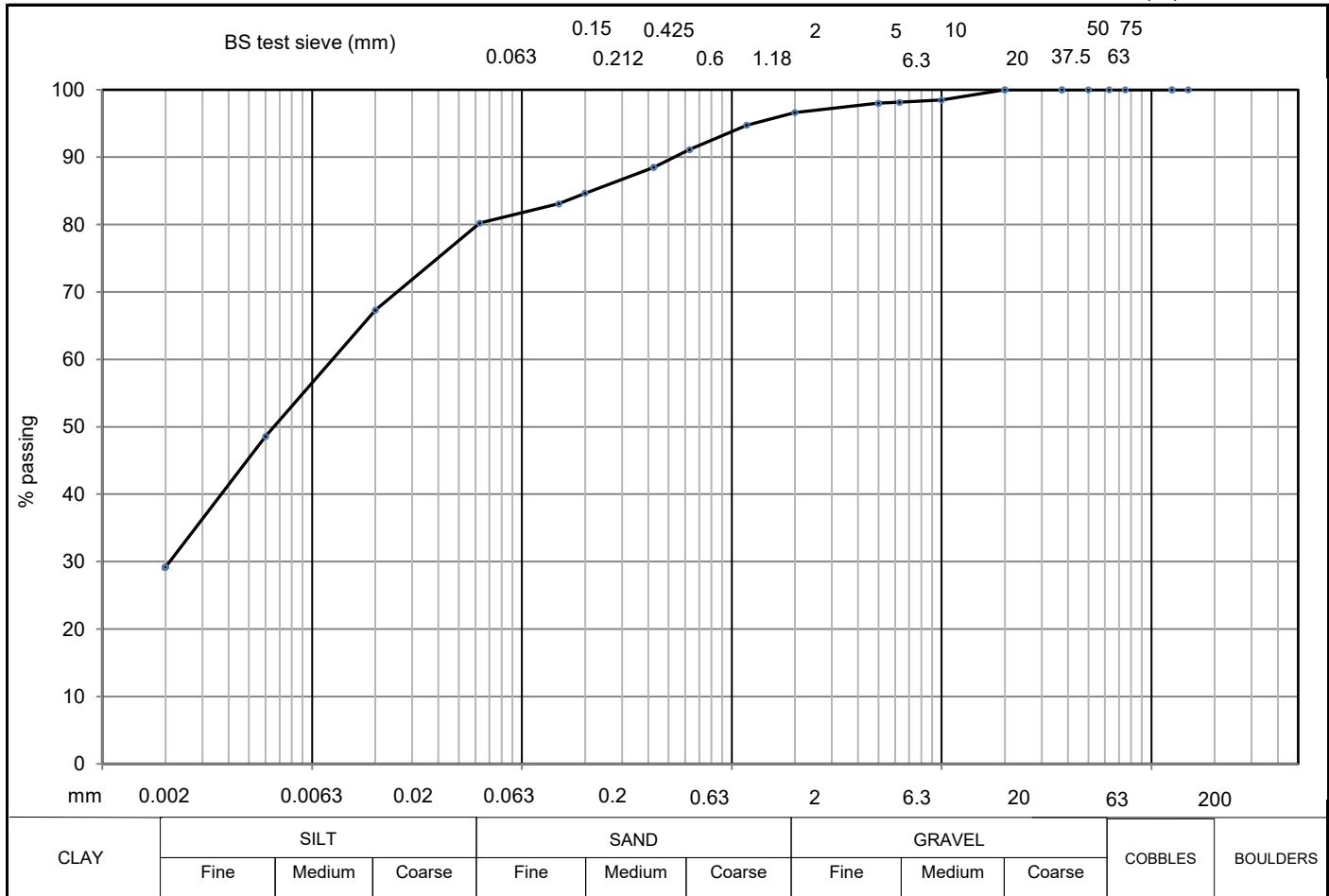
remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	CONTRACT <b>35560/10</b>	CHECKED <b>EC</b>
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# PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	RC516
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)	SAMPLE No./TYPE	7L
DESCRIPTION	Yellowish brown slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	1.20
		SPECIMEN TOP (m)	1.20
		SPECIMEN BASE (m)	2.70



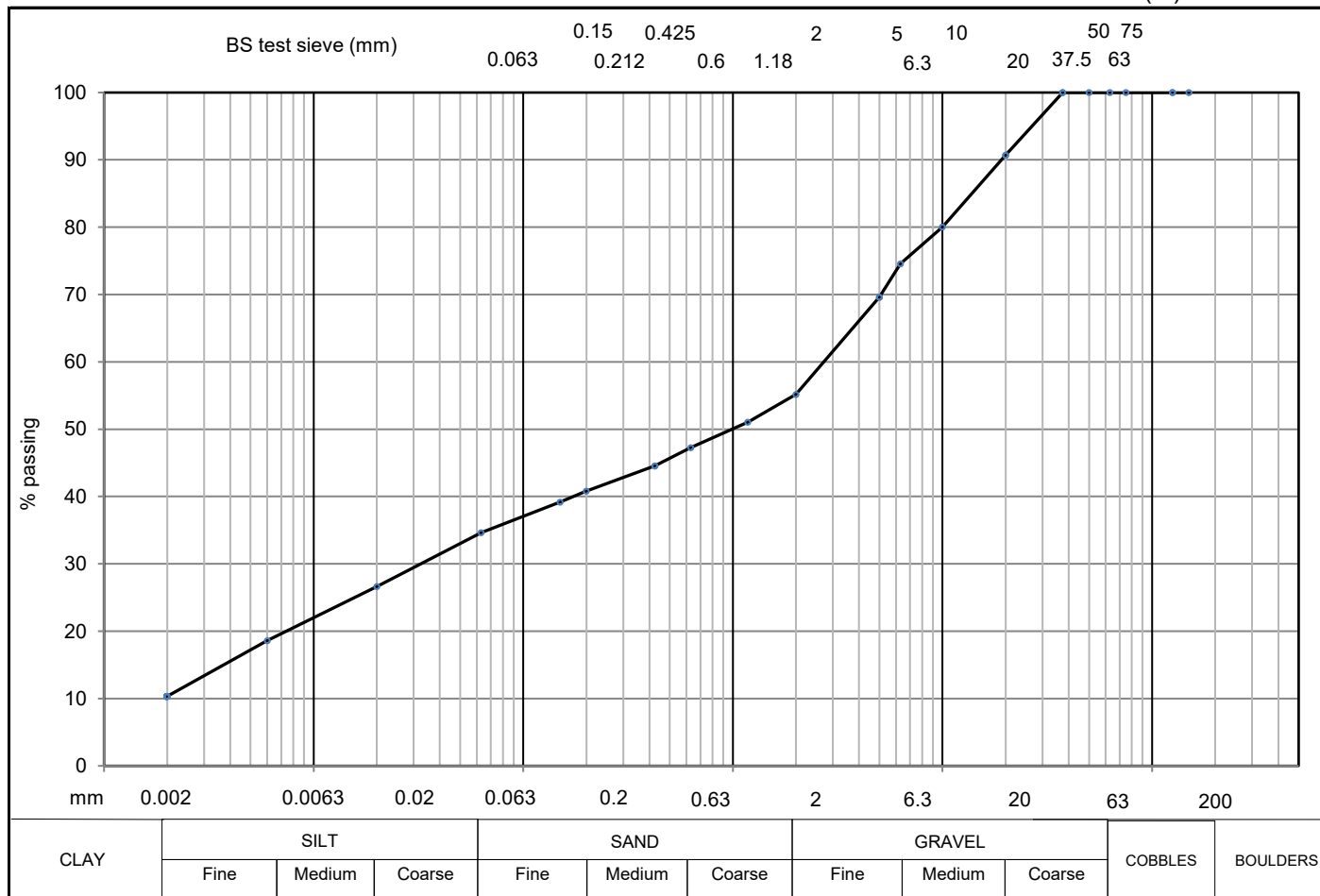
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	29						
SILT	51	150		5	98	20	67
SILT & CLAY	80						
SAND	16	75		2	97	6	49
GRAVEL	3						
COBBLE & BOULDER	0	63		1.18	95	2	29
test method(s)	5.2 & 5.4	50		0.63	91		
test method		37.5		0.425	89		
5.2 - sieving		20	100	0.2	85		
5.3 - sedimentation by hydrometer		10	98	0.15	83		
5.4 - sedimentation by pipette		6.3	98	0.063	80		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	CONTRACT <b>35560/10</b>	CHECKED <b>EC</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP606
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)	SAMPLE No./TYPE	3LB
DESCRIPTION	Brown slightly sandy gravelly silty CLAY	SAMPLE DEPTH (m)	0.30
		SPECIMEN TOP (m)	0.30
		SPECIMEN BASE (m)	0.50



CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		

soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	10			5	70	20	27
SILT	24	150		2	55	6	19
SILT & CLAY	35			1.18	51	2	10
SAND	21	75					
GRAVEL	45						
COBBLE & BOULDER	0	63					
test method(s)	5.2 & 5.4	50		0.63	47		
test method		37.5	100	0.425	45		
5.2 - sieving		20	91	0.2	41		
5.3 - sedimentation by hydrometer		10	80	0.15	39		
5.4 - sedimentation by pipette		6.3	75	0.063	35		

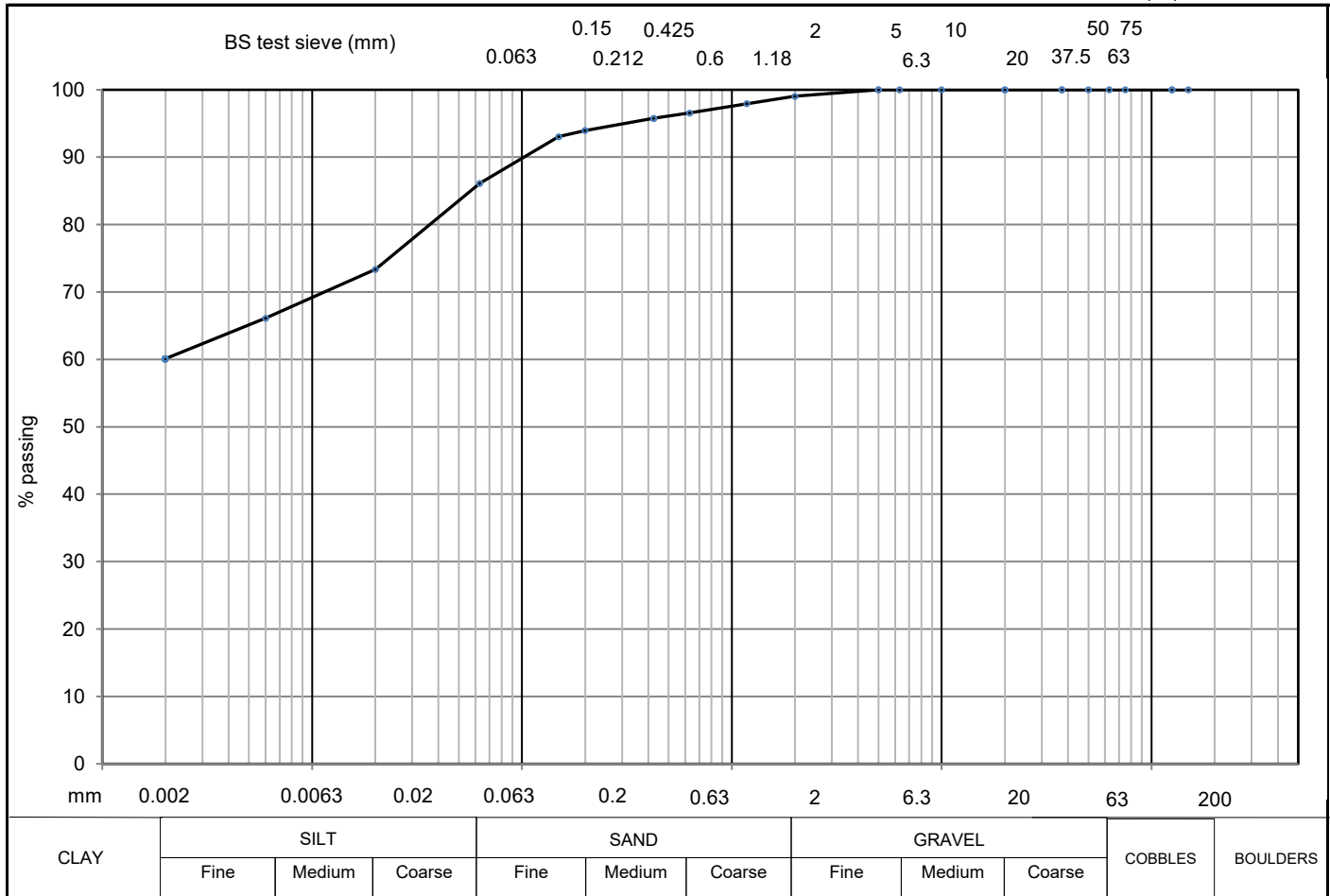
remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35560/10</b>	<b>CHECKED</b> <b>EC</b>
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# PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP635
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)	SAMPLE No./TYPE	7B
DESCRIPTION	Orangish brown slightly sandy CLAY	SAMPLE DEPTH (m)	0.90
		SPECIMEN TOP (m)	0.90
		SPECIMEN BASE (m)	1.10



CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		

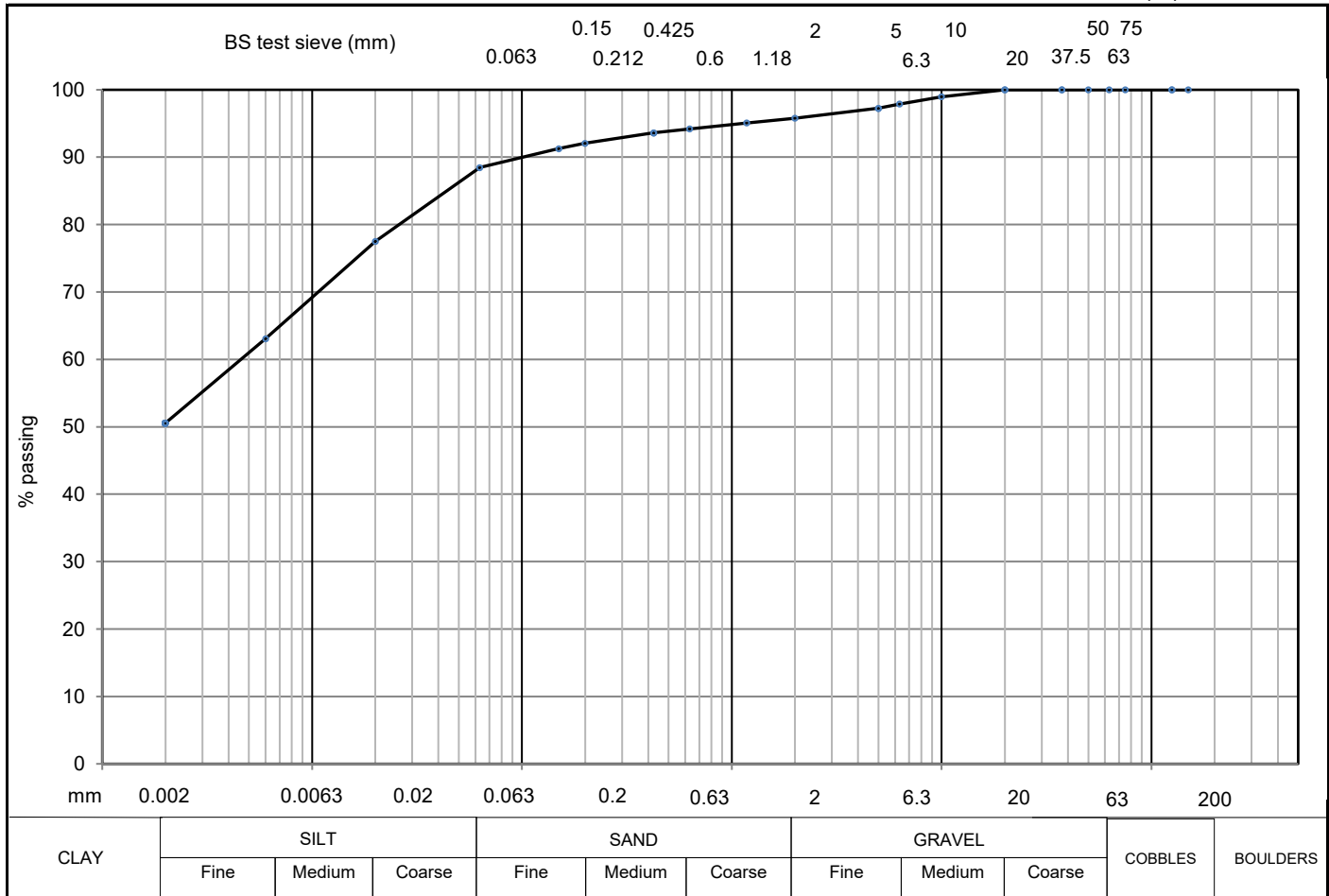
soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	60						
SILT	26	150		5	100	20	73
SILT & CLAY	86						
SAND	13	75		2	99	6	66
GRAVEL	1						
COBBLE & BOULDER	0	63		1.18	98	2	60
test method(s)	5.2 & 5.4						
test method		50		0.63	97		
5.2 - sieving		37.5		0.425	96		
5.3 - sedimentation by hydrometer		20		0.2	94		
5.4 - sedimentation by pipette		10		0.15	93		
		6.3		0.063	86		

remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m3	CONTRACT <b>35560/10</b>	CHECKED <b>EC</b>
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Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP635
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)	SAMPLE No./TYPE	9LB
DESCRIPTION	Orangish brown mottled greyish brown slightly gravelly slightly sandy CLAY	SAMPLE DEPTH (m)	1.50
		SPECIMEN TOP (m)	1.50
		SPECIMEN BASE (m)	1.70



CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		

soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	51						
SILT	38	150		5	97	20	78
SILT & CLAY	88						
SAND	7	75		2	96	6	63
GRAVEL	4						
COBBLE & BOULDER	0	63		1.18	95	2	51
test method(s)	5.2 & 5.4	50		0.63	94		
test method		37.5		0.425	94		
5.2 - sieving		20	100	0.2	92		
5.3 - sedimentation by hydrometer		10	99	0.15	91		
5.4 - sedimentation by pipette		6.3	98	0.063	88		

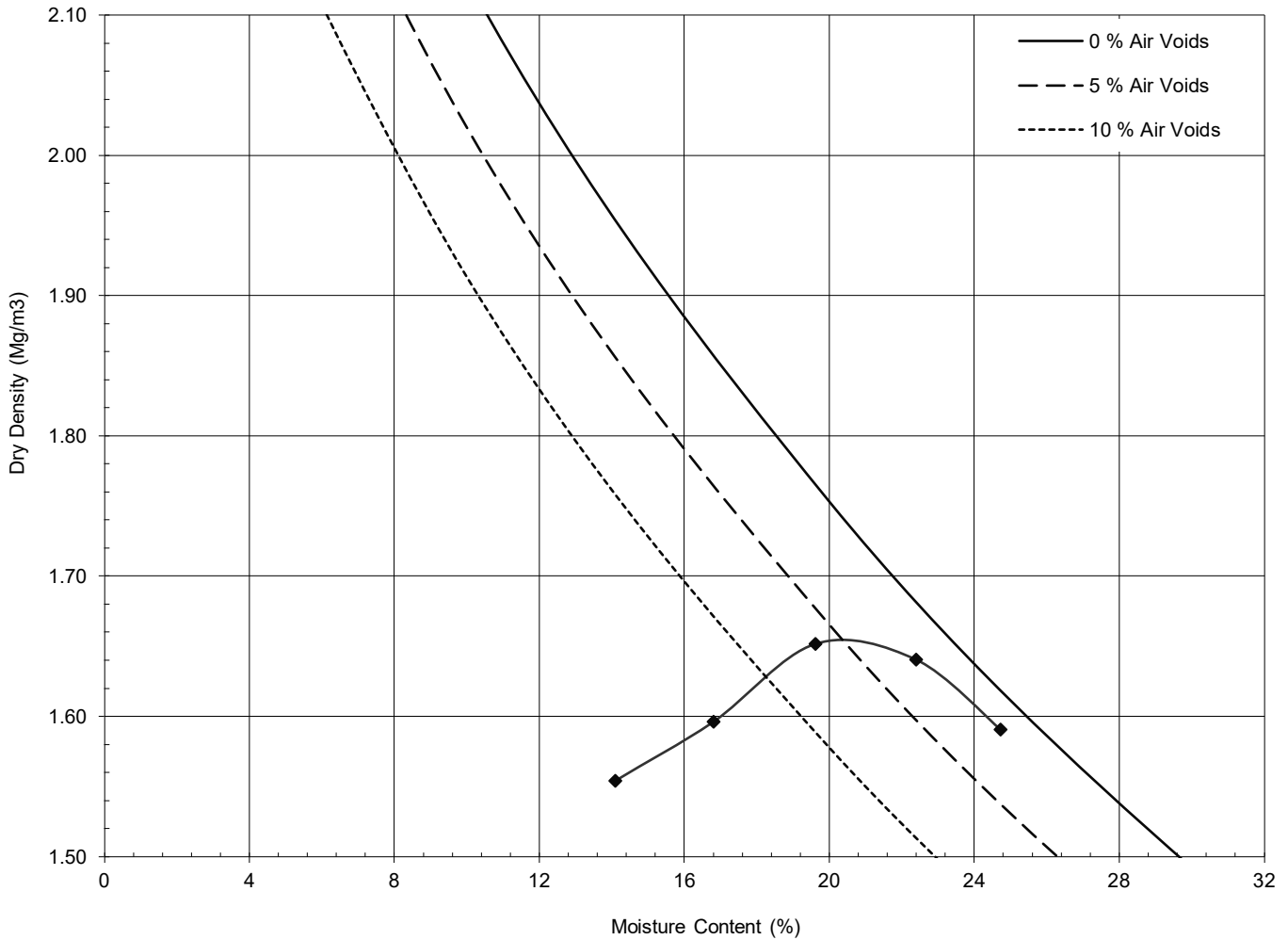
remarks # denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>	<b>CONTRACT</b> <b>35560/10</b>	<b>CHECKED</b> <b>EC</b>
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# DRY DENSITY/MOISTURE CONTENT RELATIONSHIP



BS. 1377 : Part 4 : 1990 : 3

CLIENT	OSBORNE	BH/TP No.	RC516
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)	SAMPLE No./TYPE	7L
DESCRIPTION	Yellowish brown slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	1.20
		SPECIMEN DEPTH (m)	1.20



test method	3.4.4.1 2.5kg dynamic compaction - CBR mould				
preparation procedure	3.2.4.1 (grading zone 1)				
sample preparation	C R				
proportion retained on 37.5mm sieve	%	0	initial moisture content	%	9
proportion retained on 20mm sieve	%	0	maximum dry density	(Mg/m <sup>3</sup> )	1.66
particle density	(Mg/m <sup>3</sup> )	#2.70	optimum moisture content	%	20
remarks	# denotes particle density has been assigned an assumed value C denotes sample has been chopped to pass 20mm sieve S denotes sample has been shredded to pass 20mm sieve R denotes sample material has been recycled between/for points				
				CONTRACT	CHECKED
				<b>35560/10</b>	<b>EC</b>

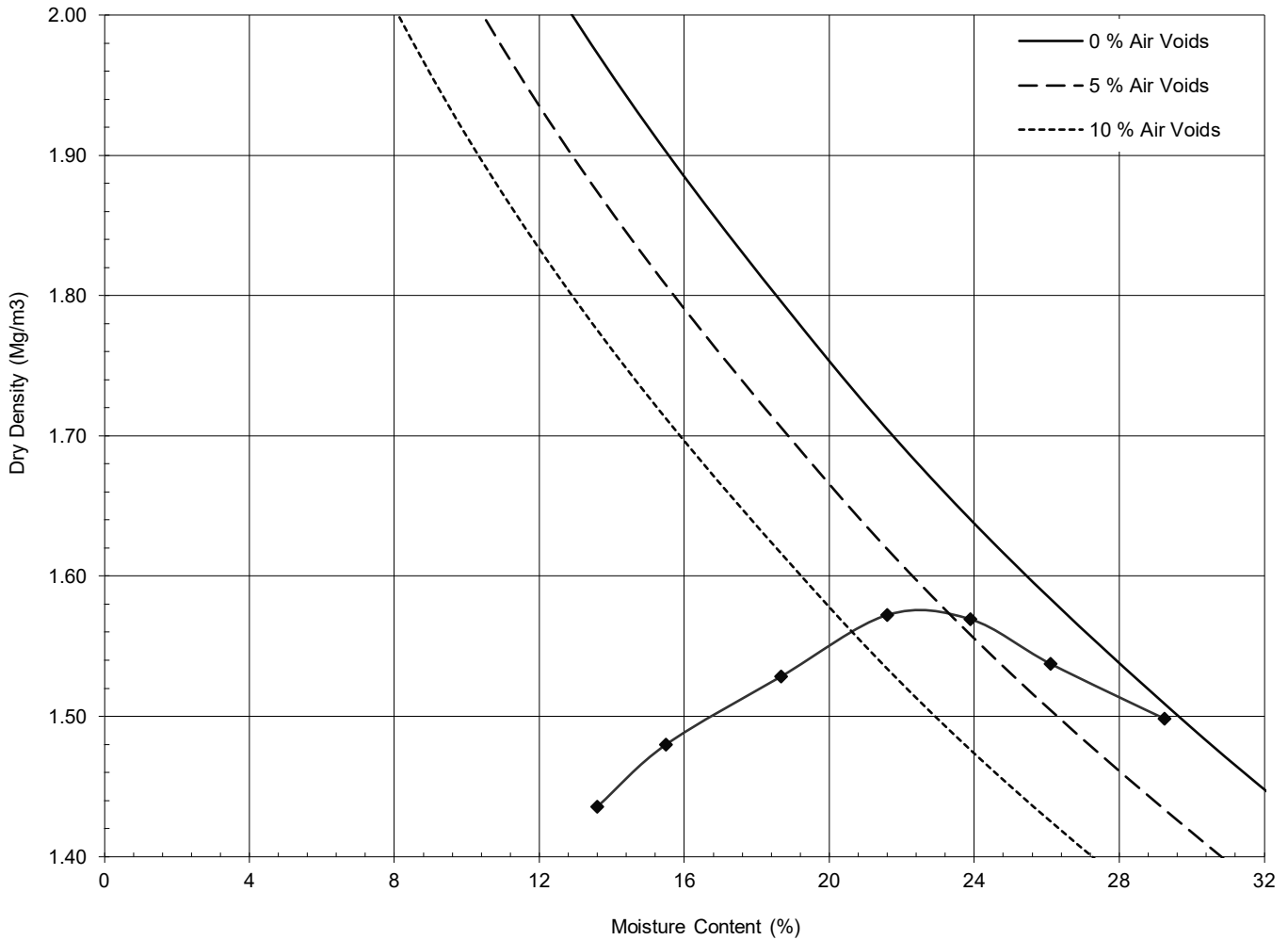


# DRY DENSITY/MOISTURE CONTENT RELATIONSHIP



BS. 1377 : Part 4 : 1990 : 3

CLIENT	OSBORNE	BH/TP No.	TP635
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)	SAMPLE No./TYPE	9LB
DESCRIPTION	Orangish brown mottled greyish brown slightly gravelly slightly sandy CLAY	SAMPLE DEPTH (m)	1.50
		SPECIMEN DEPTH (m)	1.50



test method	3.4.4.1 2.5kg dynamic compaction - CBR mould			
preparation procedure	3.2.4.1 (grading zone 1)			
sample preparation	C R			
proportion retained on 37.5mm sieve	%	0	initial moisture content	% 32
proportion retained on 20mm sieve	%	0	maximum dry density	(Mg/m <sup>3</sup> ) 1.58
particle density	(Mg/m <sup>3</sup> )	#2.70	optimum moisture content	% 22
remarks	# denotes particle density has been assigned an assumed value C denotes sample has been chopped to pass 20mm sieve S denotes sample has been shredded to pass 20mm sieve R denotes sample material has been recycled between/for points			
			CONTRACT	CHECKED
			<b>35560/10</b>	<b>EC</b>

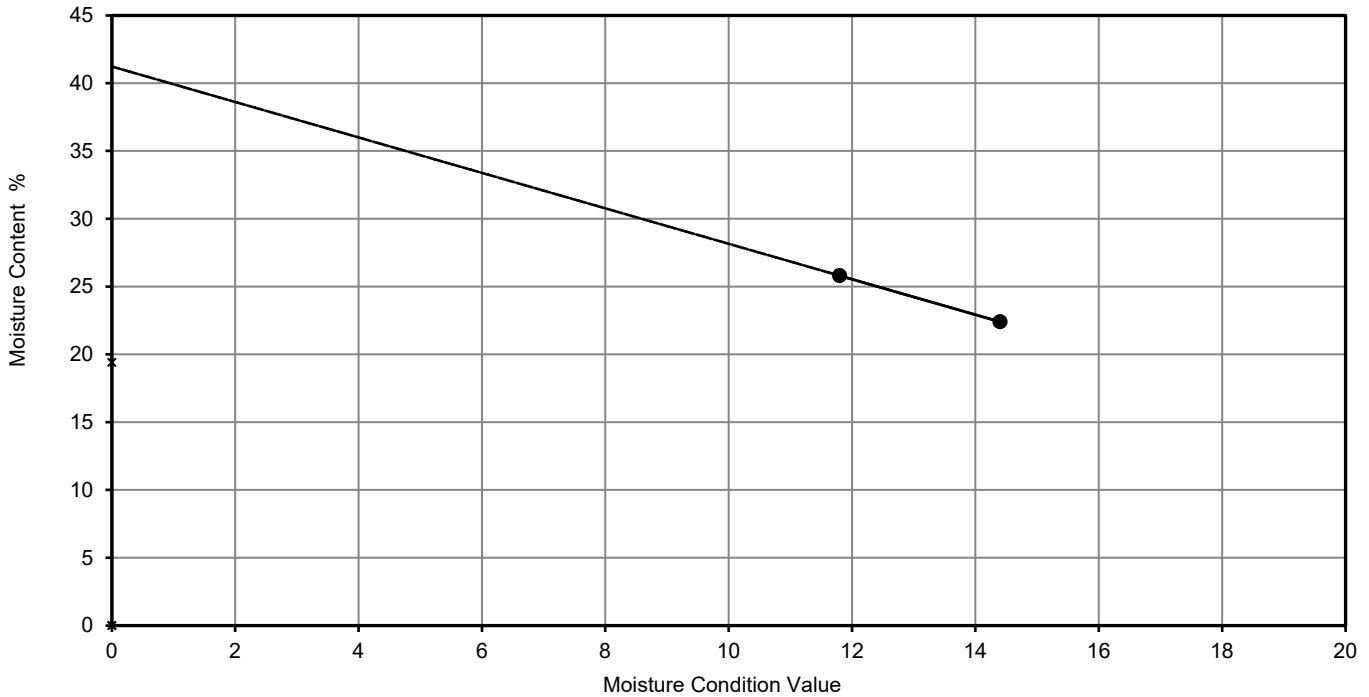
# MCV / MOISTURE CONTENT RELATIONSHIP

BS. 1377 : Part 4 : 1990 : 5.5



CLIENT	OSBORNE	BH/TP No.	TP635
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)	SAMPLE No./TYPE	9LB
DESCRIPTION	Orangish brown mottled greyish brown slightly gravelly slightly sandy CLAY	SAMPLE DEPTH (m)	1.50
		SPECIMEN DEPTH (m)	1.50

● valid points    × invalid points    - - - - extended regression    — linear regression



MCV	-2146826246.0	14.4	11.8		
moisture content (%)	19.4	22.4	25.8		
H/PP	kPa				

sample details			characteristics of calibration line		
natural moisture content	(%)	27.7	moisture content intercept	(%)	41.3
proportion retained on 20mm sieve	(%)	0	natural slope of line		-1.31
			sensitivity	(MCV/1%mc)	-0.76

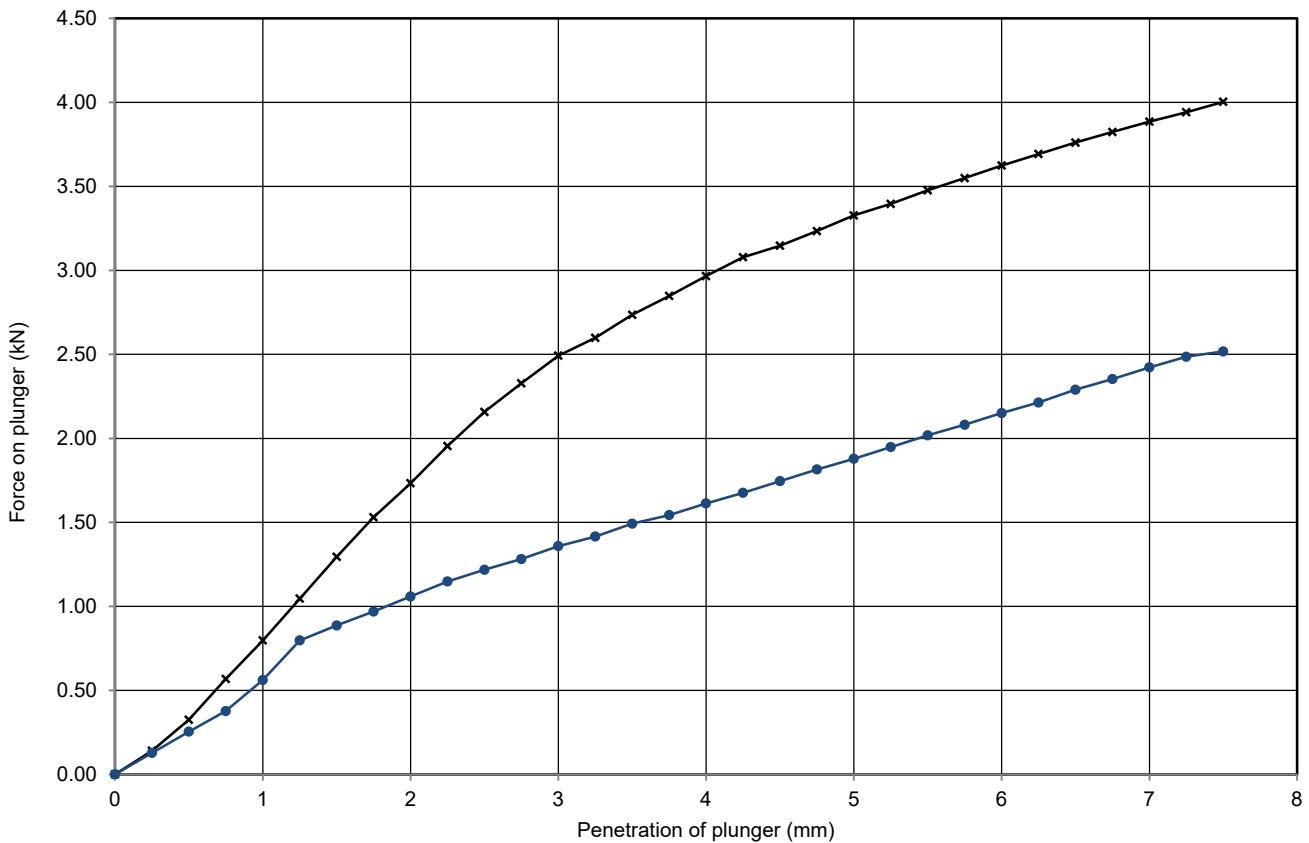
remarks  
**Point 1 19% (OMC -3%) (Invalid); Point 2 22% MC (OMC); Point 3 25% MC (OMC +3%).**

	CONTRACT	CHECKED
	<b>35560/10</b>	<b>EC</b>

Geotechnical Engineering Limited  
**CALIFORNIA BEARING RATIO**  
 BS. 1377 : Part 4 : 1990 : 7



CLIENT	OSBORNE	BH/TP No.	RC516
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)	SAMPLE No./TYPE	7L
DESCRIPTION	Yellowish brown slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	1.20
		SPECIMEN DEPTH (m)	1.20

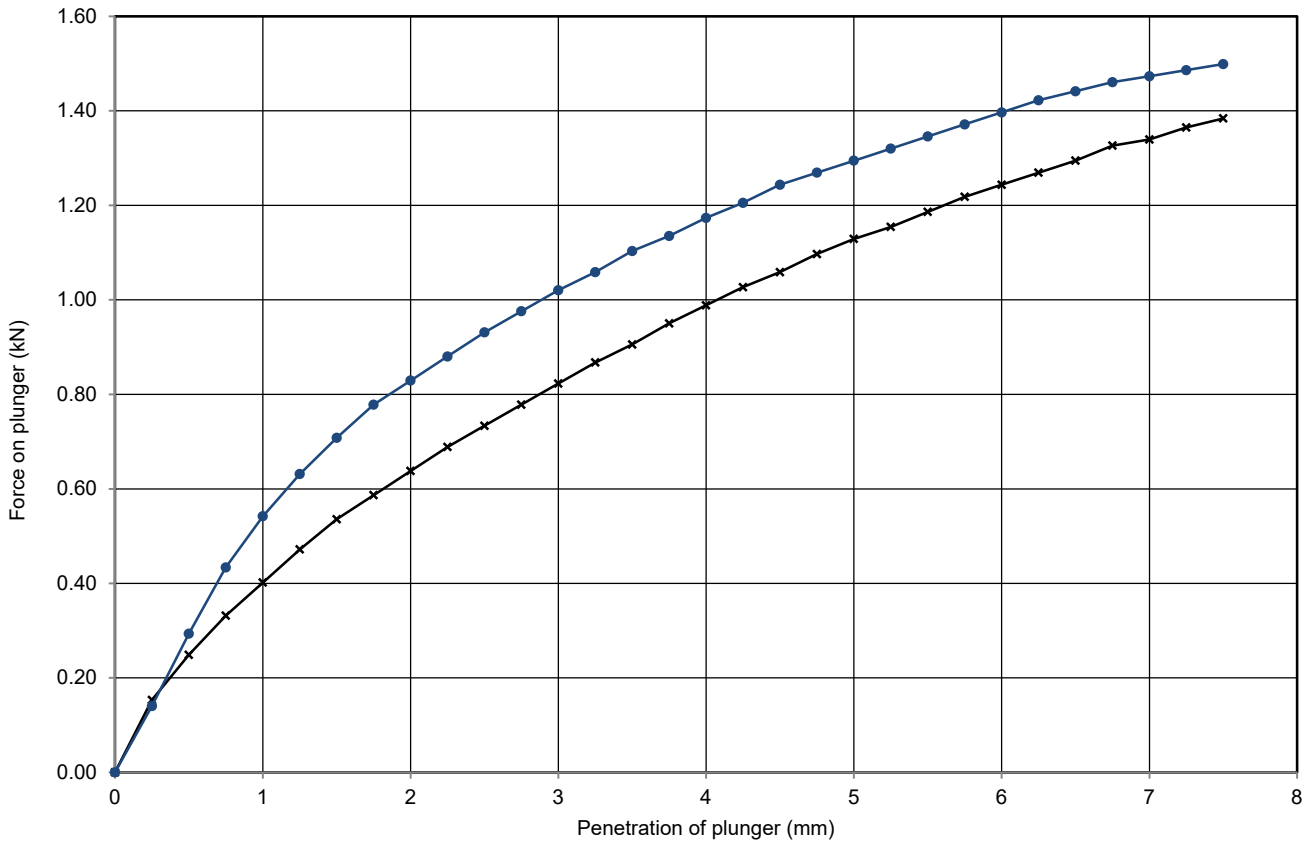


sample preparation:		Dynamic compaction - 2.5kg rammer with specified effort	
proportion > 20mm removed (%)	0.0	sample condition	Unsoaked
surcharge mass (kg)	10	amount of swell (mm)	
INITIAL CONDITIONS		FINAL CONDITIONS	
moisture content (%)	18	moisture content top (%)	18
bulk density (Mg/m <sup>3</sup> )	1.92	moisture content base (%)	18
dry density (Mg/m <sup>3</sup> )	1.63		
remarks		results	
Tested at 17% MC (OMC -3%)		CBR value top (%)	17
		CBR value base (%)	9.9
		average CBR value (%)	
		CONTRACT	CHECKED
		<b>35560/10</b>	<b>EC</b>

Geotechnical Engineering Limited  
**CALIFORNIA BEARING RATIO**  
 BS. 1377 : Part 4 : 1990 : 7



CLIENT	OSBORNE	BH/TP No.	RC516
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)	SAMPLE No./TYPE	7L
DESCRIPTION	Yellowish brown slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	1.20
		SPECIMEN DEPTH (m)	1.20

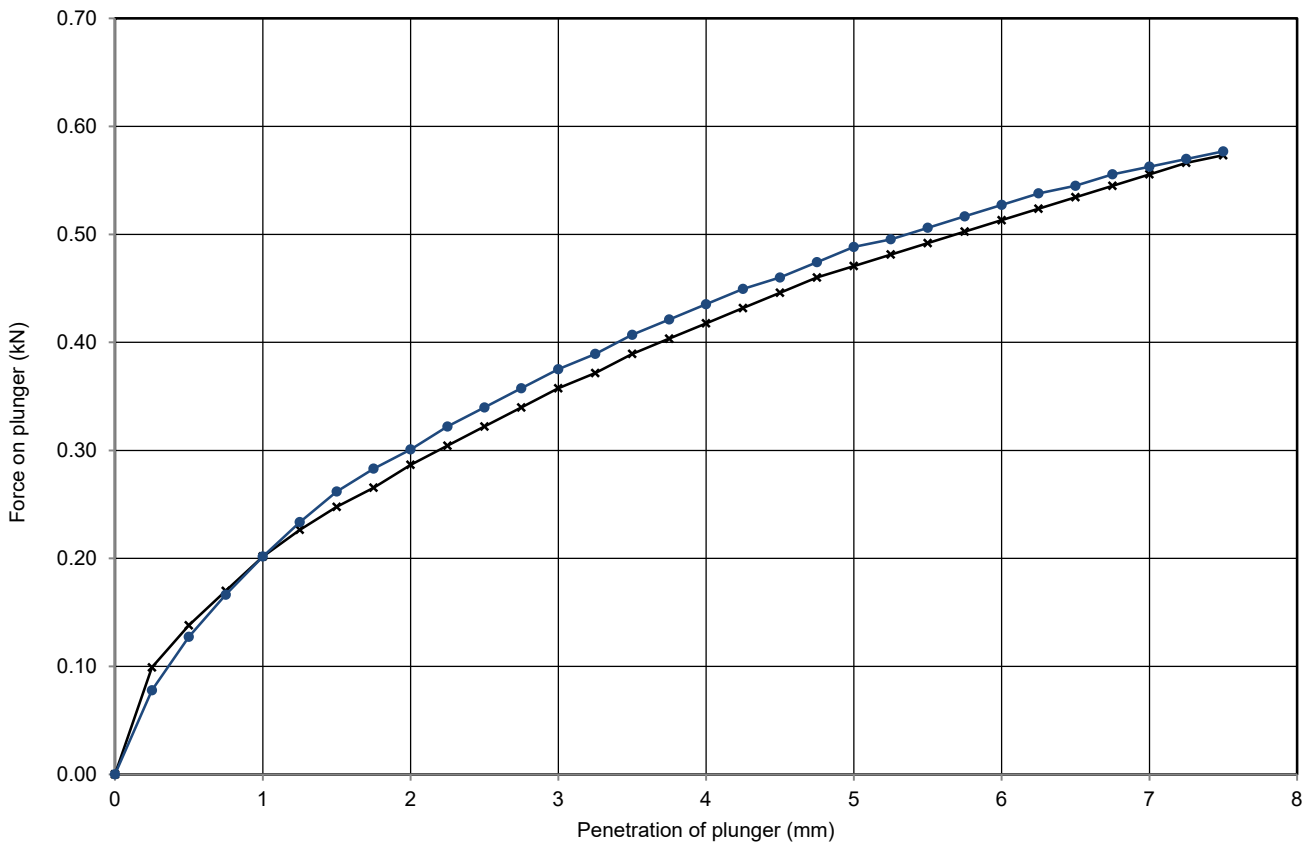


sample preparation:		Dynamic compaction - 2.5kg rammer with specified effort	
proportion > 20mm removed (%)	0.0	sample condition	Unsoaked
surcharge mass (kg)	10	amount of swell (mm)	
INITIAL CONDITIONS		FINAL CONDITIONS	
moisture content (%)	20	moisture content top (%)	21
bulk density (Mg/m <sup>3</sup> )	2.00	moisture content base (%)	21
dry density (Mg/m <sup>3</sup> )	1.66		
remarks		results	
Tested at 20% MC (OMC)		CBR value top (%)	5.6
		CBR value base (%)	7.1
		average CBR value (%)	
		CONTRACT	CHECKED
		<b>35560/10</b>	<b>EC</b>

Geotechnical Engineering Limited  
**CALIFORNIA BEARING RATIO**  
 BS. 1377 : Part 4 : 1990 : 7



CLIENT	OSBORNE	BH/TP No.	RC516
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)	SAMPLE No./TYPE	7L
DESCRIPTION	Yellowish brown slightly gravelly slightly sandy silty CLAY	SAMPLE DEPTH (m)	1.20
		SPECIMEN DEPTH (m)	1.20

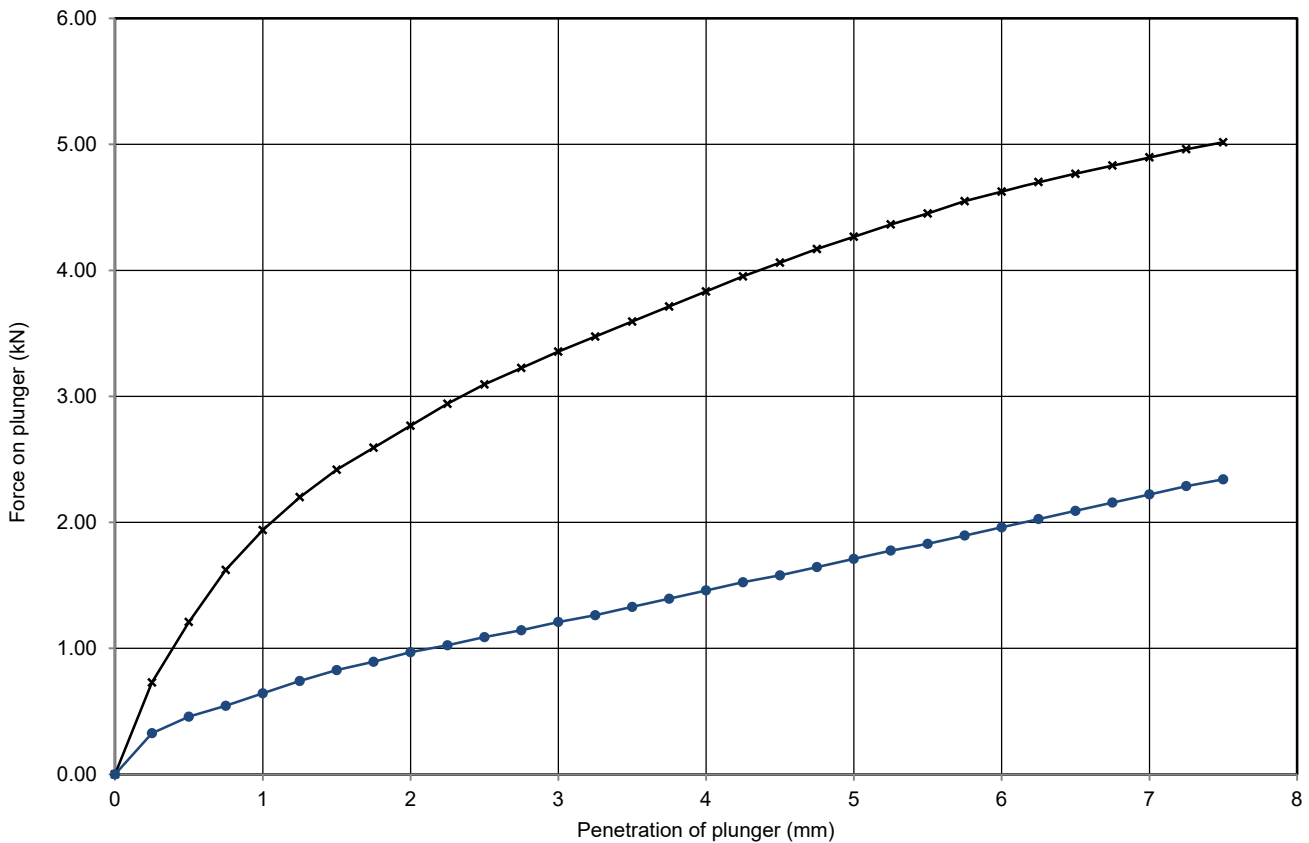


sample preparation:		Dynamic compaction - 2.5kg rammer with specified effort	
proportion > 20mm removed (%)	0.0	sample condition	Unsoaked
surcharge mass (kg)	10	amount of swell (mm)	
INITIAL CONDITIONS		FINAL CONDITIONS	
moisture content (%)	23	moisture content top (%)	24
bulk density (Mg/m <sup>3</sup> )	1.95	moisture content base (%)	23
dry density (Mg/m <sup>3</sup> )	1.58		
remarks		results	
Tested at 23% MC (OMC +3%)		CBR value top (%)	2.4
		CBR value base (%)	2.6
		average CBR value (%)	2.5
— x — x — Top — ● — ● — Base		CONTRACT	CHECKED
		<b>35560/10</b>	<b>EC</b>

Geotechnical Engineering Limited  
**CALIFORNIA BEARING RATIO**  
 BS. 1377 : Part 4 : 1990 : 7



CLIENT	OSBORNE	BH/TP No.	TP635
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)	SAMPLE No./TYPE	9LB
DESCRIPTION	Orangish brown mottled greyish brown slightly gravelly slightly sandy CLAY	SAMPLE DEPTH (m)	1.50
		SPECIMEN DEPTH (m)	1.50

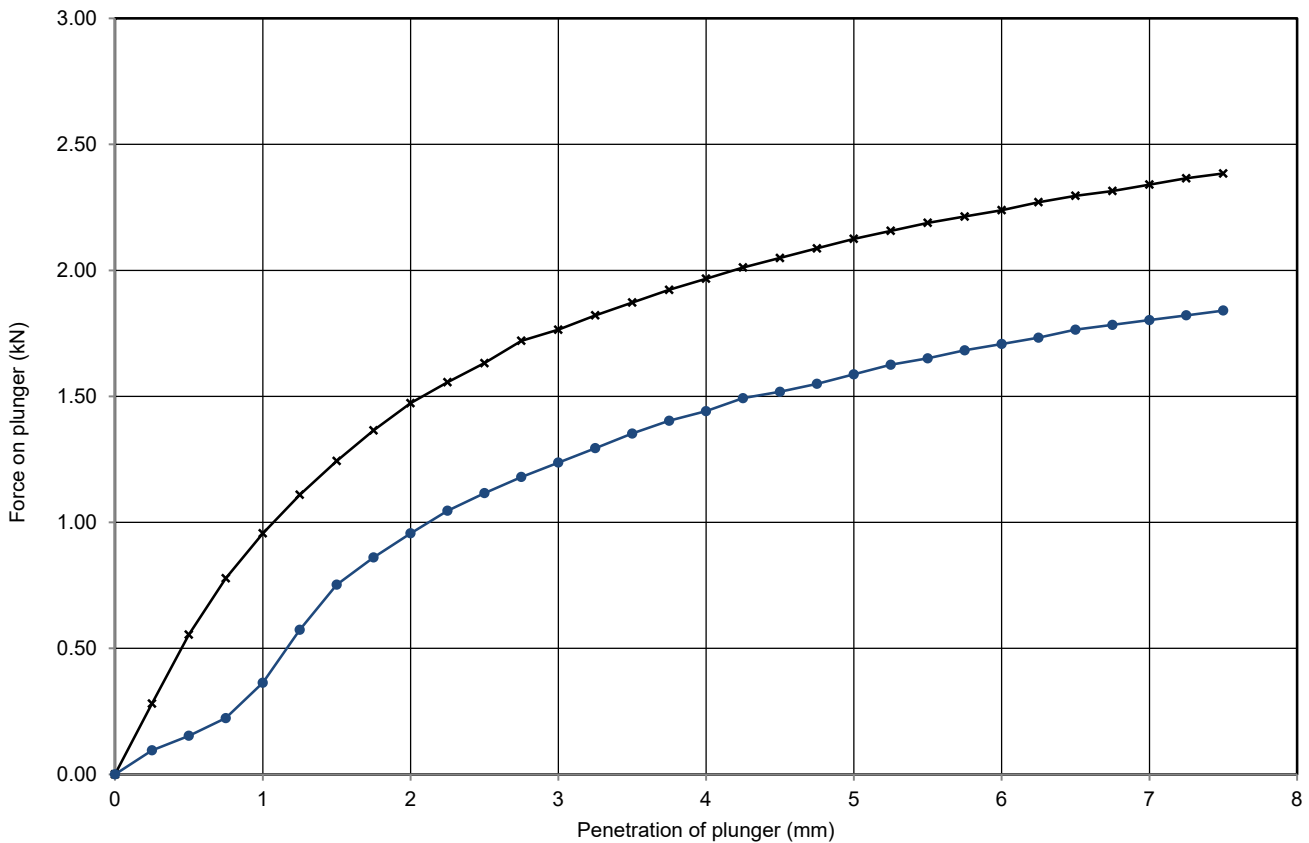


sample preparation:		Dynamic compaction - 2.5kg rammer with specified effort	
proportion > 20mm removed (%)	0.0	sample condition	Unsoaked
surcharge mass (kg)	10	amount of swell (mm)	
INITIAL CONDITIONS		FINAL CONDITIONS	
moisture content (%)	20	moisture content top (%)	19
bulk density (Mg/m <sup>3</sup> )	1.73	moisture content base (%)	19
dry density (Mg/m <sup>3</sup> )	1.45		
remarks		results	
Tested at 19% MC (OMC -3%)		CBR value top (%)	23
		CBR value base (%)	8.6
		average CBR value (%)	
		CONTRACT	CHECKED
		<b>35560/10</b>	<b>EC</b>

Geotechnical Engineering Limited  
**CALIFORNIA BEARING RATIO**  
 BS. 1377 : Part 4 : 1990 : 7



CLIENT	OSBORNE	BH/TP No.	TP635
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)	SAMPLE No./TYPE	9LB
DESCRIPTION	Orangish brown mottled greyish brown slightly gravelly slightly sandy CLAY	SAMPLE DEPTH (m)	1.50
		SPECIMEN DEPTH (m)	1.50

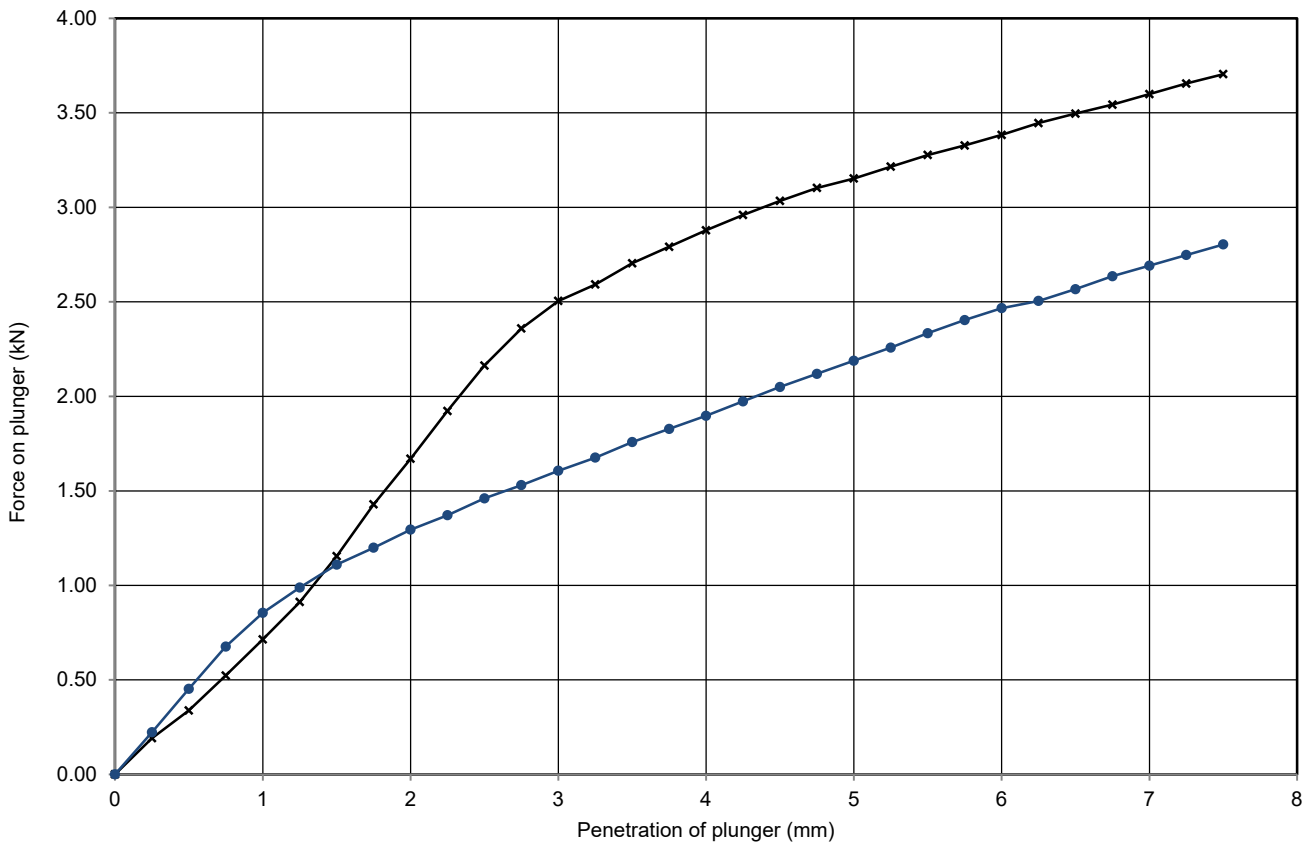


sample preparation:		Dynamic compaction - 2.5kg rammer with specified effort	
proportion > 20mm removed (%)	0.0	sample condition	Unsoaked
surcharge mass (kg)	10	amount of swell (mm)	
INITIAL CONDITIONS		FINAL CONDITIONS	
moisture content (%)	25	moisture content top (%)	25
bulk density (Mg/m <sup>3</sup> )	1.96	moisture content base (%)	25
dry density (Mg/m <sup>3</sup> )	1.57		
remarks		results	
Tested at 25% MC (OMC +3%)		CBR value top (%)	12
		CBR value base (%)	9.4
		average CBR value (%)	
— x — x — Top — ● — ● — Base		CONTRACT	CHECKED
		<b>35560/10</b>	<b>EC</b>

Geotechnical Engineering Limited  
**CALIFORNIA BEARING RATIO**  
 BS. 1377 : Part 4 : 1990 : 7



CLIENT	OSBORNE	BH/TP No.	TP635
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)	SAMPLE No./TYPE	9LB
DESCRIPTION	Orangish brown mottled greyish brown slightly gravelly slightly sandy CLAY	SAMPLE DEPTH (m)	1.50
		SPECIMEN DEPTH (m)	1.50



sample preparation:		Dynamic compaction - 2.5kg rammer with specified effort	
proportion > 20mm removed (%)	0.0	sample condition	Unsoaked
surcharge mass (kg)	10	amount of swell (mm)	
INITIAL CONDITIONS		FINAL CONDITIONS	
moisture content (%)	22	moisture content top (%)	23
bulk density (Mg/m <sup>3</sup> )	1.87	moisture content base (%)	23
dry density (Mg/m <sup>3</sup> )	1.53		
remarks		results	
Tested at 22% MC (OMC)		CBR value top (%)	16
		CBR value base (%)	11
		average CBR value (%)	
		CONTRACT	CHECKED
		<b>35560/10</b>	<b>EC</b>



# SHEAR STRENGTH BY DIRECT SHEAR



**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No. TP635

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)

SAMPLE No./TYPE 11LB

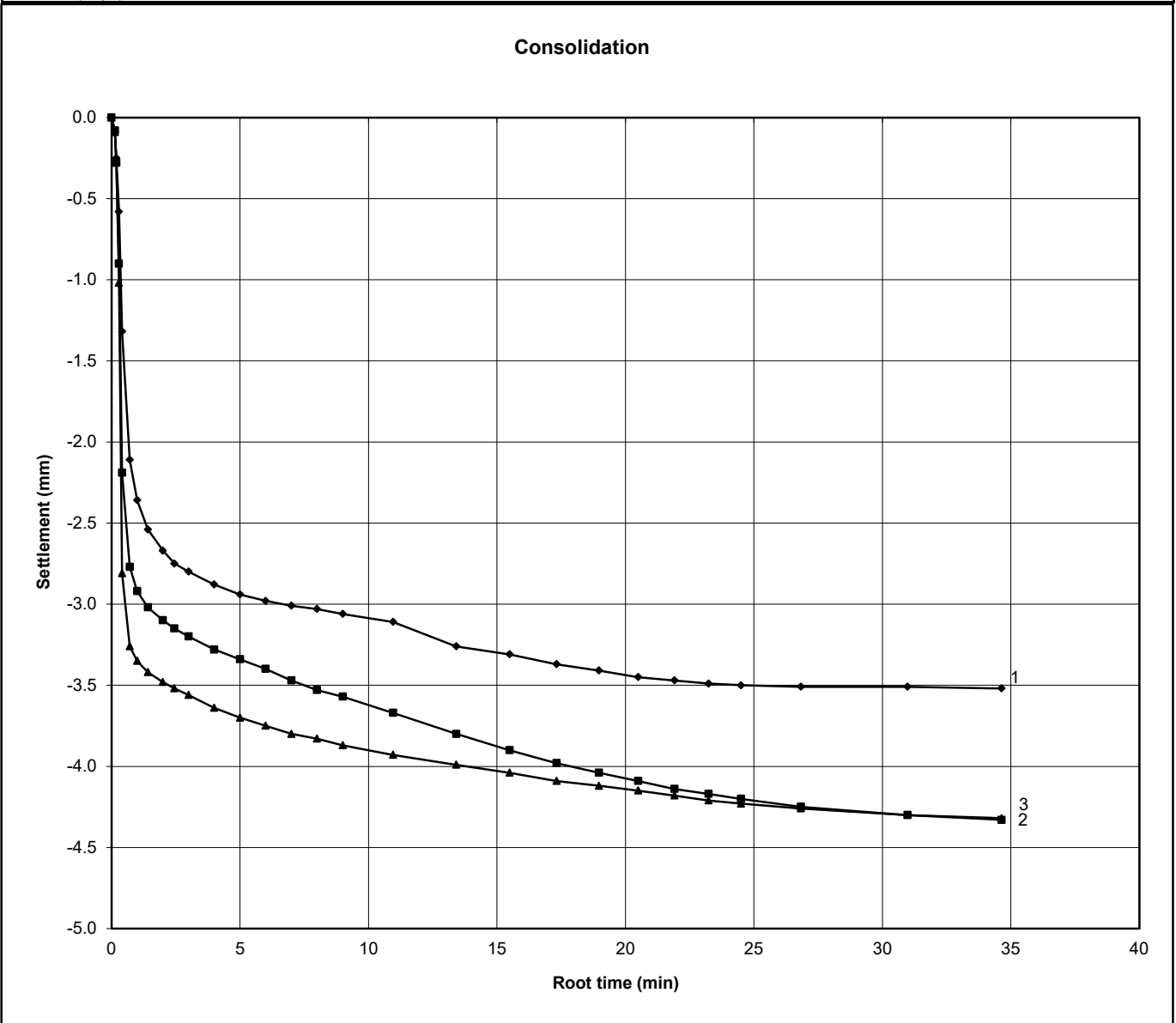
SAMPLE DEPTH (m) 2.50-2.70

SPECIMEN DEPTH (m) 2.50-2.70

DESCRIPTION Brown mottled grey slightly sandy CLAY

PREPARATION DETAILS Remoulded using a tamping rod - 0% removed (retained on 2mm sieve).

CONSOLIDATION STAGE RESULTS			
Specimen	1	2	3
t100 (min)	12.50	11.60	17.50
t <sub>f</sub> (min)	158.75	147.32	222.25
Machine speed (mm/min)	0.0100	0.0100	0.0100
Normal Stress (kPa)	50	100	200
Initial height (mm)	19.96	19.96	19.96
Final height (mm)	16.44	15.63	15.64
Duration (days)	1	1	1



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remarks: Specimens are submerged throughout the test.	CONTRACT <b>35560/10</b>	CHECKED <b>NP</b>
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# SHEAR STRENGTH BY DIRECT SHEAR

**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No.

TP635

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)

SAMPLE No./TYPE

11LB

SAMPLE DEPTH (m)

2.50-2.70

DESCRIPTION Brown mottled grey slightly sandy CLAY

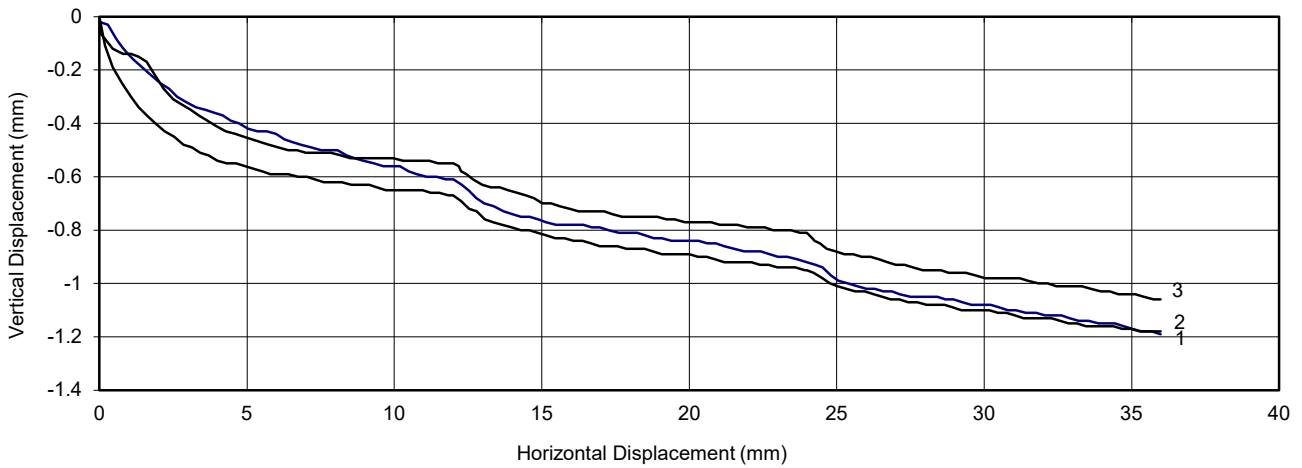
SPECIMEN DEPTH (m)

2.50-2.70

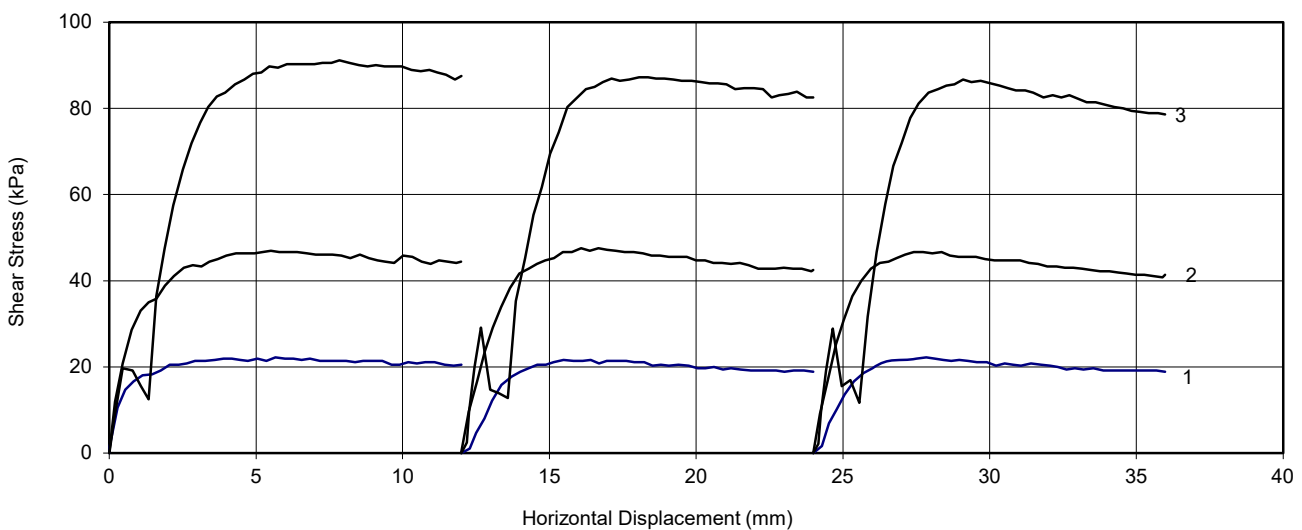
**SHEAR STAGE RESULTS**

Specimen	1	2	3
Peak Shear Strength (kPa)	22.2	46.9	91.1
Residual Shear Strength (kPa)	18.9	40.8	78.6
Cum. Vertical Displ. (mm)	-1.190	-1.180	-1.060
Cum. Forward Displ. (mm)	35.980	35.980	35.980
Normal Stress (kPa)	50	100	200
Duration (days)	3	3	3

**Vertical Displacement**



**Shear Stress**



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remarks:

slow machine reversal

CONTRACT

**35560/10**

CHECKED

**NP**



# SHEAR STRENGTH BY DIRECT SHEAR

**BS1377:Part 7:1990:4 (Small Shear Box)**

CLIENT OSBORNE

BH/TP No. TP635

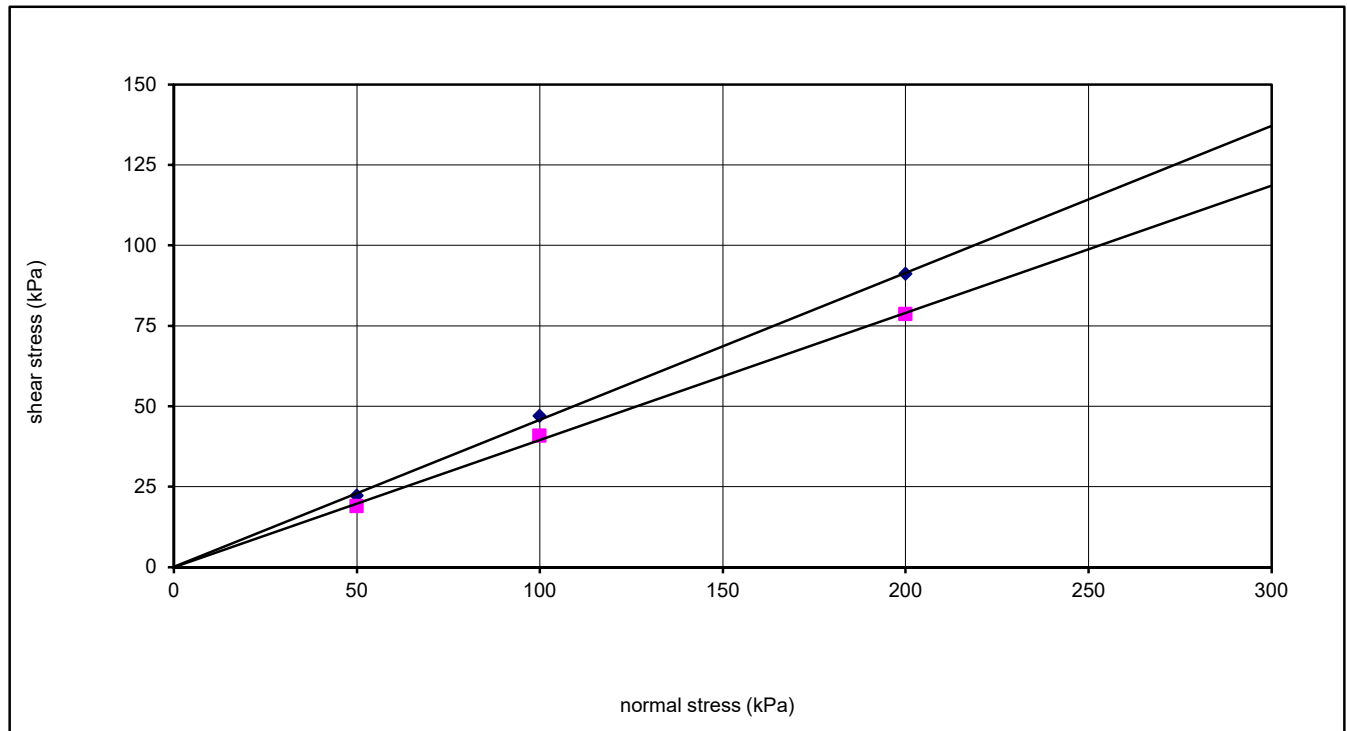
SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)

SAMPLE No./TYPE 11LB

SAMPLE DEPTH (m) 2.50-2.70

DESCRIPTION Brown mottled grey slightly sandy CLAY

SPECIMEN DEPTH (m) 2.50-2.70



INITIAL CONDITIONS						
				specimen 1	specimen 2	specimen 3
specimen size (mm)	60	moisture content (%)		29.1	25.8	23.1
	Square	bulk density Mg/m <sup>3</sup>		1.64	1.66	1.65
specimen height (mm)	19.96	dry density Mg/m <sup>3</sup>		1.27	1.32	1.34
		voids ratio		1.130	1.051	1.016
particle density (Mg/m <sup>3</sup> )	2.70 #	degree of saturation (%)		70	66	61
		strain rate (mm/min)		0.01	0.01	0.01

SHEARING STAGES						
specimen	normal stress (kPa)	peak shear stress (kPa)	horizontal displacement (mm)	residual shear stress (kPa)	traverses (No.)	total forward displacement (mm)
1	50	22.2	5.670	18.9	3	35.980
2	100	46.9	5.510	40.8	3	35.980
3	200	91.1	7.850	78.6	3	35.980

SHEAR STRENGTH PARAMETERS			
peak angle of shearing resistance $\phi'$	25	residual angle of shearing resistance $\phi'_r$	22
peak effective cohesion intercept, $c'$ (kPa)	0	residual effective cohesion intercept, $c'_r$ (kPa)	0

remarks: # denotes particle density has been assigned an assumed value.	CONTRACT	CHECKED
	<b>35560/10</b>	<b>NP</b>
	◆ peak	■ residual

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# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	RC516
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)	SAMPLE No./TYPE	9LS
		SAMPLE DEPTH (m)	2.00-2.40
DESCRIPTION	Brown mottled orange and grey slightly sandy CLAY	SPECIMEN DEPTH (m)	2.00-2.20

**TYPE OF SPECIMEN** Undisturbed / Vertical  
**TYPE OF TEST** Single Specimen Single Stage  
**SIDE DRAINS FITTED** Yes  
**DRAINAGE CONDITIONS** One end and radial boundary

		SPECIMEN	1
<b>INITIAL CONDITIONS</b>	Length	mm	205.48
	Diameter	mm	99.98
	Moisture Content	%	19
	Bulk Density	Mg/m <sup>3</sup>	2.05
	Dry Density	Mg/m <sup>3</sup>	1.73
<b>FINAL CONDITIONS</b>	Moisture Content	%	21
	Bulk Density	Mg/m <sup>3</sup>	2.11
	Dry Density	Mg/m <sup>3</sup>	1.75
<b>SATURATION</b> (by cell pressure and back pressure increments)	Initial PWP	kPa	-11
	Saturated PWP	kPa	201
	Final Cell Pressure	kPa	210
	B Value		0.97
	Duration	Days	6
<b>CONSOLIDATION</b>	Cell Pressure	kPa	340
	Back Pressure	kPa	300
	Initial PWP	kPa	328
	Final PWP	kPa	300
	Duration	Days	2
<b>COMPRESSION</b>	Cell Pressure	kPa	340
	Back Pressure	kPa	300
	$\sigma_3$	kPa	40
	Rate of Strain	%/hr	0.766
	Duration	Days	2
<b>FAILURE CONDITIONS</b> (based on maximum deviator stress)	Strain ( $\epsilon$ )	%	20.4
	$\delta u$	kPa	-11
	$\sigma_{3f}$	kPa	51
	$(\sigma_1 - \sigma_3)_f$	kPa	113

Membrane correction of 0.1kPa/% strain applied to deviator stress.

Side drain correction of 3.5kPa applied to deviator stress (100mm diameter)

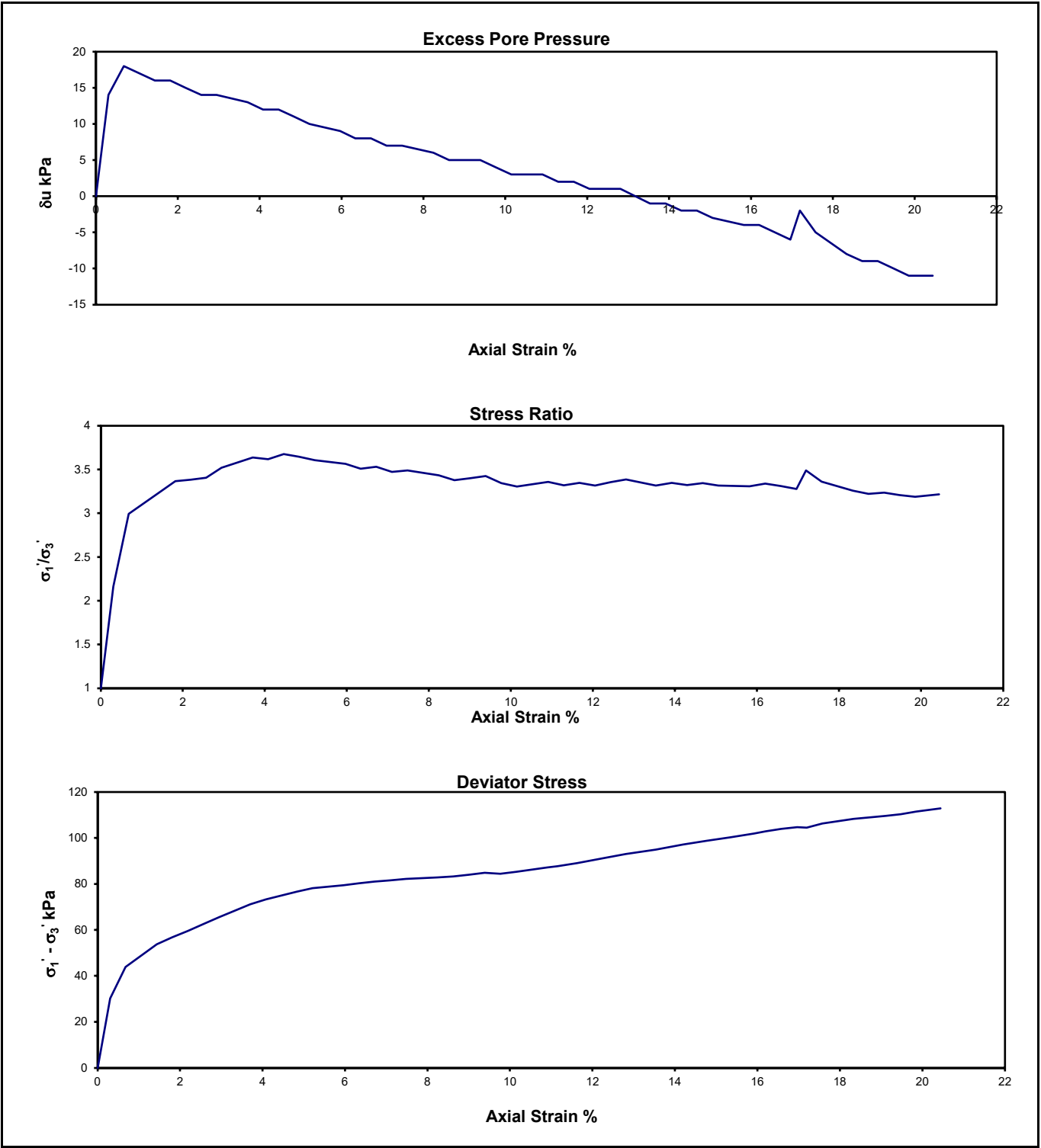
<b>FAILURE MODE</b> (see photo)	SHEAR	<b>EFFECTIVE STRESS PARAMETERS</b>	<b>c' kPa :</b>	<b><math>\phi'</math> deg :</b>
			CONTRACT	CHECKED
remarks			<b>35560/10</b>	<b>NP</b>

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE THESS1303 A417 MISSING LINK GROUND INVESTIGATION	BH/TP No.	RC516
SITE	- PHASE 2A (1143)	SAMPLE No./TYPE	9LS
		SAMPLE DEPTH (m)	2.00-2.40
		SPECIMEN DEPTH (m)	2.00-2.20



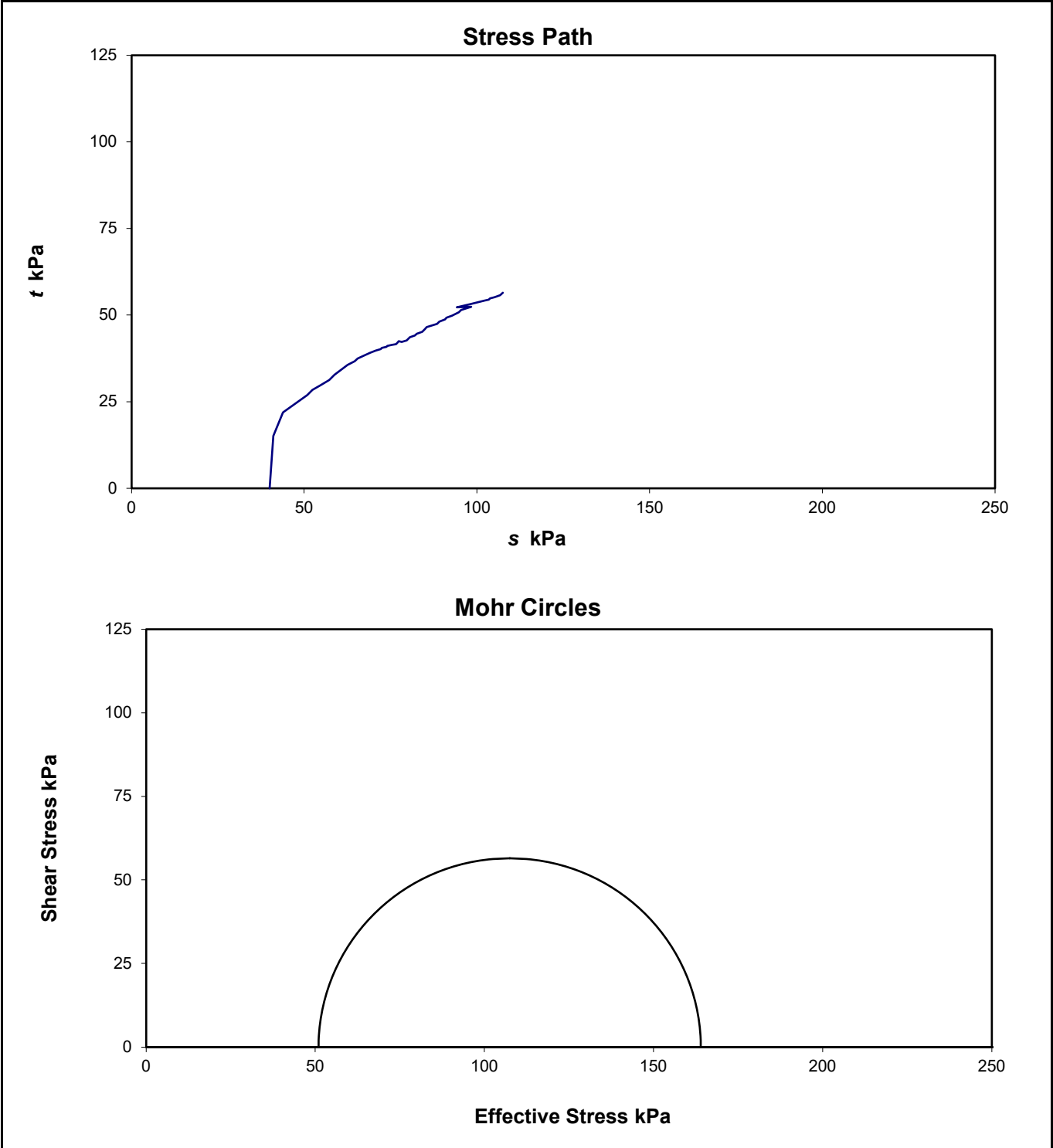
remarks	CONTRACT	CHECKED
	<b>35560/10</b>	<b>NP</b>

# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP



BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE HESSLEWOOD A417 MISSING LINK GROUND INVESTIGATION	BH/TP No.	RC516
SITE	- PHASE 2A (1143)	SAMPLE No./TYPE	9LS
		SAMPLE DEPTH (m)	2.00-2.40
		SPECIMEN DEPTH (m)	2.00-2.20



remarks	CONTRACT	CHECKED
	<b>35560/10</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	RC516
	PESSISUS A417 MISSING LINK GROUND INVESTIGATION		
SITE	- PHASE 2A (1143)	SAMPLE No./TYPE	9LS
		SAMPLE DEPTH (m)	2.00-2.40
		SPECIMEN DEPTH (m)	2.00-2.20



Failure Mode SHEAR

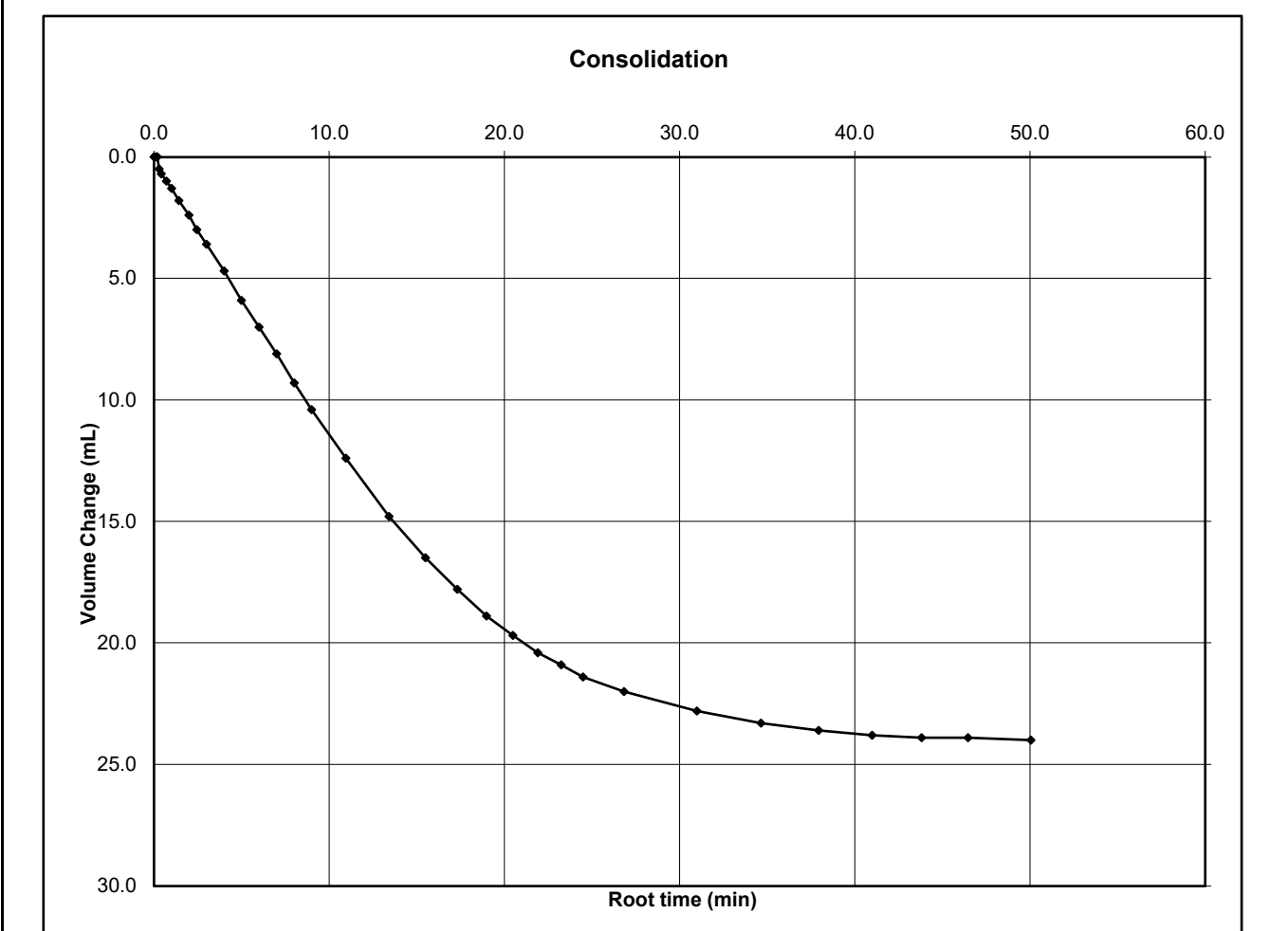
remarks Please note the photos are intended to show the mode of failure only.	CONTRACT	CHECKED
	<b>35560/10</b>	<b>NP</b>



# CONSOLIDATED UNDRAINED TRIAXIAL TEST with PWP

BS1377 : Part 8 : 1990 and "Manual of Soil Laboratory Testing", Volume 3, K.H. Head & R.J. Epps

CLIENT	OSBORNE	BH/TP No.	RC516
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION	SAMPLE No./TYPE	9LS
		SAMPLE DEPTH (m)	2.00-2.40
		SPECIMEN DEPTH (m)	2.00-2.20



Cell pressure	kPa	340
Back pressure	kPa	300
Effective pressure	kPa	40
Initial PWP	kPa	328
Final PWP	kPa	300
PWP Dissipation	%	100.00
Volume change	mL	24.0
	t100	435.99

remarks	CONTRACT	CHECKED
	<b>35560/10</b>	<b>NP</b>



**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
DSRC312	3.00	A	X	N	100		50	6.55	79.79	1.03	1.23	1.27	Yellowish brown LIMESTONE
DSRC312	3.00	D	Y	N		50	100	11.79	100.00	1.18	1.37	1.61	Yellowish brown LIMESTONE
DSRC312	4.60	A	X	N	100		50	8.18	79.79	1.28	1.23	1.59	Yellowish brown LIMESTONE
DSRC312	4.60	D	Y	N		55	100	8.84	100.00	0.88	1.37	1.21	Yellowish brown LIMESTONE
DSRC312	5.75	A	X	N	100		60	15.75	87.40	2.06	1.29	2.65	Light brown LIMESTONE
DSRC312	5.75	D	Y	N		60	100	13.70	100.00	1.37	1.37	1.87	Light brown LIMESTONE
DSRC312	9.95	A	X	N	100		60	4.76	87.40	0.62	1.29	0.80	Light brown LIMESTONE
DSRC312	9.95	D	Y	N		60	100	6.31	100.00	0.63	1.37	0.86	Light brown LIMESTONE
DSRC312	13.40	A	X	N	100		50	21.78	79.79	3.42	1.23	4.22	Light brown and grey LIMESTONE
DSRC312	13.40	D	Y	N		60	100	17.90	100.00	1.79	1.37	2.45	Light brown and grey LIMESTONE
DSRC312	17.10	A	X	N	100		60	1.13	87.40	0.15	1.29	0.19	Grey MUDSTONE
DSRC312	17.10	D	Y	N		60	100	1.39	100.00	0.14	1.37	0.19	Grey MUDSTONE
DSRC312	24.35	A	X	N	100		40	1.08	71.36	0.21	1.17	0.25	Grey SILTSTONE
DSRC312	24.35	D	Y	N		70	100	2.35	100.00	0.24	1.37	0.32	Grey SILTSTONE
OH411	2.45	A	X	N	100		65	22.25	90.97	2.69	1.31	3.52	Light brown LIMESTONE
OH411	2.45	D	Y	N		55	100	20.87	100.00	2.09	1.37	2.85	Light brown LIMESTONE
OH411	4.35	A	X	N	100		50	27.20	79.79	4.27	1.23	5.27	Light brown LIMESTONE
OH411	4.35	D	Y	N		50	100	28.92	100.00	2.89	1.37	3.95	Light brown LIMESTONE
OH411	8.65	A	X	N	100		40	11.37	71.36	2.23	1.17	2.62	Light brown LIMESTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular      U - unknown	N - natural moisture content	<b>35560/10</b>	<b>EC</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)

borehole /trial pit no.	sample depth (m)	test type	test orientation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
OH411	8.65	D	Y	N		70	100	10.84	100.00	1.08	1.37	1.48	Light brown LIMESTONE
OH411	11.90	A	X	N	100		50	0.57	79.79	0.09	1.23	0.11	Light grey MUDSTONE
OH411	11.90	D	Y	N		50	100	0.60	100.00	0.06	1.37	0.08	Light grey MUDSTONE
OH411	14.65	A	X	N	100		70	10.18	94.41	1.14	1.33	1.52	Light grey LIMESTONE
OH411	14.65	D	Y	N		70	100	17.63	100.00	1.76	1.37	2.41	Light grey LIMESTONE
OH411	17.75	A	X	N	100		60	0.70	87.40	0.09	1.29	0.12	Grey MUDSTONE
OH411	17.75	D	Y	N		75	100	0.10	100.00	0.01	1.37	0.01	Grey MUDSTONE
OH411	21.65	A	X	N	100		45	0.08	75.69	0.01	1.21	0.02	Grey MUDSTONE
OH411	21.65	D	Y	N		80	100	0.08	100.00	0.01	1.37	0.01	Grey MUDSTONE
RC516	4.75	A	X	P	90		40	1.96	67.70	0.43	1.15	0.49	Light yellow LIMESTONE
RC516	4.75	D	Y	P		40	90	2.44	90.00	0.30	1.30	0.39	Light yellow LIMESTONE
RC516	7.85	A	X	N	100		60	7.32	87.40	0.96	1.29	1.23	Light brown LIMESTONE
RC516	7.85	D	Y	N		70	100	4.75	100.00	0.48	1.37	0.65	Light brown LIMESTONE
RC516	8.70	A	X	N	100		60	6.05	87.40	0.79	1.29	1.02	Light brown LIMESTONE
RC516	8.70	D	Y	N		65	100	10.65	100.00	1.07	1.37	1.45	Light brown LIMESTONE
RC516	11.15	A	X	N	100		50	4.11	79.79	0.65	1.23	0.80	Light brown LIMESTONE
RC516	11.15	D	Y	N		70	100	5.25	100.00	0.53	1.37	0.72	Light brown LIMESTONE
RC516	13.35	A	X	N	100		60	9.88	87.40	1.29	1.29	1.66	Light brown LIMESTONE
RC516	13.35	D	Y	N		60	100	9.27	100.00	0.93	1.37	1.27	Light brown LIMESTONE

## general remarks

tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength  
test machine PLM02

test type	test orientation relative to discontinuities	moisture condition	CONTRACT	CHECKED
A - axial	X - perpendicular U - unknown	N - natural moisture content	<b>35560/10</b>	<b>EC</b>
D - diametral	Y - parallel	P - partially air dried		
I - irregular lump	Z - oblique	S - soaked		

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1143)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
RC516	17.30	A	X	N	100		50	6.60	79.79	1.04	1.23	1.28	Light brown mottled orange LIMESTONE
RC516	17.30	D	Y	N		70	100	12.06	100.00	1.21	1.37	1.65	Light brown mottled orange LIMESTONE
RC516	20.00	A	X	N	100		50	4.75	79.79	0.75	1.23	0.92	Yellowish brown LIMESTONE
RC516	20.00	D	Y	N		70	100	16.60	100.00	1.66	1.37	2.27	Yellowish brown LIMESTONE
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02													
test type		test orientation relative to discontinuities				moisture condition				CONTRACT	CHECKED		
A - axial		X - perpendicular		U - unknown		N - natural moisture content				<b>35560/10</b>	<b>EC</b>		
D - diametral		Y - parallel		P - partially air dried									
I - irregular lump		Z - oblique		S - soaked									



# Final Report

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**Report No.:** 20-19648-1  
**Initial Date of Issue:** 04-Aug-2020  
**Client** Geotechnical Engineering Ltd  
**Client Address:** Centurion House  
Olympus Park  
Quedgeley  
Gloucester  
Gloucestershire  
GL2 4NF  
**Contact(s):** GEL  
Tom Best

**Project** 35560/10 A417 Missing Link

<b>Quotation No.:</b>		<b>Date Received:</b>	29-Jul-2020
<b>Order No.:</b>	35560/10TB	<b>Date Instructed:</b>	29-Jul-2020
<b>No. of Samples:</b>	6		
<b>Turnaround (Wkdays):</b>	5	<b>Results Due:</b>	04-Aug-2020
<b>Date Approved:</b>	04-Aug-2020		

**Approved By:**



**Details:** Glynn Harvey, Technical Manager

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## Results - Soil

**Project: 35560/10 A417 Missing Link**

<b>Client: Geotechnical Engineering Ltd</b>		<b>Chemtest Job No.:</b>		20-19648	20-19648	20-19648	20-19648	20-19648	20-19648	
Quotation No.:		<b>Chemtest Sample ID.:</b>		1039606	1039607	1039608	1039609	1039610	1039611	
Order No.: 35560/10TB		Client Sample Ref.:		14	21	6	11	20	5	
		Client Sample ID.:		Cs	Cs	D	C	Cs	B	
		Sample Location:		DSRC312	DSRC312	RC516	RC516	RC516	TP606	
		Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	
		Top Depth (m):		4.53	9.85	1.00	4.20	11.15	0.50	
		Bottom Depth (m):		4.70	10.10	1.10	5.70	11.45	0.70	
		Date Sampled:		27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020	27-Jul-2020	
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>						
Moisture	N	2030	%	0.020	2.2	8.6	21	0.19	7.6	13
pH	U	2010		4.0	8.8	8.9	8.5	8.7	8.8	8.7
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total Sulphur	U	2175	%	0.010	0.017	0.027	0.034	0.037	0.046	0.031
Sulphate (Acid Soluble)	U	2430	%	0.010	0.010	0.029	0.030	0.031	0.036	0.021

## Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

## **Report Information**

### **Key**

---

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### **Sample Deviation Codes**

---

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

### **Sample Retention and Disposal**

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All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



# Final Report

---

**Report No.:** 20-20131-1  
**Initial Date of Issue:** 07-Aug-2020  
**Client** Geotechnical Engineering Ltd  
**Client Address:** Centurion House  
Olympus Park  
Quedgeley  
Gloucester  
Gloucestershire  
GL2 4NF

**Contact(s):** GEL  
Tom Best

**Project** 35560-10B A417 Missing Link

**Quotation No.:** **Date Received:** 03-Aug-2020

**Order No.:** 35560/10/TB **Date Instructed:** 03-Aug-2020

**No. of Samples:** 3

**Turnaround (Wkdays):** 5 **Results Due:** 07-Aug-2020

**Date Approved:** 07-Aug-2020

**Approved By:**



**Details:** Glynn Harvey, Technical Manager

---



## Results - Soil

**Project: 35560-10B A417 Missing Link**

<b>Client: Geotechnical Engineering Ltd</b>	<b>Chemtest Job No.:</b>				20-20131	20-20131	20-20131
Quotation No.:	<b>Chemtest Sample ID.:</b>				1041937	1041938	1041939
Order No.: 35560/10/TB	Client Sample Ref.:				12	16	22
	Sample Location:				OH411	OH411	OH411
	Sample Type:				SOIL	SOIL	SOIL
	Top Depth (m):				3.2	6.2	12
	Bottom Depth (m):				4.7	7.7	13.7
	Date Sampled:				31-Jul-2020	31-Jul-2020	31-Jul-2020
<b>Determinand</b>	<b>Accred.</b>	<b>SOP</b>	<b>Units</b>	<b>LOD</b>			
Moisture	N	2030	%	0.020	0.67	0.39	2.4
pH (2.5:1)	N	2010		4.0	8.4	8.4	
Magnesium (Water Soluble)	N	2120	g/l	0.010	< 0.010	< 0.010	
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	< 0.010	
Total Sulphur	U	2175	%	0.010	0.084	0.038	
Chloride (Water Soluble)	U	2220	g/l	0.010	< 0.010	< 0.010	
Nitrate (Water Soluble)	N	2220	g/l	0.010	< 0.010	< 0.010	
Carbonate	N	2260	%	0.10			37
Sulphate (Acid Soluble)	U	2430	%	0.010	0.12	0.013	

## Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measurement by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2260	Carbonate	Carbonate	Titration
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.

## **Report Information**

### **Key**

---

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---

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---

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[customerservices@chemtest.com](mailto:customerservices@chemtest.com)



2718

GEOTECHNICAL ENGINEERING LIMITED



For the attention of David Owen


Version No. 1  
Page No. 1 of 5  
Date of Issue 03/12/2020

### TEST REPORT

PROJECT/SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1219)	Samples received	22/10/2020
GEL REPORT NUMBER	35560/11	Schedule received	05/11/2020
Test report refers to	Schedule 1	Testing commenced	19/11/2020
		Status	Final

### SUMMARY OF RESULTS ATTACHED

TEST METHOD & DESCRIPTION	QUANTITY	ACCREDITED TEST
BS EN ISO 17892-1: 2014:5. Water Content	1	YES
BS1377: Part 2: 1990:4.2-4.4&5.2-5.4, Liquid & Plastic Limits	1	YES
BS EN ISO 17892-4: 2016: 5.2, Particle Size Distribution - Wet Sieve	1	YES
ISRM: 2007: Point Load Strength Test	2	YES

<p>Remarks</p> <p>This report may not be partially reproduced without written permission from this laboratory.</p> <p>The results reported relate to samples received in the laboratory</p>	<p>Approved Signatories:</p> <p>T Best (Deputy Laboratory Manager) E Crimp (Senior Engineer)</p> <p>J Hanson (Director) N Parry (Director)</p> 
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Doc TR01 Rev No. 22 Revision date 02/01/20 DC:JH

### Geotechnical Engineering Ltd

Centurion House  
Olympus Park, Quedgeley  
Gloucester GL2 4NF

[www.geoeng.co.uk](http://www.geoeng.co.uk)  
geotech@geoeng.co.uk  
TEL: 01452 527743  
Fax: 01452 729314

Registered number: 00700739  
VAT Number: 682 5857 89

Payments: Geotechnical Engineering Limited  
Sort code: 16-22-11 Bank account: 11125135

# LIQUID AND PLASTIC LIMITS

BS.1377 : PART 2 : 1990 : 4 and 5



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1219)

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
TP602	3D	0.20	0.20	20.8	BXE	62	56	32	24	Brown slightly sandy gravelly clayey SILT

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

specimen preparation

A - as received

B - washed on 0.425mm sieve

C - air dried

D - oven dried (60°C)

E - oven dried (105°C)

F - not known

test method

X - cone penetrometer (test 4.3)

Y - cone penetrometer (test 4.4)

Z - casagrande apparatus (test 4.5)

CONTRACT

**35560/11**

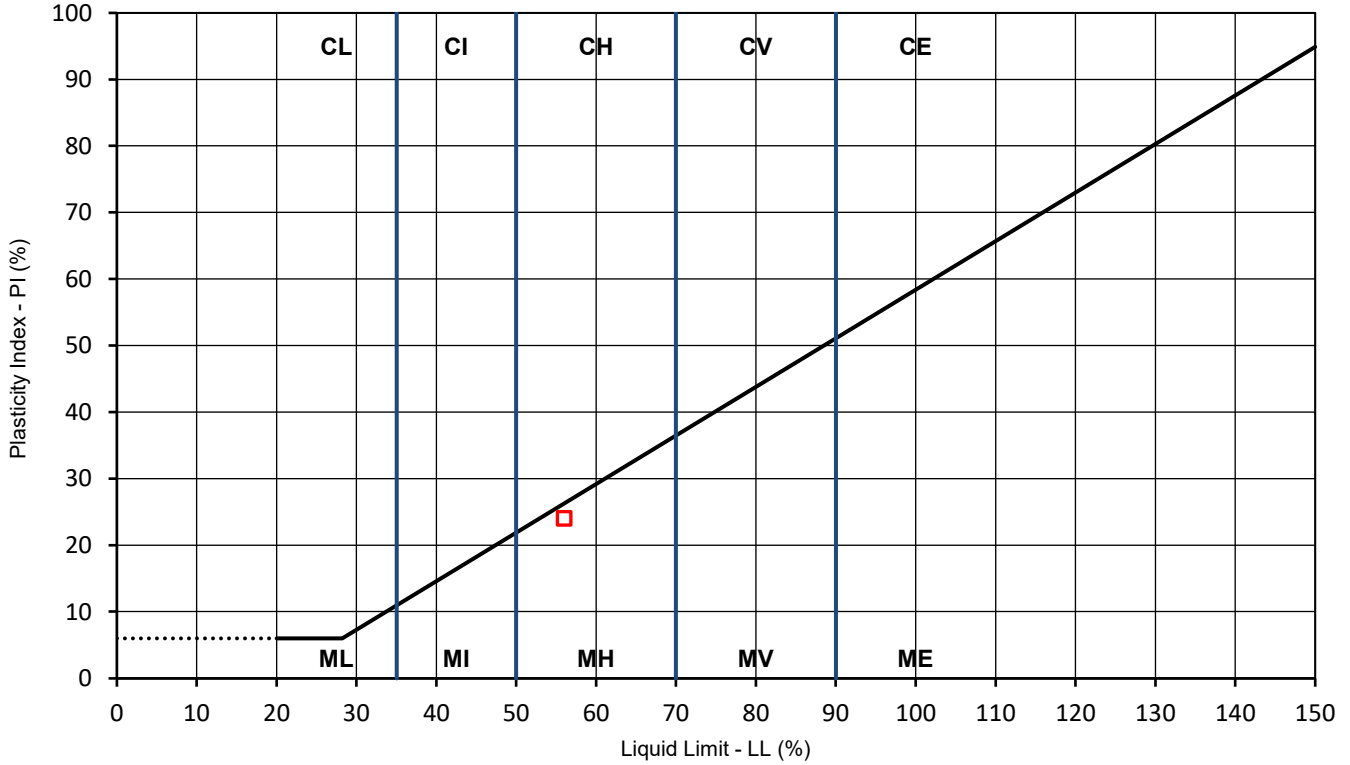
CHECKED

**EC**



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1219)



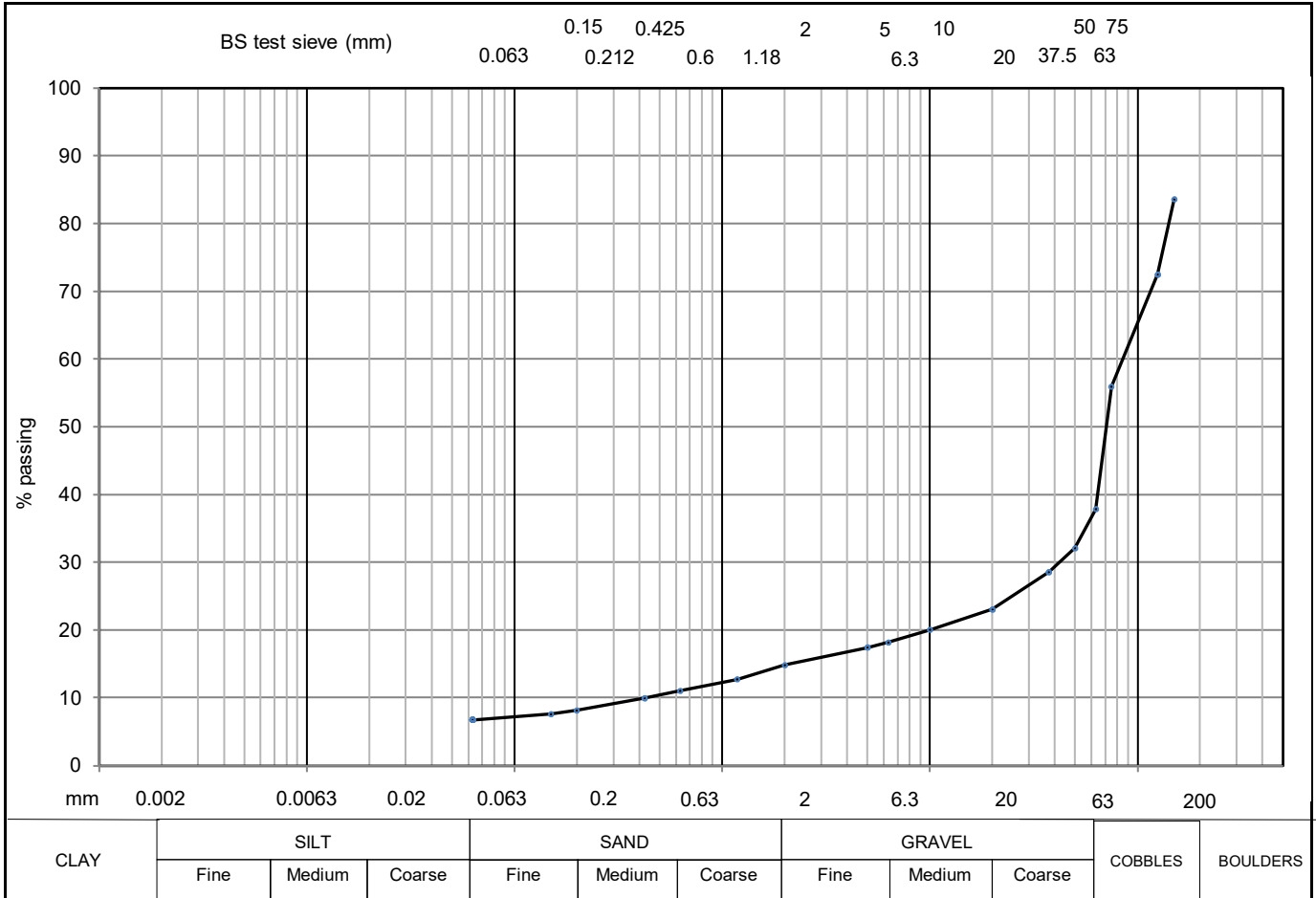
BH/TP No.	depth (m)	LL	PL	PI	remarks
□ TP602	0.20	56	32	24	

CONTRACT	CHECKED
<b>35560/11</b>	<b>EC</b>

Geotechnical Engineering Limited  
**PARTICLE SIZE DISTRIBUTION**  
 BS EN ISO 17892 - 4 : 2016 : 5



CLIENT	OSBORNE	BH/TP No.	TP602
SITE	HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1219)	SAMPLE No./TYPE	4B
DESCRIPTION	Light brown COBBLES with much clayey very sandy gravel	SAMPLE DEPTH (m)	0.50
		SPECIMEN TOP (m)	0.50
		SPECIMEN BASE (m)	0.60



soil type	% fraction	SAND		GRAVEL			COBBLES	BOULDERS
		Fine	Medium	Coarse	Fine	Medium		
CLAY								
SILT								
SILT & CLAY	7							
SAND	8							
GRAVEL	23							
COBBLE & BOULDER	62							
test method(s)	5.2							
test method								
5.2 - sieving								
5.3 - sedimentation by hydrometer								
5.4 - sedimentation by pipette								
remarks	# denotes sample tested is smaller than that which is recommended in accordance with BS EN 17892 Particle density assigned an assumed value of 2.70 Mg/m <sup>3</sup>						CONTRACT	CHECKED
							<b>35560/11</b>	<b>EC</b>

**POINT LOAD STRENGTH TEST**

I.S.R.M. Suggested Methods : 2007 Edition



CLIENT OSBORNE

SITE HE551505 A417 MISSING LINK GROUND INVESTIGATION - PHASE 2A (1219)

borehole /trial pit no.	sample depth (m)	test type	test orien- tation	moisture condition	width		platen sep. D (mm)	failure load P (kN)	equiv. diam. De (mm)	Is (MPa)	size factor	Is(50) (MPa)	description and remarks
					W (mm)	L (mm)							
RC506	5.45	A	X	N	100		80	4.10	100.93	0.40	1.37	0.55	Yellowish brown LIMESTONE
RC506	5.45	D	Y	N		80	100	0.28	100.00	0.03	1.37	0.04	Yellowish brown LIMESTONE
RC506	10.02	A	X	N	100		70	5.60	94.41	0.63	1.33	0.84	Yellowish brown LIMESTONE
RC506	10.02	D	Y	N		70	100	9.53	100.00	0.95	1.37	1.30	Yellowish brown LIMESTONE
general remarks tests carried out in accordance with I.S.R.M.(2007): Suggested Methods for Determining Point Load Strength test machine PLM02													
test type		test orientation relative to discontinuities				moisture condition				CONTRACT	CHECKED		
A - axial		X - perpendicular		U - unknown		N - natural moisture content				<b>35560/11</b>	<b>EC</b>		
D - diametral		Y - parallel		P - partially air dried									
I - irregular lump		Z - oblique		S - soaked									





---

# **APPENDIX F**

## **CHEMICAL ANALYSES**



**Simon Phelpstead**  
Geotechnical Engineering Ltd  
Centurion House  
Olympus Park  
Quedgeley  
Gloucester  
GL2 4NF

i2 Analytical Ltd.  
7 Woodshots Meadow,  
Croxley Green  
Business Park,  
Watford,  
Herts,  
WD18 8YS

**t:** 01923 225404  
**f:** 01923 237404  
**e:** reception@i2analytical.com

## **Analytical Report Number : 19-37543**

<b>Project / Site name:</b>	HE551505 A417 Missing Link Ground Investigation	<b>Samples received on:</b>	12/04/2019
<b>Your job number:</b>	35102-DO	<b>Samples instructed on:</b>	16/04/2019
<b>Your order number:</b>	35102-DO	<b>Analysis completed by:</b>	24/04/2019
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	24/04/2019
<b>Samples Analysed:</b>	1 water sample		

**Signed:** 

Dr Claire Stone  
Quality Manager  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.



Analytical Report Number: 19-37543

Project / Site name: HE551505 A417 Missing Link Ground Investigation

Your Order No: 35102-DO

<b>Lab Sample Number</b>				1201444				
<b>Sample Reference</b>				DSRC110				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				32.03				
<b>Date Sampled</b>				12/04/2019				
<b>Time Taken</b>				1030				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	12.1				
Temperature on Receipt	oC	0.1	NONE	3.80				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	2200				
Sulphate as SO <sub>4</sub>	µg/l	45	ISO 17025	157000				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	157				
Chloride	mg/l	0.15	ISO 17025	39				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	290				
Nitrate as N	mg/l	0.01	ISO 17025	2.30				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	10.2				
Nitrite as N	µg/l	1	ISO 17025	37				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	480				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	430				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	2.3				
Total Suspended Solids	mg/l	2	ISO 17025	1100				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	101				
Bicarbonate	mgHCO <sub>3</sub> /l	10	NONE	360				
Dissolved Oxygen	mg/l	1	NONE	8.0				

**Heavy Metals / Metalloids**

Aluminium (dissolved)	ug/l	1	ISO 17025	290				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	1.15				
Boron (dissolved)	µg/l	10	ISO 17025	24				
Calcium (dissolved)	mg/l	0.012	ISO 17025	41				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.13				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	0.023				
Manganese (dissolved)	µg/l	0.05	ISO 17025	2.0				
Potassium (dissolved)	mg/l	0.025	ISO 17025	14				
Sodium (dissolved)	mg/l	0.01	ISO 17025	240				

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 19-37543**

**Project / Site name: HE551505 A417 Missing Link Ground Investigation**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Alkalinity in Water (by titration)	Determination of Alkalinity by titration (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L025-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Dissolved Oxygen in water	Determination of dissolved oxygen.	In-house method	L086-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Suspended solids in water	Determined gravimetrically with GFC filtration papers.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L004-PL	W	ISO 17025
Temperature on Receipt (water)	Temperature of water upon receipt.	In-house method	L019-UK	W	NONE
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025



**Analytical Report Number : 19-37543**

**Project / Site name: HE551505 A417 Missing Link Ground Investigation**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078-PL	W	NONE

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSRC110	1	W	19-37543	1201444	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC110	1	W	19-37543	1201444	c	Dissolved Oxygen in water	L086-PL	c
DSRC110	1	W	19-37543	1201444	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC110	1	W	19-37543	1201444	c	pH at 20oC in water (automated)	L099-PL	c



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**Analytical Report Number : 19-38256**

<b>Project / Site name:</b>	A417	<b>Samples received on:</b>	23/04/2019
<b>Your job number:</b>	35205-DO	<b>Samples instructed on:</b>	23/04/2019
<b>Your order number:</b>	355205-DO	<b>Analysis completed by:</b>	30/04/2019
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	30/04/2019
<b>Samples Analysed:</b>	2 leachate samples - 2 soil samples		

**Signed:**



Zina Abdul Razzak  
 Assistant Quality/Reporting Manager  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 19-38256  
 Project / Site name: A417  
 Your Order No: 355205-DO

Lab Sample Number				1205747	1205748			
Sample Reference				DSRC108	CP106			
Sample Number				4	4			
Depth (m)				1.00	1.00			
Date Sampled				15/04/2019	15/04/2019			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
				Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	N/A	NONE	14	8.6			
Total mass of sample received	kg	0.001	NONE	2.0	2.0			

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected			

#### General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.2	8.5			
Free Cyanide	mg/kg	1	MCERTS	< 1	< 1			
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.050	0.081			
Total Sulphur	mg/kg	50	MCERTS	600	530			
Fraction Organic Carbon (FOC)	N/A	0.001	MCERTS	0.011	0.013			

#### Phenols by HPLC

Catechol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10			
Resorcinol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10			
Cresols (o-, m-, p-)	mg/kg	0.3	ISO 17025	< 0.30	< 0.30			
Total Naphthols (sum of 1- and 2- Naphthol)	mg/kg	0.2	ISO 17025	< 0.20	< 0.20			
2-Isopropylphenol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10			
Phenol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10			
Trimethylphenol (2,3,5-)	mg/kg	0.1	ISO 17025	< 0.10	< 0.10			
Total Xylenols and Ethylphenols	mg/kg	0.3	ISO 17025	< 0.30	< 0.30			

#### Total Phenols

Total Phenols (HPLC)	mg/kg	1.3	ISO 17025	< 1.3	< 1.3			

#### Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	0.41			
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	0.38			
Fluorene	mg/kg	0.05	MCERTS	< 0.05	0.48			
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	4.7			
Anthracene	mg/kg	0.05	MCERTS	< 0.05	1.5			
Fluoranthene	mg/kg	0.05	MCERTS	0.38	11			
Pyrene	mg/kg	0.05	MCERTS	0.32	9.2			
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.24	5.7			
Chrysene	mg/kg	0.05	MCERTS	0.21	4.4			
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.36	6.9			
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.12	3.0			
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.30	5.8			
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	2.6			
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	0.69			
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	3.1			

#### Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	1.93	59.4			



Analytical Report Number: 19-38256  
 Project / Site name: A417  
 Your Order No: 355205-DO

Lab Sample Number				1205747	1205748			
Sample Reference				DSRC108	CP106			
Sample Number				4	4			
Depth (m)				1.00	1.00			
Date Sampled				15/04/2019	15/04/2019			
Time Taken				None Supplied	None Supplied			
<b>Analytical Parameter (Soil Analysis)</b>								
	Units	Limit of detection	Accreditation Status					

**Heavy Metals / Metalloids**

Element	Units	Limit of detection	Accreditation Status	1205747	1205748			
Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	< 1.0	1.3			
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	39	16			
Barium (aqua regia extractable)	mg/kg	1	MCERTS	180	50			
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.44	0.45			
Boron (water soluble)	mg/kg	0.2	MCERTS	1.7	1.2			
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.7	0.4			
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0			
Chromium (III)	mg/kg	1	NONE	16	16			
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	17	16			
Copper (aqua regia extractable)	mg/kg	1	MCERTS	9.4	15			
Iron (aqua regia extractable)	mg/kg	40	MCERTS	24000	18000			
Lead (aqua regia extractable)	mg/kg	1	MCERTS	35	44			
Manganese (aqua regia extractable)	mg/kg	1	MCERTS	270	300			
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3			
Molybdenum (aqua regia extractable)	mg/kg	0.25	MCERTS	< 0.25	< 0.25			
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	9.0	7.0			
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0			
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	34	23			
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	80	82			

**Monoaromatics & Oxygenates**

Compound	Units	Limit of detection	Accreditation Status	1205747	1205748			
Benzene	ug/kg	1	MCERTS	< 1.0	< 1.0			
Toluene	ug/kg	1	MCERTS	< 1.0	< 1.0			
Ethylbenzene	ug/kg	1	MCERTS	< 1.0	< 1.0			
p & m-xylene	ug/kg	1	MCERTS	< 1.0	< 1.0			
o-xylene	ug/kg	1	MCERTS	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	ug/kg	1	MCERTS	< 1.0	< 1.0			

**Petroleum Hydrocarbons**

Parameter	Units	Limit of detection	Accreditation Status	1205747	1205748			
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0			
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0			
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	8.8			
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	86			
<b>TPH-CWG - Aliphatic (EC5 - EC35)</b>	mg/kg	10	MCERTS	< 10	96			

Parameter	Units	Limit of detection	Accreditation Status	1205747	1205748			
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	1.2			
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	8.5			
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	67			
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	310			
<b>TPH-CWG - Aromatic (EC5 - EC35)</b>	mg/kg	10	MCERTS	< 10	390			

Analytical Report Number: 19-38256

Project / Site name: A417

Your Order No: 355205-DO

Lab Sample Number				1205747	1205748			
Sample Reference				DSRC108	CP106			
Sample Number				4	4			
Depth (m)				1.00	1.00			
Date Sampled				15/04/2019	15/04/2019			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
<b>VOCs</b>								
Chloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0			
Chloroethane	µg/kg	1	NONE	< 1.0	< 1.0			
Bromomethane	µg/kg	1	ISO 17025	< 1.0	< 1.0			
Vinyl Chloride	µg/kg	1	NONE	< 1.0	< 1.0			
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	< 1.0			
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0			
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	< 1.0			
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0			
Trichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0			
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0			
Trichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Dibromomethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0			
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0			
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0			
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0			
Tetrachloroethene	µg/kg	1	NONE	< 1.0	< 1.0			
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	< 1.0			
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Styrene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Tribromomethane	µg/kg	1	NONE	< 1.0	< 1.0			
o-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Bromobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0			
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0			
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0			
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0			
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0			
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	< 1.0			
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0			
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0			



Analytical Report Number: 19-38256

Project / Site name: A417

Your Order No: 355205-DO

Lab Sample Number				1205749	1205750			
Sample Reference				DSRC108	CP106			
Sample Number				4	4			
Depth (m)				1.00	1.00			
Date Sampled				15/04/2019	15/04/2019			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Leachate Analysis)				Units	Limit of detection	Accreditation Status		

**General Inorganics**

pH	pH Units	N/A	ISO 17025	8.1	8.2			
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Complex Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Sulphate as SO <sub>4</sub>	µg/l	100	ISO 17025	4480	7760			
Chloride	mg/l	0.15	ISO 17025	1.8	5.2			
Fluoride	µg/l	50	ISO 17025	440	380			
Ammoniacal Nitrogen as N	µg/l	15	NONE	< 15	< 15			
Hardness - Total	mgCaCO <sub>3</sub> /l	1	NONE	77.2	41.5			

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5	< 0.5			
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5			
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5			
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5			
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5			
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**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	1.7	ISO 17025	< 1.7	< 1.7			
Arsenic (dissolved)	µg/l	1.1	ISO 17025	7.8	9.9			
Barium (dissolved)	µg/l	0.05	ISO 17025	39	6.9			
Beryllium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Boron (dissolved)	µg/l	10	ISO 17025	24	26			
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08			
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0			
Chromium (III)	µg/l	1	NONE	< 1.0	1.2			
Chromium (dissolved)	µg/l	0.4	ISO 17025	0.5	1.2			
Copper (dissolved)	µg/l	0.7	ISO 17025	4.4	6.3			
Iron (dissolved)	mg/l	0.004	ISO 17025	0.67	0.56			
Lead (dissolved)	µg/l	1	ISO 17025	3.0	3.3			
Manganese (dissolved)	µg/l	0.06	ISO 17025	150	110			
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5			
Molybdenum (dissolved)	µg/l	0.4	ISO 17025	4.5	3.5			
Nickel (dissolved)	µg/l	0.3	ISO 17025	1.4	7.3			
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0			
Vanadium (dissolved)	µg/l	1.7	ISO 17025	2.7	< 1.7			
Zinc (dissolved)	µg/l	0.4	ISO 17025	5.4	2.1			
Calcium (dissolved)	mg/l	0.012	ISO 17025	28	12			
Magnesium (dissolved)	mg/l	0.005	ISO 17025	1.5	2.5			



**Analytical Report Number : 19-38256**

**Project / Site name: A417**

\* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1205747	DSRC108	4	1.00	Light brown clay and sand with gravel.
1205748	CP106	4	1.00	Light brown clay and sand with stones.

**Analytical Report Number : 19-38256**

**Project / Site name: A417**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammoniacal Nitrogen as N in leachate	Determination of Ammonium/Ammonia/Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron in leachate	Determination of boron in leachate. Sample acidified and followed by ICP-OES.	In-house method based on MEWAM	L039-PL	W	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Cations in soil by ICP-OES	Determination of cations in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Chloride in leachate	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Complex cyanide in leachate	Determination of complex cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L040-PL	W	ISO 17025
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Fluoride in leachate	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Fraction of Organic Carbon in soil	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L009-PL	D	MCERTS
Free cyanide in leachate	Determination of free cyanide by distillation followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025

**Analytical Report Number : 19-38256**

**Project / Site name: A417**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Phenols, speciated, in leachate, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate in leachates	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Total cyanide in leachate	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total Hardness of leachates	Determination of hardness in leachates by calculation from calcium and magnesium.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	NONE
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L0738-PL	W	MCERTS

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



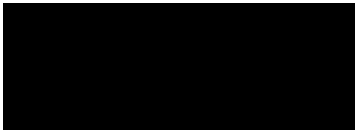
Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
CP106	4	S	19-38256	1205748	c	Free cyanide in soil	L080-PL	c
DSRC108	4	S	19-38256	1205747	c	Free cyanide in soil	L080-PL	c



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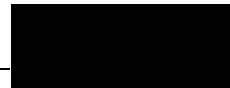
**t:** 01923 225404  
**f:** 01923 237404  
**e:** reception@i2analytical.com



## Analytical Report Number : 19-39928

<b>Project / Site name:</b>	HE551505 A417 Missing Link Ground Investigation	<b>Samples received on:</b>	03/05/2019
<b>Your job number:</b>	35205-DO	<b>Samples instructed on:</b>	03/05/2019
<b>Your order number:</b>	35205-DO	<b>Analysis completed by:</b>	13/05/2019
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	13/05/2019
<b>Samples Analysed:</b>	1 leachate sample - 1 soil sample		

**Signed:**



Zina Abdul Razzak  
 Senior Quality Specialist  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.





Analytical Report Number: 19-39928  
 Project / Site name: HE551505 A417 Missing Link Ground Investigation  
 Your Order No: 35205-DO

Lab Sample Number				1214892				
Sample Reference				TP207				
Sample Number				1				
Depth (m)				0.10-0.20				
Date Sampled				01/05/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	18				
Total mass of sample received	kg	0.001	NONE	2.0				

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected				
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**General Inorganics**

pH - Automated	pH Units	N/A	MCERTS	6.7				
Free Cyanide	mg/kg	1	MCERTS	< 1				
Water Soluble Sulphate as SO <sub>4</sub> 16hr extraction (2:1)	mg/kg	2.5	MCERTS	29				
Water Soluble SO <sub>4</sub> 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.015				
Water Soluble SO <sub>4</sub> 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	14.6				
Total Sulphur	mg/kg	50	MCERTS	570				
Fraction Organic Carbon (FOC)	N/A	0.001	MCERTS	0.030				

**Phenols by HPLC**

Catechol	mg/kg	0.1	ISO 17025	< 0.10				
Resorcinol	mg/kg	0.1	ISO 17025	< 0.10				
Cresols (o-, m-, p-)	mg/kg	0.3	ISO 17025	< 0.30				
Total Naphthols (sum of 1- and 2- Naphthol)	mg/kg	0.2	ISO 17025	< 0.20				
2-Isopropylphenol	mg/kg	0.1	ISO 17025	< 0.10				
Phenol	mg/kg	0.1	ISO 17025	< 0.10				
Trimethylphenol (2,3,5-)	mg/kg	0.1	ISO 17025	< 0.10				
Total Xylenols and Ethylphenols	mg/kg	0.3	ISO 17025	< 0.30				

**Total Phenols**

Total Phenols (HPLC)	mg/kg	1.3	ISO 17025	< 1.3				
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Analytical Report Number: 19-39928  
 Project / Site name: HE551505 A417 Missing Link Ground Investigation  
 Your Order No: 35205-DO

Lab Sample Number				1214892				
Sample Reference				TP207				
Sample Number				1				
Depth (m)				0.10-0.20				
Date Sampled				01/05/2019				
Time Taken				None Supplied				
<b>Analytical Parameter (Soil Analysis)</b>								
	Units	Limit of detection	Accreditation Status					

**Speciated PAHs**

Naphthalene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05				
Fluorene	mg/kg	0.05	MCERTS	< 0.05				
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05				
Anthracene	mg/kg	0.05	MCERTS	< 0.05				
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Pyrene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Chrysene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05				

**Total PAH**

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80				
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**Heavy Metals / Metalloids**

Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	1.6				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	29				
Barium (aqua regia extractable)	mg/kg	1	MCERTS	48				
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.2				
Boron (water soluble)	mg/kg	0.2	MCERTS	1.9				
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2				
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0				
Chromium (III)	mg/kg	1	NONE	43				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	44				
Copper (aqua regia extractable)	mg/kg	1	MCERTS	12				
Iron (aqua regia extractable)	mg/kg	40	MCERTS	39000				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	30				
Manganese (aqua regia extractable)	mg/kg	1	MCERTS	290				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3				
Molybdenum (aqua regia extractable)	mg/kg	0.25	MCERTS	< 0.25				
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	21				
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0				
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	57				
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	59				



Analytical Report Number: 19-39928  
 Project / Site name: HE551505 A417 Missing Link Ground Investigation  
 Your Order No: 35205-DO

Lab Sample Number				1214892				
Sample Reference				TP207				
Sample Number				1				
Depth (m)				0.10-0.20				
Date Sampled				01/05/2019				
Time Taken				None Supplied				
<b>Analytical Parameter (Soil Analysis)</b>								
	Units	Limit of detection	Accreditation Status					

**Monoaromatics & Oxygenates**

Benzene	ug/kg	1	MCERTS	< 1.0				
Toluene	ug/kg	1	MCERTS	< 1.0				
Ethylbenzene	ug/kg	1	MCERTS	< 1.0				
p & m-xylene	ug/kg	1	MCERTS	< 1.0				
o-xylene	ug/kg	1	MCERTS	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	ug/kg	1	MCERTS	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0				
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0				
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0				
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0				
<b>TPH-CWG - Aliphatic (EC5 - EC35)</b>	mg/kg	10	MCERTS	< 10				

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0				
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0				
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10				
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10				
<b>TPH-CWG - Aromatic (EC5 - EC35)</b>	mg/kg	10	MCERTS	< 10				



Analytical Report Number: 19-39928  
 Project / Site name: HE551505 A417 Missing Link Ground Investigation  
 Your Order No: 35205-DO

Lab Sample Number				1214892				
Sample Reference				TP207				
Sample Number				1				
Depth (m)				0.10-0.20				
Date Sampled				01/05/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
<b>VOCs</b>								
Chloromethane	µg/kg	1	ISO 17025	< 1.0				
Chloroethane	µg/kg	1	NONE	< 1.0				
Bromomethane	µg/kg	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/kg	1	NONE	< 1.0				
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0				
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0				
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0				
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0				
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0				
Trichloromethane	µg/kg	1	MCERTS	< 1.0				
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0				
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0				
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0				
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0				
Benzene	µg/kg	1	MCERTS	< 1.0				
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0				
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0				
Trichloroethene	µg/kg	1	MCERTS	< 1.0				
Dibromomethane	µg/kg	1	MCERTS	< 1.0				
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0				
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0				
Toluene	µg/kg	1	MCERTS	< 1.0				
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0				
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/kg	1	NONE	< 1.0				
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0				
Chlorobenzene	µg/kg	1	MCERTS	< 1.0				
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0				
Ethylbenzene	µg/kg	1	MCERTS	< 1.0				
p & m-Xylene	µg/kg	1	MCERTS	< 1.0				
Styrene	µg/kg	1	MCERTS	< 1.0				
Tribromomethane	µg/kg	1	NONE	< 1.0				
o-Xylene	µg/kg	1	MCERTS	< 1.0				
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0				
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0				
Bromobenzene	µg/kg	1	MCERTS	< 1.0				
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0				
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0				
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0				
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0				
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0				
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0				
Butylbenzene	µg/kg	1	MCERTS	< 1.0				
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0				
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0				
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0				



Analytical Report Number: 19-39928

Project / Site name: HE551505 A417 Missing Link Ground Investigation

Your Order No: 35205-DO

Lab Sample Number				1214893				
Sample Reference				TP207				
Sample Number				1				
Depth (m)				0.10-0.20				
Date Sampled				01/05/2019				
Time Taken				None Supplied				
<b>Analytical Parameter (Leachate Analysis)</b>				<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>		

**General Inorganics**

pH	pH Units	N/A	ISO 17025	6.8				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Complex Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	mg/l	0.1	ISO 17025	0.4				
Chloride	mg/l	0.15	ISO 17025	0.29				
Fluoride	µg/l	50	ISO 17025	240				
Ammoniacal Nitrogen as N	µg/l	15	NONE	20				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	1.7	ISO 17025	< 1.7				
Arsenic (dissolved)	µg/l	1.1	ISO 17025	< 1.1				
Barium (dissolved)	µg/l	0.05	ISO 17025	6.9				
Beryllium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Boron (dissolved)	µg/l	10	ISO 17025	16				
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	3.4				
Chromium (dissolved)	µg/l	0.4	ISO 17025	3.4				
Copper (dissolved)	µg/l	0.7	ISO 17025	32				
Iron (dissolved)	mg/l	0.004	ISO 17025	2.3				
Lead (dissolved)	µg/l	1	ISO 17025	1.4				
Manganese (dissolved)	µg/l	0.06	ISO 17025	16				
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5				
Molybdenum (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Nickel (dissolved)	µg/l	0.3	ISO 17025	2.9				
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0				
Vanadium (dissolved)	µg/l	1.7	ISO 17025	9.1				
Zinc (dissolved)	µg/l	0.4	ISO 17025	9.7				
Calcium (dissolved)	mg/l	0.012	ISO 17025	1.4				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	0.49				



**Analytical Report Number : 19-39928**

**Project / Site name: HE551505 A417 Missing Link Ground Investigation**

\* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1214892	TP207	1	0.10-0.20	Brown loam and clay with vegetation.

**Analytical Report Number : 19-39928**

**Project / Site name: HE551505 A417 Missing Link Ground Investigation**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammoniacal Nitrogen as N in leachate	Determination of Ammonium/Ammonia/Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron in leachate	Determination of boron in leachate. Sample acidified and followed by ICP-OES.	In-house method based on MEWAM	L039-PL	W	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L0738-PL	W	MCERTS
Cations in soil by ICP-OES	Determination of cations in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Chloride in leachate	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Complex cyanide in leachate	Determination of complex cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L040-PL	W	ISO 17025
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Fluoride in leachate	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination'	L033B-PL	W	ISO 17025
Fraction of Organic Carbon in soil	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L009-PL	D	MCERTS
Free cyanide in leachate	Determination of free cyanide by distillation followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS

Analytical Report Number : 19-39928

Project / Site name: HE551505 A417 Missing Link Ground Investigation

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
NRA Leachate Prep	10:1 extract with de-ionised water shaken for 24 hours then filtered.	In-house method based on National Rivers Authority	L020-PL	W	NONE
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Phenols, speciated, in leachate, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate in leachates	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil <sup>TM</sup>	L039-PL	W	ISO 17025
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Total cyanide in leachate	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.





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**Analytical Report Number : 19-39931**

<b>Project / Site name:</b>	HE551505 A417 Missing Link Ground Investigation	<b>Samples received on:</b>	03/05/2019
<b>Your job number:</b>	35205-DO	<b>Samples instructed on:</b>	03/05/2019
<b>Your order number:</b>		<b>Analysis completed by:</b>	13/05/2019
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	13/05/2019
<b>Samples Analysed:</b>	5 leachate samples - 5 soil samples		

**Signed:**

Zina Abdul Razzak  
 Senior Quality Specialist  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 19-39931

Project / Site name: HE551505 A417 Missing Link Ground Investigation

Lab Sample Number	1214899	1214900	1214901	1214902	1214903			
Sample Reference	DSRC107	CP105	TP601	TP601	TP601			
Sample Number	4	1	1	3	5			
Depth (m)	1.80-1.90	1.60-1.80	0.10-0.30	0.70-0.80	4.00-4.10			
Date Sampled	30/04/2019	30/04/2019	30/04/2019	30/04/2019	30/04/2019			
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied			
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	12	18	2.5	17	18
Total mass of sample received	kg	0.001	NONE	1.4	2.0	1.9	1.6	1.7

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
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**General Inorganics**

pH - Automated	pH Units	N/A	MCERTS	8.3	7.8	7.9	7.5	8.0
Free Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Water Soluble Sulphate as SO <sub>4</sub> 16hr extraction (2:1)	mg/kg	2.5	MCERTS	27	19	17	53	130
Water Soluble SO <sub>4</sub> 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.013	0.0096	0.0087	0.027	0.066
Water Soluble SO <sub>4</sub> 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	13.3	9.6	8.7	26.5	66.4
Total Sulphur	mg/kg	50	MCERTS	320	160	220	290	680
Fraction Organic Carbon (FOC)	N/A	0.001	MCERTS	0.0062	0.0046	0.012	0.011	0.013

**Phenols by HPLC**

Catechol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Resorcinol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Cresols (o-, m-, p-)	mg/kg	0.3	ISO 17025	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
Total Naphthols (sum of 1- and 2- Naphthol)	mg/kg	0.2	ISO 17025	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
2-Isopropylphenol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Trimethylphenol (2,3,5-)	mg/kg	0.1	ISO 17025	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Xylenols and Ethylphenols	mg/kg	0.3	ISO 17025	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30

**Total Phenols**

Total Phenols (HPLC)	mg/kg	1.3	ISO 17025	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3
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Analytical Report Number: 19-39931

Project / Site name: HE551505 A417 Missing Link Ground Investigation

Lab Sample Number	1214899	1214900	1214901	1214902	1214903			
Sample Reference	DSRC107	CP105	TP601	TP601	TP601			
Sample Number	4	1	1	3	5			
Depth (m)	1.80-1.90	1.60-1.80	0.10-0.30	0.70-0.80	4.00-4.10			
Date Sampled	30/04/2019	30/04/2019	30/04/2019	30/04/2019	30/04/2019			
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied			
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					

**Speciated PAHs**

Compound	mg/kg	Limit of detection	Accreditation Status	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.20
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.40
Pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.32
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.16
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	0.22
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

**Total PAH**

Speciated Total EPA-16 PAHs	mg/kg	Limit of detection	Accreditation Status	< 0.80	< 0.80	< 0.80	< 0.80	1.30
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**Heavy Metals / Metalloids**

Compound	mg/kg	Limit of detection	Accreditation Status	< 1.0	1.4	< 1.0	1.8	< 1.0
Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	< 1.0	1.4	< 1.0	1.8	< 1.0
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	24	15	9.9	13	17
Barium (aqua regia extractable)	mg/kg	1	MCERTS	15	46	53	63	28
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.34	0.76	0.60	0.72	0.44
Boron (water soluble)	mg/kg	0.2	MCERTS	0.8	< 0.2	0.5	1.2	1.0
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.2	0.2	0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (III)	mg/kg	1	NONE	15	27	20	26	21
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	15	27	20	26	21
Copper (aqua regia extractable)	mg/kg	1	MCERTS	3.7	4.0	20	21	8.7
Iron (aqua regia extractable)	mg/kg	40	MCERTS	18000	30000	22000	37000	20000
Lead (aqua regia extractable)	mg/kg	1	MCERTS	4.9	11	19	19	15
Manganese (aqua regia extractable)	mg/kg	1	MCERTS	170	490	340	360	190
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Molybdenum (aqua regia extractable)	mg/kg	0.25	MCERTS	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	7.0	11	15	23	9.5
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	30	36	27	38	32
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	22	47	60	62	36

Analytical Report Number: 19-39931

Project / Site name: HE551505 A417 Missing Link Ground Investigation

Lab Sample Number	1214899	1214900	1214901	1214902	1214903
Sample Reference	DSRC107	CP105	TP601	TP601	TP601
Sample Number	4	1	1	3	5
Depth (m)	1.80-1.90	1.60-1.80	0.10-0.30	0.70-0.80	4.00-4.10
Date Sampled	30/04/2019	30/04/2019	30/04/2019	30/04/2019	30/04/2019
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		

**Monoaromatics & Oxygenates**

	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	ug/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

**Petroleum Hydrocarbons**

	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
<b>TPH-CWG - Aliphatic (EC5 - EC35)</b>	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10

	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	34	< 10	< 10	< 10
<b>TPH-CWG - Aromatic (EC5 - EC35)</b>	mg/kg	10	MCERTS	< 10	39	< 10	< 10	< 10

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Lab Sample Number				1214899	1214900	1214901	1214902	1214903
Sample Reference				DSRC107	CP105	TP601	TP601	TP601
Sample Number				4	1	1	3	5
Depth (m)				1.80-1.90	1.60-1.80	0.10-0.30	0.70-0.80	4.00-4.10
Date Sampled				30/04/2019	30/04/2019	30/04/2019	30/04/2019	30/04/2019
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
				<b>VOCs</b>				
Chloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane	µg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0



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Lab Sample Number	1214904	1214905	1214906	1214907	1214908
Sample Reference	DSRC107	CP105	TP601	TP601	TP601
Sample Number	4	1	1	3	5
Depth (m)	1.80-1.90	1.60-1.80	0.10-0.30	0.70-0.80	4.00-4.10
Date Sampled	30/04/2019	30/04/2019	30/04/2019	30/04/2019	30/04/2019
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status		

**General Inorganics**

	pH Units	N/A	ISO 17025	8.3	7.4	7.8	7.9	8.1
pH								
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Complex Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Sulphate as SO <sub>4</sub>	mg/l	0.1	ISO 17025	1.2	0.7	0.3	3.4	3.3
Chloride	mg/l	0.15	ISO 17025	0.58	0.35	0.43	0.64	0.90
Fluoride	µg/l	50	ISO 17025	160	230	490	630	380
Ammoniacal Nitrogen as N	µg/l	15	NONE	23	< 15	20	3500	2400

**Phenols by HPLC**

	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Catechol								
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5	< 3.5	< 3.5	< 3.5

**Heavy Metals / Metalloids**

	µg/l	1.7	ISO 17025	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7
Antimony (dissolved)								
Arsenic (dissolved)	µg/l	1.1	ISO 17025	< 1.1	< 1.1	< 1.1	4.0	3.9
Barium (dissolved)	µg/l	0.05	ISO 17025	12	3.8	6.8	13	9.1
Beryllium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Boron (dissolved)	µg/l	10	ISO 17025	< 10	< 10	< 10	30	20
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chromium (III)	µg/l	1	NONE	2.5	< 1.0	< 1.0	1.1	1.9
Chromium (dissolved)	µg/l	0.4	ISO 17025	2.5	0.8	0.7	1.1	1.9
Copper (dissolved)	µg/l	0.7	ISO 17025	14	13	24	31	24
Iron (dissolved)	mg/l	0.004	ISO 17025	1.6	0.37	0.33	0.62	1.1
Lead (dissolved)	µg/l	1	ISO 17025	< 1.0	1.2	1.0	1.4	2.0
Manganese (dissolved)	µg/l	0.06	ISO 17025	9.9	9.3	6.9	10	16
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Molybdenum (dissolved)	µg/l	0.4	ISO 17025	< 0.4	< 0.4	< 0.4	< 0.4	1.7
Nickel (dissolved)	µg/l	0.3	ISO 17025	2.1	0.4	1.1	2.9	1.5
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Vanadium (dissolved)	µg/l	1.7	ISO 17025	4.0	< 1.7	< 1.7	3.9	< 1.7
Zinc (dissolved)	µg/l	0.4	ISO 17025	10	4.4	8.1	8.8	8.8
Calcium (dissolved)	mg/l	0.012	ISO 17025	16	3.0	11	12	19
Magnesium (dissolved)	mg/l	0.005	ISO 17025	1.2	0.21	0.65	1.4	1.6



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\* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1214899	DSRC107	4	1.80-1.90	Light brown clay and sand.
1214900	CP105	1	1.60-1.80	Light brown clay and sand.
1214901	TP601	1	0.10-0.30	Brown loam and clay with vegetation.
1214902	TP601	3	0.70-0.80	Brown sandy clay with gravel.
1214903	TP601	5	4.00-4.10	Brown clay and sand with gravel.

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**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammoniacal Nitrogen as N in leachate	Determination of Ammonium/Ammonia/Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron in leachate	Determination of boron in leachate. Sample acidified and followed by ICP-OES.	In-house method based on MEWAM	L039-PL	W	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L0738-PL	W	MCERTS
Cations in soil by ICP-OES	Determination of cations in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Chloride in leachate	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Complex cyanide in leachate	Determination of complex cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L040-PL	W	ISO 17025
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Fluoride in leachate	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination'	L033B-PL	W	ISO 17025
Fraction of Organic Carbon in soil	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L009-PL	D	MCERTS
Free cyanide in leachate	Determination of free cyanide by distillation followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS



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**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
NRA Leachate Prep	10:1 extract with de-ionised water shaken for 24 hours then filtered.	In-house method based on National Rivers Authority	L020-PL	W	NONE
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Phenols, speciated, in leachate, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate in leachates	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil <sup>TM</sup>	L039-PL	W	ISO 17025
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Total cyanide in leachate	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



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## Analytical Report Number : 19-41357

<b>Project / Site name:</b>	HE551505 A417 Missing Link Ground Investigation	<b>Samples received on:</b>	15/05/2019
<b>Your job number:</b>	35205-DO	<b>Samples instructed on:</b>	15/05/2019
<b>Your order number:</b>		<b>Analysis completed by:</b>	22/05/2019
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	22/05/2019
<b>Samples Analysed:</b>	1 leachate sample - 1 soil sample		

**Signed:** 

Rexona Rahman  
 Head of Customer Services  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 19-41357

Project / Site name: HE551505 A417 Missing Link Ground Investigation

<b>Lab Sample Number</b>				1222487				
<b>Sample Reference</b>				CP206				
<b>Sample Number</b>				4				
<b>Depth (m)</b>				1.70-1.80				
<b>Date Sampled</b>				03/05/2019				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Soil Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	11				
Total mass of sample received	kg	0.001	NONE	2.0				
<b>Asbestos in Soil</b>	Type	N/A	ISO 17025	Not-detected				
<b>General Inorganics</b>								
pH - Automated	pH Units	N/A	MCERTS	8.3				
Free Cyanide	mg/kg	1	MCERTS	< 1				
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.013				
Total Sulphur	mg/kg	50	MCERTS	310				
Fraction Organic Carbon (FOC)	N/A	0.001	MCERTS	< 0.0010				
<b>Phenols by HPLC</b>								
Catechol	mg/kg	0.1	ISO 17025	< 0.10				
Resorcinol	mg/kg	0.1	ISO 17025	< 0.10				
Cresols (o-, m-, p-)	mg/kg	0.3	ISO 17025	< 0.30				
Total Naphthols (sum of 1- and 2- Naphthol)	mg/kg	0.2	ISO 17025	< 0.20				
2-Isopropylphenol	mg/kg	0.1	ISO 17025	< 0.10				
Phenol	mg/kg	0.1	ISO 17025	< 0.10				
Trimethylphenol (2,3,5-)	mg/kg	0.1	ISO 17025	< 0.10				
Total Xylenols and Ethylphenols	mg/kg	0.3	ISO 17025	< 0.30				
<b>Total Phenols</b>								
Total Phenols (HPLC)	mg/kg	1.3	ISO 17025	< 1.3				
<b>Speciated PAHs</b>								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05				
Fluorene	mg/kg	0.05	MCERTS	< 0.05				
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05				
Anthracene	mg/kg	0.05	MCERTS	< 0.05				
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Pyrene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Chrysene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05				
<b>Total PAH</b>								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80				

Analytical Report Number: 19-41357

Project / Site name: HE551505 A417 Missing Link Ground Investigation

<b>Lab Sample Number</b>				1222487				
<b>Sample Reference</b>				CP206				
<b>Sample Number</b>				4				
<b>Depth (m)</b>				1.70-1.80				
<b>Date Sampled</b>				03/05/2019				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Soil Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	< 1.0				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	15				
Barium (aqua regia extractable)	mg/kg	1	MCERTS	22				
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.37				
Boron (water soluble)	mg/kg	0.2	MCERTS	0.4				
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2				
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0				
Chromium (III)	mg/kg	1	NONE	16				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	16				
Copper (aqua regia extractable)	mg/kg	1	MCERTS	7.3				
Iron (aqua regia extractable)	mg/kg	40	MCERTS	23000				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	14				
Manganese (aqua regia extractable)	mg/kg	1	MCERTS	160				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3				
Molybdenum (aqua regia extractable)	mg/kg	0.25	MCERTS	< 0.25				
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	9.4				
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0				
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	27				
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	21				

**Monoaromatics & Oxygenates**

Benzene	µg/kg	1	MCERTS	< 1.0				
Toluene	µg/kg	1	MCERTS	6.7				
Ethylbenzene	µg/kg	1	MCERTS	< 1.0				
p & m-xylene	µg/kg	1	MCERTS	< 1.0				
o-xylene	µg/kg	1	MCERTS	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0				
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0				
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0				
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0				
<b>TPH-CWG - Aliphatic (EC5 - EC35)</b>	mg/kg	10	MCERTS	< 10				

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	0.007				
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0				
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0				
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10				
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10				
<b>TPH-CWG - Aromatic (EC5 - EC35)</b>	mg/kg	10	MCERTS	< 10				

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Project / Site name: HE551505 A417 Missing Link Ground Investigation

Lab Sample Number		1222487						
Sample Reference		CP206						
Sample Number		4						
Depth (m)		1.70-1.80						
Date Sampled		03/05/2019						
Time Taken		None Supplied						
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
<b>VOCs</b>								
Chloromethane	µg/kg	1	ISO 17025	< 1.0				
Chloroethane	µg/kg	1	NONE	< 1.0				
Bromomethane	µg/kg	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/kg	1	NONE	< 1.0				
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0				
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0				
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0				
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0				
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0				
Trichloromethane	µg/kg	1	MCERTS	< 1.0				
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0				
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0				
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0				
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0				
Benzene	µg/kg	1	MCERTS	< 1.0				
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0				
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0				
Trichloroethene	µg/kg	1	MCERTS	< 1.0				
Dibromomethane	µg/kg	1	MCERTS	< 1.0				
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0				
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0				
Toluene	µg/kg	1	MCERTS	6.7				
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0				
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/kg	1	NONE	< 1.0				
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0				
Chlorobenzene	µg/kg	1	MCERTS	< 1.0				
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0				
Ethylbenzene	µg/kg	1	MCERTS	< 1.0				
p & m-Xylene	µg/kg	1	MCERTS	< 1.0				
Styrene	µg/kg	1	MCERTS	< 1.0				
Tribromomethane	µg/kg	1	NONE	< 1.0				
o-Xylene	µg/kg	1	MCERTS	< 1.0				
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0				
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0				
Bromobenzene	µg/kg	1	MCERTS	< 1.0				
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0				
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0				
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0				
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0				
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0				
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0				
Butylbenzene	µg/kg	1	MCERTS	< 1.0				
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0				
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0				
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0				



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Project / Site name: HE551505 A417 Missing Link Ground Investigation

Lab Sample Number				1222488				
Sample Reference				CP206				
Sample Number				4				
Depth (m)				1.70-1.80				
Date Sampled				03/05/2019				
Time Taken				None Supplied				
<b>Analytical Parameter (Leachate Analysis)</b>								
	Units	Limit of detection	Accreditation Status					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	8.0				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Complex Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	µg/l	100	ISO 17025	275				
Chloride	mg/l	0.15	ISO 17025	0.77				
Fluoride	µg/l	50	ISO 17025	590				
Ammoniacal Nitrogen as N	µg/l	15	NONE	< 15				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	NONE	43.9				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	1.7	ISO 17025	< 1.7				
Arsenic (dissolved)	µg/l	1.1	ISO 17025	< 1.1				
Barium (dissolved)	µg/l	0.05	ISO 17025	3.6				
Beryllium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Boron (dissolved)	µg/l	10	ISO 17025	< 10				
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	1.2				
Chromium (dissolved)	µg/l	0.4	ISO 17025	1.2				
Copper (dissolved)	µg/l	0.7	ISO 17025	2.2				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.27				
Lead (dissolved)	µg/l	1	ISO 17025	1.0				
Manganese (dissolved)	µg/l	0.06	ISO 17025	6.2				
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5				
Molybdenum (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Nickel (dissolved)	µg/l	0.3	ISO 17025	< 0.3				
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0				
Vanadium (dissolved)	µg/l	1.7	ISO 17025	< 1.7				
Zinc (dissolved)	µg/l	0.4	ISO 17025	2.6				
Calcium (dissolved)	mg/l	0.012	ISO 17025	17				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	0.63				



**Analytical Report Number : 19-41357**

**Project / Site name: HE551505 A417 Missing Link Ground Investigation**

\* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1222487	CP206	4	1.70-1.80	Light brown clay and sand with gravel.

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**Project / Site name: HE551505 A417 Missing Link Ground Investigation**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammoniacal Nitrogen as N in leachate	Determination of Ammonium/Ammonia/Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron in leachate	Determination of boron in leachate. Sample acidified and followed by ICP-OES.	In-house method based on MEWAM	L039-PL	W	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Cations in soil by ICP-OES	Determination of cations in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Chloride in leachate	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Complex cyanide in leachate	Determination of complex cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L040-PL	W	ISO 17025
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Fluoride in leachate	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Fraction of Organic Carbon in soil	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L009-PL	D	MCERTS
Free cyanide in leachate	Determination of free cyanide by distillation followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025



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Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Phenols, speciated, in leachate, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate in leachates	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Total cyanide in leachate	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total Hardness of leachates	Determination of hardness in leachates by calculation from calcium and magnesium.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	NONE
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L0738-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
CP206	4	S	19-41357	1222487	c	Free cyanide in soil	L080-PL	c



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## Analytical Report Number : 19-41546

<b>Project / Site name:</b>	HE551505 A417 Missing Link Ground Investigation	<b>Samples received on:</b>	15/05/2019
<b>Your job number:</b>	35205-DO	<b>Samples instructed on:</b>	15/05/2019
<b>Your order number:</b>		<b>Analysis completed by:</b>	22/05/2019
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	22/05/2019
<b>Samples Analysed:</b>	1 leachate sample - 1 soil sample		

**Signed:** 

Zina Abdul Razzak  
 Senior Quality Specialist  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 19-41546

Project / Site name: HE551505 A417 Missing Link Ground Investigation

<b>Lab Sample Number</b>				1223316				
<b>Sample Reference</b>				DSRC224				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				0.30-0.50				
<b>Date Sampled</b>				07/05/2019				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Soil Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	9.7				
Total mass of sample received	kg	0.001	NONE	2.0				
<b>Asbestos in Soil</b>	Type	N/A	ISO 17025	Not-detected				
<b>General Inorganics</b>								
pH - Automated	pH Units	N/A	NONE	8.5				
Free Cyanide	mg/kg	1	NONE	< 1				
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	NONE	0.0065				
Total Sulphur	mg/kg	50	NONE	320				
Fraction Organic Carbon (FOC)	N/A	0.001	NONE	0.0077				
<b>Phenols by HPLC</b>								
Catechol	mg/kg	0.1	NONE	< 0.10				
Resorcinol	mg/kg	0.1	NONE	< 0.10				
Cresols (o-, m-, p-)	mg/kg	0.3	NONE	< 0.30				
Total Naphthols (sum of 1- and 2- Naphthol)	mg/kg	0.2	NONE	< 0.20				
2-Isopropylphenol	mg/kg	0.1	NONE	< 0.10				
Phenol	mg/kg	0.1	NONE	< 0.10				
Trimethylphenol (2,3,5-)	mg/kg	0.1	NONE	< 0.10				
Total Xylenols and Ethylphenols	mg/kg	0.3	NONE	< 0.30				
<b>Total Phenols</b>								
Total Phenols (HPLC)	mg/kg	1.3	NONE	< 1.3				
<b>Speciated PAHs</b>								
Naphthalene	mg/kg	0.05	NONE	< 0.05				
Acenaphthylene	mg/kg	0.05	NONE	< 0.05				
Acenaphthene	mg/kg	0.05	NONE	< 0.05				
Fluorene	mg/kg	0.05	NONE	< 0.05				
Phenanthrene	mg/kg	0.05	NONE	< 0.05				
Anthracene	mg/kg	0.05	NONE	< 0.05				
Fluoranthene	mg/kg	0.05	NONE	< 0.05				
Pyrene	mg/kg	0.05	NONE	< 0.05				
Benzo(a)anthracene	mg/kg	0.05	NONE	< 0.05				
Chrysene	mg/kg	0.05	NONE	< 0.05				
Benzo(b)fluoranthene	mg/kg	0.05	NONE	< 0.05				
Benzo(k)fluoranthene	mg/kg	0.05	NONE	< 0.05				
Benzo(a)pyrene	mg/kg	0.05	NONE	< 0.05				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	< 0.05				
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	< 0.05				
Benzo(ghi)perylene	mg/kg	0.05	NONE	< 0.05				
<b>Total PAH</b>								
Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	< 0.80				
<b>Heavy Metals / Metalloids</b>								
Antimony (aqua regia extractable)	mg/kg	1	NONE	< 1.0				
Arsenic (aqua regia extractable)	mg/kg	1	NONE	14				
Barium (aqua regia extractable)	mg/kg	1	NONE	16				
Beryllium (aqua regia extractable)	mg/kg	0.06	NONE	0.17				
Boron (water soluble)	mg/kg	0.2	NONE	1.1				
Cadmium (aqua regia extractable)	mg/kg	0.2	NONE	< 0.2				
Chromium (hexavalent)	mg/kg	4	NONE	< 4.0				
Chromium (III)	mg/kg	1	NONE	13				
Chromium (aqua regia extractable)	mg/kg	1	NONE	13				
Copper (aqua regia extractable)	mg/kg	1	NONE	6.9				
Iron (aqua regia extractable)	mg/kg	40	NONE	17000				
Lead (aqua regia extractable)	mg/kg	1	NONE	4.8				



Analytical Report Number: 19-41546

Project / Site name: HE551505 A417 Missing Link Ground Investigation

<b>Lab Sample Number</b>				1223316				
<b>Sample Reference</b>				DSRC224				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				0.30-0.50				
<b>Date Sampled</b>				07/05/2019				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Soil Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					
Manganese (aqua regia extractable)	mg/kg	1	NONE	220				
Mercury (aqua regia extractable)	mg/kg	0.3	NONE	< 0.3				
Molybdenum (aqua regia extractable)	mg/kg	0.25	NONE	< 0.25				
Nickel (aqua regia extractable)	mg/kg	1	NONE	5.9				
Selenium (aqua regia extractable)	mg/kg	1	NONE	< 1.0				
Vanadium (aqua regia extractable)	mg/kg	1	NONE	22				
Zinc (aqua regia extractable)	mg/kg	1	NONE	30				



Analytical Report Number: 19-41546

Project / Site name: HE551505 A417 Missing Link Ground Investigation

<b>Lab Sample Number</b>				1223316				
<b>Sample Reference</b>				DSRC224				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				0.30-0.50				
<b>Date Sampled</b>				07/05/2019				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Soil Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Monoaromatics & Oxygenates**

Benzene	µg/kg	1	NONE	< 1.0				
Toluene	µg/kg	1	NONE	< 1.0				
Ethylbenzene	µg/kg	1	NONE	< 1.0				
p & m-xylene	µg/kg	1	NONE	< 1.0				
o-xylene	µg/kg	1	NONE	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	NONE	< 0.001				
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	NONE	< 0.001				
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	NONE	< 0.001				
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	NONE	< 1.0				
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	NONE	< 2.0				
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	NONE	< 8.0				
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	NONE	< 8.0				
<b>TPH-CWG - Aliphatic (EC5 - EC35)</b>	mg/kg	10	NONE	< 10				

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	NONE	< 0.001				
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	NONE	< 0.001				
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	NONE	< 0.001				
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	NONE	< 1.0				
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	NONE	< 2.0				
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	NONE	< 10				
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	NONE	< 10				
<b>TPH-CWG - Aromatic (EC5 - EC35)</b>	mg/kg	10	NONE	< 10				



Analytical Report Number: 19-41546

Project / Site name: HE551505 A417 Missing Link Ground Investigation

<b>Lab Sample Number</b>				1223316				
<b>Sample Reference</b>				DSRC224				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				0.30-0.50				
<b>Date Sampled</b>				07/05/2019				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Soil Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					
<b>VOCs</b>								
Chloromethane	µg/kg	1	NONE	< 1.0				
Chloroethane	µg/kg	1	NONE	< 1.0				
Bromomethane	µg/kg	1	NONE	< 1.0				
Vinyl Chloride	µg/kg	1	NONE	< 1.0				
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0				
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0				
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	NONE	< 1.0				
Cis-1,2-dichloroethene	µg/kg	1	NONE	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	NONE	< 1.0				
1,1-Dichloroethane	µg/kg	1	NONE	< 1.0				
2,2-Dichloropropane	µg/kg	1	NONE	< 1.0				
Trichloromethane	µg/kg	1	NONE	< 1.0				
1,1,1-Trichloroethane	µg/kg	1	NONE	< 1.0				
1,2-Dichloroethane	µg/kg	1	NONE	< 1.0				
1,1-Dichloropropene	µg/kg	1	NONE	< 1.0				
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0				
Benzene	µg/kg	1	NONE	< 1.0				
Tetrachloromethane	µg/kg	1	NONE	< 1.0				
1,2-Dichloropropane	µg/kg	1	NONE	< 1.0				
Trichloroethene	µg/kg	1	NONE	< 1.0				
Dibromomethane	µg/kg	1	NONE	< 1.0				
Bromodichloromethane	µg/kg	1	NONE	< 1.0				
Cis-1,3-dichloropropene	µg/kg	1	NONE	< 1.0				
Trans-1,3-dichloropropene	µg/kg	1	NONE	< 1.0				
Toluene	µg/kg	1	NONE	< 1.0				
1,1,2-Trichloroethane	µg/kg	1	NONE	< 1.0				
1,3-Dichloropropane	µg/kg	1	NONE	< 1.0				
Dibromochloromethane	µg/kg	1	NONE	< 1.0				
Tetrachloroethene	µg/kg	1	NONE	< 1.0				
1,2-Dibromoethane	µg/kg	1	NONE	< 1.0				
Chlorobenzene	µg/kg	1	NONE	< 1.0				
1,1,1,2-Tetrachloroethane	µg/kg	1	NONE	< 1.0				
Ethylbenzene	µg/kg	1	NONE	< 1.0				
p & m-Xylene	µg/kg	1	NONE	< 1.0				
Styrene	µg/kg	1	NONE	< 1.0				
Tribromomethane	µg/kg	1	NONE	< 1.0				
o-Xylene	µg/kg	1	NONE	< 1.0				
1,1,2,2-Tetrachloroethane	µg/kg	1	NONE	< 1.0				
Isopropylbenzene	µg/kg	1	NONE	< 1.0				
Bromobenzene	µg/kg	1	NONE	< 1.0				
n-Propylbenzene	µg/kg	1	NONE	< 1.0				
2-Chlorotoluene	µg/kg	1	NONE	< 1.0				
4-Chlorotoluene	µg/kg	1	NONE	< 1.0				
1,3,5-Trimethylbenzene	µg/kg	1	NONE	< 1.0				
tert-Butylbenzene	µg/kg	1	NONE	< 1.0				
1,2,4-Trimethylbenzene	µg/kg	1	NONE	< 1.0				
sec-Butylbenzene	µg/kg	1	NONE	< 1.0				
1,3-Dichlorobenzene	µg/kg	1	NONE	< 1.0				
p-Isopropyltoluene	µg/kg	1	NONE	< 1.0				
1,2-Dichlorobenzene	µg/kg	1	NONE	< 1.0				
1,4-Dichlorobenzene	µg/kg	1	NONE	< 1.0				
Butylbenzene	µg/kg	1	NONE	< 1.0				
1,2-Dibromo-3-chloropropane	µg/kg	1	NONE	< 1.0				
1,2,4-Trichlorobenzene	µg/kg	1	NONE	< 1.0				
Hexachlorobutadiene	µg/kg	1	NONE	< 1.0				
1,2,3-Trichlorobenzene	µg/kg	1	NONE	< 1.0				



Analytical Report Number: 19-41546

Project / Site name: HE551505 A417 Missing Link Ground Investigation

<b>Lab Sample Number</b>				1223316				
<b>Sample Reference</b>				DSRC224				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				0.30-0.50				
<b>Date Sampled</b>				07/05/2019				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Soil Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					





Analytical Report Number: 19-41546

Project / Site name: HE551505 A417 Missing Link Ground Investigation

Lab Sample Number				1223317				
Sample Reference				DSRC224				
Sample Number				1				
Depth (m)				0.30-0.50				
Date Sampled				07/05/2019				
Time Taken				None Supplied				
<b>Analytical Parameter (Leachate Analysis)</b>				<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>		

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.7				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Complex Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	µg/l	100	ISO 17025	1720				
Chloride	mg/l	0.15	ISO 17025	0.48				
Fluoride	µg/l	50	ISO 17025	290				
Ammoniacal Nitrogen as N	µg/l	15	NONE	< 15				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	1.7	ISO 17025	< 1.7				
Arsenic (dissolved)	µg/l	1.1	ISO 17025	< 1.1				
Barium (dissolved)	µg/l	0.05	ISO 17025	1.1				
Beryllium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Boron (dissolved)	µg/l	10	ISO 17025	< 10				
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Copper (dissolved)	µg/l	0.7	ISO 17025	3.8				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.085				
Lead (dissolved)	µg/l	1	ISO 17025	< 1.0				
Manganese (dissolved)	µg/l	0.06	ISO 17025	0.67				
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5				
Molybdenum (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Nickel (dissolved)	µg/l	0.3	ISO 17025	< 0.3				
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0				
Vanadium (dissolved)	µg/l	1.7	ISO 17025	< 1.7				
Zinc (dissolved)	µg/l	0.4	ISO 17025	1.7				

Calcium (dissolved)	mg/l	0.012	ISO 17025	18				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	0.78				



**Analytical Report Number : 19-41546**

**Project / Site name: HE551505 A417 Missing Link Ground Investigation**

\* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1223316	DSRC224	1	0.30-0.50	Brown sandy gravel.**

\*\* NON MCERTS MATRIX

Analytical Report Number : 19-41546

Project / Site name: HE551505 A417 Missing Link Ground Investigation

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammoniacal Nitrogen as N in leachate	Determination of Ammonium/Ammonia/Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron in leachate	Determination of boron in leachate. Sample acidified and followed by ICP-OES.	In-house method based on MEWAM	L039-PL	W	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	NONE
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	NONE
Cations in soil by ICP-OES	Determination of cations in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	NONE
Chloride in leachate	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Complex cyanide in leachate	Determination of complex cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L040-PL	W	ISO 17025
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Fluoride in leachate	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Fraction of Organic Carbon in soil	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L009-PL	D	NONE
Free cyanide in leachate	Determination of free cyanide by distillation followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	NONE
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	NONE
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025

Analytical Report Number : 19-41546

Project / Site name: HE551505 A417 Missing Link Ground Investigation

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	NONE
Phenols, speciated, in leachate, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate in leachates	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	NONE
Total cyanide in leachate	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	NONE
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSRC224	1	S	19-41546	1223316	c	Free cyanide in soil	L080-PL	c



**Emma Leivers**  
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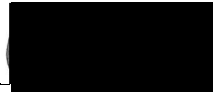
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**Analytical Report Number : 19-43142**

<b>Project / Site name:</b>	HE551505 A417 Missing Link Ground Investigation	<b>Samples received on:</b>	28/05/2019
<b>Your job number:</b>	35205-DO	<b>Samples instructed on:</b>	28/05/2019
<b>Your order number:</b>		<b>Analysis completed by:</b>	04/06/2019
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	04/06/2019
<b>Samples Analysed:</b>	1 leachate sample - 1 soil sample		

**Signed:**



Dr Claire Stone  
 Quality Manager  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 19-43142

Project / Site name: HE551505 A417 Missing Link Ground Investigation

<b>Lab Sample Number</b>				1231841				
<b>Sample Reference</b>				CP216				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				0.30-0.50				
<b>Date Sampled</b>				24/05/2019				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Soil Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	16				
Total mass of sample received	kg	0.001	NONE	2.0				
<b>Asbestos in Soil</b>	Type	N/A	ISO 17025	Not-detected				
<b>General Inorganics</b>								
pH - Automated	pH Units	N/A	MCERTS	7.4				
Free Cyanide	mg/kg	1	MCERTS	< 1				
Water Soluble SO <sub>4</sub> 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.23				
Total Sulphur	mg/kg	50	MCERTS	500				
Fraction Organic Carbon (FOC)	N/A	0.001	MCERTS	0.018				
<b>Phenols by HPLC</b>								
Catechol	mg/kg	0.1	ISO 17025	< 0.10				
Resorcinol	mg/kg	0.1	ISO 17025	< 0.10				
Cresols (o-, m-, p-)	mg/kg	0.3	ISO 17025	< 0.30				
Total Naphthols (sum of 1- and 2- Naphthol)	mg/kg	0.2	ISO 17025	< 0.20				
2-Isopropylphenol	mg/kg	0.1	ISO 17025	< 0.10				
Phenol	mg/kg	0.1	ISO 17025	< 0.10				
Trimethylphenol (2,3,5-)	mg/kg	0.1	ISO 17025	< 0.10				
Total Xylenols and Ethylphenols	mg/kg	0.3	ISO 17025	< 0.30				
<b>Total Phenols</b>								
Total Phenols (HPLC)	mg/kg	1.3	ISO 17025	< 1.3				
<b>Speciated PAHs</b>								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05				
Fluorene	mg/kg	0.05	MCERTS	< 0.05				
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05				
Anthracene	mg/kg	0.05	MCERTS	< 0.05				
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Pyrene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Chrysene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05				
<b>Total PAH</b>								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80				

Analytical Report Number: 19-43142

Project / Site name: HE551505 A417 Missing Link Ground Investigation

<b>Lab Sample Number</b>				1231841				
<b>Sample Reference</b>				CP216				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				0.30-0.50				
<b>Date Sampled</b>				24/05/2019				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Soil Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	1.4				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	22				
Barium (aqua regia extractable)	mg/kg	1	MCERTS	48				
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.2				
Boron (water soluble)	mg/kg	0.2	MCERTS	1.7				
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2				
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0				
Chromium (III)	mg/kg	1	NONE	40				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	41				
Copper (aqua regia extractable)	mg/kg	1	MCERTS	12				
Iron (aqua regia extractable)	mg/kg	40	MCERTS	33000				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	21				
Manganese (aqua regia extractable)	mg/kg	1	MCERTS	270				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3				
Molybdenum (aqua regia extractable)	mg/kg	0.25	MCERTS	< 0.25				
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	18				
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0				
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	46				
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	49				

**Monoaromatics & Oxygenates**

Benzene	µg/kg	1	MCERTS	< 1.0				
Toluene	µg/kg	1	MCERTS	< 1.0				
Ethylbenzene	µg/kg	1	MCERTS	< 1.0				
p & m-xylene	µg/kg	1	MCERTS	< 1.0				
o-xylene	µg/kg	1	MCERTS	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0				
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	9.5				
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	17				
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	68				
<b>TPH-CWG - Aliphatic (EC5 - EC35)</b>	mg/kg	10	MCERTS	94				

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0				
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	6.1				
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	17				
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	45				
<b>TPH-CWG - Aromatic (EC5 - EC35)</b>	mg/kg	10	MCERTS	68				



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Project / Site name: HE551505 A417 Missing Link Ground Investigation

Lab Sample Number				1231841				
Sample Reference				CP216				
Sample Number				1				
Depth (m)				0.30-0.50				
Date Sampled				24/05/2019				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
<b>VOCs</b>								
Chloromethane	µg/kg	1	ISO 17025	< 1.0				
Chloroethane	µg/kg	1	NONE	< 1.0				
Bromomethane	µg/kg	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/kg	1	NONE	< 1.0				
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0				
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0				
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0				
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0				
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0				
Trichloromethane	µg/kg	1	MCERTS	< 1.0				
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0				
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0				
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0				
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0				
Benzene	µg/kg	1	MCERTS	< 1.0				
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0				
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0				
Trichloroethene	µg/kg	1	MCERTS	< 1.0				
Dibromomethane	µg/kg	1	MCERTS	< 1.0				
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0				
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0				
Toluene	µg/kg	1	MCERTS	< 1.0				
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0				
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/kg	1	NONE	< 1.0				
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0				
Chlorobenzene	µg/kg	1	MCERTS	< 1.0				
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0				
Ethylbenzene	µg/kg	1	MCERTS	< 1.0				
p & m-Xylene	µg/kg	1	MCERTS	< 1.0				
Styrene	µg/kg	1	MCERTS	< 1.0				
Tribromomethane	µg/kg	1	NONE	< 1.0				
o-Xylene	µg/kg	1	MCERTS	< 1.0				
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0				
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0				
Bromobenzene	µg/kg	1	MCERTS	< 1.0				
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0				
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0				
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0				
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0				
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0				
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0				
Butylbenzene	µg/kg	1	MCERTS	< 1.0				
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0				
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0				
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0				



Analytical Report Number: 19-43142

Project / Site name: HE551505 A417 Missing Link Ground Investigation

Lab Sample Number				1231842				
Sample Reference				CP216				
Sample Number				1				
Depth (m)				0.30-0.50				
Date Sampled				24/05/2019				
Time Taken				None Supplied				
<b>Analytical Parameter (Leachate Analysis)</b>				<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>		

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.2				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Complex Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	mg/l	0.1	ISO 17025	1.0				
Chloride	mg/l	0.15	ISO 17025	0.89				
Fluoride	µg/l	50	ISO 17025	240				
Ammoniacal Nitrogen as N	µg/l	15	NONE	< 15				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	1.7	ISO 17025	< 1.7				
Arsenic (dissolved)	µg/l	1.1	ISO 17025	< 1.1				
Barium (dissolved)	µg/l	0.05	ISO 17025	6.2				
Beryllium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Boron (dissolved)	µg/l	10	ISO 17025	11				
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	3.6				
Chromium (dissolved)	µg/l	0.4	ISO 17025	3.6				
Copper (dissolved)	µg/l	0.7	ISO 17025	29				
Iron (dissolved)	mg/l	0.004	ISO 17025	2.8				
Lead (dissolved)	µg/l	1	ISO 17025	2.1				
Manganese (dissolved)	µg/l	0.06	ISO 17025	13				
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5				
Molybdenum (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Nickel (dissolved)	µg/l	0.3	ISO 17025	4.6				
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0				
Vanadium (dissolved)	µg/l	1.7	ISO 17025	6.4				
Zinc (dissolved)	µg/l	0.4	ISO 17025	8.9				
Calcium (dissolved)	mg/l	0.012	ISO 17025	5.7				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	0.52				



**Analytical Report Number : 19-43142**

**Project / Site name: HE551505 A417 Missing Link Ground Investigation**

\* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1231841	CP216	1	0.30-0.50	Light brown clay and loam with vegetation.

**Analytical Report Number : 19-43142**

**Project / Site name: HE551505 A417 Missing Link Ground Investigation**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammoniacal Nitrogen as N in leachate	Determination of Ammonium/Ammonia/Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron in leachate	Determination of boron in leachate. Sample acidified and followed by ICP-OES.	In-house method based on MEWAM	L039-PL	W	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Cations in soil by ICP-OES	Determination of cations in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Chloride in leachate	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Complex cyanide in leachate	Determination of complex cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L040-PL	W	ISO 17025
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Fluoride in leachate	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Fraction of Organic Carbon in soil	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L009-PL	D	MCERTS
Free cyanide in leachate	Determination of free cyanide by distillation followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025

**Analytical Report Number : 19-43142**

**Project / Site name: HE551505 A417 Missing Link Ground Investigation**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Phenols, speciated, in leachate, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate in leachates	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil <sup>TM</sup>	L039-PL	W	ISO 17025
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Total cyanide in leachate	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



**Emma Leivers**

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## **Analytical Report Number : 19-44443**

<b>Project / Site name:</b>	HE551505 A417 Missing Link Ground Investigation	<b>Samples received on:</b>	06/06/2019
<b>Your job number:</b>	35205-DO	<b>Samples instructed on:</b>	06/06/2019
<b>Your order number:</b>		<b>Analysis completed by:</b>	13/06/2019
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	13/06/2019
<b>Samples Analysed:</b>	1 leachate sample - 1 soil sample		

**Signed:** 

Zina Abdul Razzak  
Senior Quality Specialist  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 19-44443

Project / Site name: HE551505 A417 Missing Link Ground Investigation

<b>Lab Sample Number</b>				1238815				
<b>Sample Reference</b>				CP230				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				0.20-0.30				
<b>Date Sampled</b>				05/06/2019				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Soil Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	16				
Total mass of sample received	kg	0.001	NONE	2.0				

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected				
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**General Inorganics**

pH - Automated	pH Units	N/A	MCERTS	7.4				
Free Cyanide	mg/kg	1	MCERTS	< 1				
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.014				
Total Sulphur	mg/kg	50	MCERTS	590				
Fraction Organic Carbon (FOC)	N/A	0.001	MCERTS	0.029				

**Phenols by HPLC**

Catechol	mg/kg	0.1	ISO 17025	< 0.10				
Resorcinol	mg/kg	0.1	ISO 17025	< 0.10				
Cresols (o-, m-, p-)	mg/kg	0.3	ISO 17025	< 0.30				
Total Naphthols (sum of 1- and 2- Naphthol)	mg/kg	0.2	ISO 17025	< 0.20				
2-Isopropylphenol	mg/kg	0.1	ISO 17025	< 0.10				
Phenol	mg/kg	0.1	ISO 17025	< 0.10				
Trimethylphenol (2,3,5-)	mg/kg	0.1	ISO 17025	< 0.10				
Total Xylenols and Ethylphenols	mg/kg	0.3	ISO 17025	< 0.30				

**Total Phenols**

Total Phenols (HPLC)	mg/kg	1.3	ISO 17025	< 1.3				
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**Speciated PAHs**

Naphthalene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05				
Fluorene	mg/kg	0.05	MCERTS	< 0.05				
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05				
Anthracene	mg/kg	0.05	MCERTS	< 0.05				
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Pyrene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Chrysene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05				

**Total PAH**

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80				
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Analytical Report Number: 19-44443

Project / Site name: HE551505 A417 Missing Link Ground Investigation

<b>Lab Sample Number</b>				1238815				
<b>Sample Reference</b>				CP230				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				0.20-0.30				
<b>Date Sampled</b>				05/06/2019				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Soil Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	1.4				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	32				
Barium (aqua regia extractable)	mg/kg	1	MCERTS	37				
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.88				
Boron (water soluble)	mg/kg	0.2	MCERTS	2.0				
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2				
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0				
Chromium (III)	mg/kg	1	NONE	29				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	30				
Copper (aqua regia extractable)	mg/kg	1	MCERTS	8.1				
Iron (aqua regia extractable)	mg/kg	40	MCERTS	34000				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	18				
Manganese (aqua regia extractable)	mg/kg	1	MCERTS	290				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.4				
Molybdenum (aqua regia extractable)	mg/kg	0.25	MCERTS	< 0.25				
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	15				
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0				
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	49				
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	51				

**Monoaromatics & Oxygenates**

Benzene	µg/kg	1	MCERTS	< 1.0				
Toluene	µg/kg	1	MCERTS	< 1.0				
Ethylbenzene	µg/kg	1	MCERTS	< 1.0				
p & m-xylene	µg/kg	1	MCERTS	< 1.0				
o-xylene	µg/kg	1	MCERTS	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0				
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0				
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0				
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0				
<b>TPH-CWG - Aliphatic (EC5 - EC35)</b>	mg/kg	10	MCERTS	< 10				

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0				
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0				
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10				
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10				
<b>TPH-CWG - Aromatic (EC5 - EC35)</b>	mg/kg	10	MCERTS	< 10				





Analytical Report Number: 19-44443

Project / Site name: HE551505 A417 Missing Link Ground Investigation

<b>Lab Sample Number</b>				1238815				
<b>Sample Reference</b>				CP230				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				0.20-0.30				
<b>Date Sampled</b>				05/06/2019				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Soil Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

VOCs								
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Chloromethane	µg/kg	1	ISO 17025	< 1.0				
Chloroethane	µg/kg	1	NONE	< 1.0				
Bromomethane	µg/kg	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/kg	1	NONE	< 1.0				
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0				
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0				
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0				
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0				
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0				
Trichloromethane	µg/kg	1	MCERTS	< 1.0				
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0				
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0				
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0				
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0				
Benzene	µg/kg	1	MCERTS	< 1.0				
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0				
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0				
Trichloroethene	µg/kg	1	MCERTS	< 1.0				
Dibromomethane	µg/kg	1	MCERTS	< 1.0				
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0				
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0				
Toluene	µg/kg	1	MCERTS	< 1.0				
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0				
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/kg	1	NONE	< 1.0				
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0				
Chlorobenzene	µg/kg	1	MCERTS	< 1.0				
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0				
Ethylbenzene	µg/kg	1	MCERTS	< 1.0				
p & m-Xylene	µg/kg	1	MCERTS	< 1.0				
Styrene	µg/kg	1	MCERTS	< 1.0				
Tribromomethane	µg/kg	1	NONE	< 1.0				
o-Xylene	µg/kg	1	MCERTS	< 1.0				
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0				
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0				
Bromobenzene	µg/kg	1	MCERTS	< 1.0				
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0				
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0				
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0				
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0				
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0				
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0				
Butylbenzene	µg/kg	1	MCERTS	< 1.0				
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0				
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0				
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0				



Analytical Report Number: 19-44443

Project / Site name: HE551505 A417 Missing Link Ground Investigation

<b>Lab Sample Number</b>				1238816				
<b>Sample Reference</b>				CP230				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				0.20-0.30				
<b>Date Sampled</b>				05/06/2019				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Leachate Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	8.0				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Complex Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	µg/l	100	ISO 17025	996				
Chloride	mg/l	0.15	ISO 17025	1.6				
Fluoride	µg/l	50	ISO 17025	540				
Ammoniacal Nitrogen as N	µg/l	15	NONE	24				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	NONE	97.4				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	1.7	ISO 17025	< 1.7				
Arsenic (dissolved)	µg/l	1.1	ISO 17025	< 1.1				
Barium (dissolved)	µg/l	0.05	ISO 17025	7.2				
Beryllium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Boron (dissolved)	µg/l	10	ISO 17025	< 10				
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.4	ISO 17025	0.7				
Copper (dissolved)	µg/l	0.7	ISO 17025	14				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.29				
Lead (dissolved)	µg/l	1	ISO 17025	2.3				
Manganese (dissolved)	µg/l	0.06	ISO 17025	6.9				
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5				
Molybdenum (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Nickel (dissolved)	µg/l	0.3	ISO 17025	2.7				
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0				
Vanadium (dissolved)	µg/l	1.7	ISO 17025	6.0				
Zinc (dissolved)	µg/l	0.4	ISO 17025	12				
Calcium (dissolved)	mg/l	0.012	ISO 17025	38				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	0.86				



**Analytical Report Number : 19-44443**

**Project / Site name: HE551505 A417 Missing Link Ground Investigation**

\* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1238815	CP230	1	0.20-0.30	Brown loam and clay with gravel and vegetation.

Analytical Report Number : 19-44443

Project / Site name: HE551505 A417 Missing Link Ground Investigation

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammoniacal Nitrogen as N in leachate	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron in leachate	Determination of boron in leachate. Sample acidified and followed by ICP-OES.	In-house method based on MEWAM	L039-PL	W	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Cations in soil by ICP-OES	Determination of cations in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Chloride in leachate	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Complex cyanide in leachate	Determination of complex cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L040-PL	W	ISO 17025
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Fluoride in leachate	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Fraction of Organic Carbon in soil	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L009-PL	D	MCERTS
Free cyanide in leachate	Determination of free cyanide by distillation followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025



**Analytical Report Number : 19-44443**

**Project / Site name: HE551505 A417 Missing Link Ground Investigation**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Phenols, speciated, in leachate, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate in leachates	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Total cyanide in leachate	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total Hardness of leachates	Determination of hardness in leachates by calculation from calcium and magnesium.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	NONE
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



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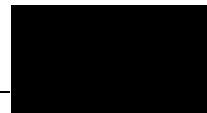
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## Analytical Report Number : 19-49924

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	15/07/2019
<b>Your job number:</b>	35371	<b>Samples instructed on:</b>	15/07/2019
<b>Your order number:</b>		<b>Analysis completed by:</b>	19/07/2019
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	19/07/2019
<b>Samples Analysed:</b>	2 leachate samples - 2 soil samples		

**Signed:**



Rexona Rahman  
 Head of Customer Services  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 19-49924  
Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1267372	1267373			
<b>Sample Reference</b>				CP200	CP200			
<b>Sample Number</b>				None Supplied	None Supplied			
<b>Depth (m)</b>				0.30-0.50	1.80-2.00			
<b>Date Sampled</b>				01/07/2019	01/07/2019			
<b>Time Taken</b>				None Supplied	None Supplied			
<b>Analytical Parameter (Soil Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					
Stone Content	%	0.1	NONE	< 0.1	< 0.1			
Moisture Content	%	N/A	NONE	5.5	27			
Total mass of sample received	kg	0.001	NONE	1.7	1.8			

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected			
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#### General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.6	7.8			
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1			
Free Cyanide	mg/kg	1	MCERTS	< 1	< 1			
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.51	0.028			
Total Sulphur	mg/kg	50	MCERTS	800	260			
Fraction Organic Carbon (FOC)	N/A	0.001	MCERTS	0.020	0.011			

#### Phenols by HPLC

Catechol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10			
Resorcinol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10			
Cresols (o-, m-, p-)	mg/kg	0.3	ISO 17025	< 0.30	< 0.30			
Total Naphthols (sum of 1- and 2- Naphthol)	mg/kg	0.2	ISO 17025	< 0.20	< 0.20			
2-Isopropylphenol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10			
Phenol	mg/kg	0.1	ISO 17025	< 0.10	< 0.10			
Trimethylphenol (2,3,5-)	mg/kg	0.1	ISO 17025	< 0.10	< 0.10			
Total Xylenols and Ethylphenols	mg/kg	0.3	ISO 17025	< 0.30	< 0.30			

#### Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0			
Total Phenols (HPLC)	mg/kg	1.3	ISO 17025	< 1.3	< 1.3			

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Lab Sample Number				1267372	1267373			
Sample Reference				CP200	CP200			
Sample Number				None Supplied	None Supplied			
Depth (m)				0.30-0.50	1.80-2.00			
Date Sampled				01/07/2019	01/07/2019			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
<b>Speciated PAHs</b>								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Phenanthrene	mg/kg	0.05	MCERTS	0.63	< 0.05			
Anthracene	mg/kg	0.05	MCERTS	0.23	< 0.05			
Fluoranthene	mg/kg	0.05	MCERTS	1.2	< 0.05			
Pyrene	mg/kg	0.05	MCERTS	1.1	< 0.05			
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.56	< 0.05			
Chrysene	mg/kg	0.05	MCERTS	0.89	< 0.05			
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	1.3	< 0.05			
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.38	< 0.05			
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.98	< 0.05			
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.50	< 0.05			
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.62	< 0.05			
<b>Total PAH</b>								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	8.29	< 0.80			
<b>Heavy Metals / Metalloids</b>								
Antimony (aqua regia extractable)	mg/kg	1	ISO 17025	< 1.0	< 1.0			
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	5.2	25			
Barium (aqua regia extractable)	mg/kg	1	MCERTS	89	34			
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.38	1.0			
Boron (water soluble)	mg/kg	0.2	MCERTS	1.3	1.2			
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.2	< 0.2			
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0			
Chromium (III)	mg/kg	1	NONE	13	37			
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	14	37			
Copper (aqua regia extractable)	mg/kg	1	MCERTS	10	13			
Iron (aqua regia extractable)	mg/kg	40	MCERTS	13000	45000			
Lead (aqua regia extractable)	mg/kg	1	MCERTS	22	12			
Manganese (aqua regia extractable)	mg/kg	1	MCERTS	350	230			
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3			
Molybdenum (aqua regia extractable)	mg/kg	0.25	MCERTS	0.36	< 0.25			
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	9.7	19			
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0			
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	22	43			
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	42	45			



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<b>Lab Sample Number</b>				1267372	1267373			
<b>Sample Reference</b>				CP200	CP200			
<b>Sample Number</b>				None Supplied	None Supplied			
<b>Depth (m)</b>				0.30-0.50	1.80-2.00			
<b>Date Sampled</b>				01/07/2019	01/07/2019			
<b>Time Taken</b>				None Supplied	None Supplied			
<b>Analytical Parameter (Soil Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Monoaromatics & Oxygenates**

Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0			
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0			

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0			
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0			
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0			
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	220	< 8.0			
<b>TPH-CWG - Aliphatic (EC5 - EC35)</b>	mg/kg	10	MCERTS	230	< 10			

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	1.1	< 1.0			
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	4.8	< 2.0			
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	47	< 10			
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	710	< 10			
<b>TPH-CWG - Aromatic (EC5 - EC35)</b>	mg/kg	10	MCERTS	760	< 10			

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Lab Sample Number				1267372	1267373			
Sample Reference				CP200	CP200			
Sample Number				None Supplied	None Supplied			
Depth (m)				0.30-0.50	1.80-2.00			
Date Sampled				01/07/2019	01/07/2019			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
<b>VOCs</b>								
Chloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0			
Chloroethane	µg/kg	1	NONE	< 1.0	< 1.0			
Bromomethane	µg/kg	1	ISO 17025	< 1.0	< 1.0			
Vinyl Chloride	µg/kg	1	NONE	< 1.0	< 1.0			
Trichlorofluoromethane	µg/kg	1	NONE	< 1.0	< 1.0			
1,1-Dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0			
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	< 1.0			
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
2,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0			
Trichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,1-Dichloropropene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0			
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0			
Trichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Dibromomethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
Bromodichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0			
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0			
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0			
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0			
Tetrachloroethene	µg/kg	1	NONE	< 1.0	< 1.0			
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	< 1.0			
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,1,1,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Styrene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Tri bromomethane	µg/kg	1	NONE	< 1.0	< 1.0			
o-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0			
Isopropylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Bromobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0			
2-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0			
4-Chlorotoluene	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0			
tert-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0			
sec-Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0			
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	< 1.0			
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Butylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0			
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Hexachlorobutadiene	µg/kg	1	MCERTS	< 1.0	< 1.0			
1,2,3-Trichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0			



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Lab Sample Number				1267990	1267991			
Sample Reference				CP200	CP200			
Sample Number				None Supplied	None Supplied			
Depth (m)				0.30-0.50	1.80-2.00			
Date Sampled				01/07/2019	01/07/2019			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Leachate Analysis)				Units	Limit of detection	Accreditation Status		

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.8	8.0			
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Complex Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Sulphate as SO <sub>4</sub>	µg/l	100	ISO 17025	263000	7140			
Chloride	mg/l	0.15	ISO 17025	2.4	32			
Fluoride	µg/l	50	ISO 17025	390	490			
Ammoniacal Nitrogen as N	µg/l	15	NONE	< 15	12000			
Hardness - Total	mgCaCO <sub>3</sub> /l	1	NONE	356	184			

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5	< 0.5			
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5			
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5			
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5			
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5			
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**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	1.7	ISO 17025	< 1.7	< 1.7			
Arsenic (dissolved)	µg/l	1.1	ISO 17025	5.1	< 1.1			
Barium (dissolved)	µg/l	0.05	ISO 17025	80	24			
Beryllium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Boron (dissolved)	µg/l	10	ISO 17025	62	46			
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08			
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0			
Chromium (III)	µg/l	1	NONE	3.0	< 1.0			
Chromium (dissolved)	µg/l	0.4	ISO 17025	3.0	0.5			
Copper (dissolved)	µg/l	0.7	ISO 17025	16	22			
Iron (dissolved)	mg/l	0.004	ISO 17025	0.084	0.031			
Lead (dissolved)	µg/l	1	ISO 17025	< 1.0	< 1.0			
Manganese (dissolved)	µg/l	0.06	ISO 17025	9.9	73			
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5			
Molybdenum (dissolved)	µg/l	0.4	ISO 17025	4.8	< 0.4			
Nickel (dissolved)	µg/l	0.3	ISO 17025	1.0	1.4			
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0			
Vanadium (dissolved)	µg/l	1.7	ISO 17025	5.9	< 1.7			
Zinc (dissolved)	µg/l	0.4	ISO 17025	8.0	5.4			
Calcium (dissolved)	mg/l	0.012	ISO 17025	130	66			
Magnesium (dissolved)	mg/l	0.005	ISO 17025	5.7	4.9			



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\* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1267372	CP200	None Supplied	0.30-0.50	Brown loam and clay with gravel and rubble.
1267373	CP200	None Supplied	1.80-2.00	Brown clay.

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**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammoniacal Nitrogen as N in leachate	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron in leachate	Determination of boron in leachate. Sample acidified and followed by ICP-OES.	In-house method based on MEWAM	L039-PL	W	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Cations in soil by ICP-OES	Determination of cations in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Chloride in leachate	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Complex cyanide in leachate	Determination of complex cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L040-PL	W	ISO 17025
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Fluoride in leachate	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Fraction of Organic Carbon in soil	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L009-PL	D	MCERTS
Free cyanide in leachate	Determination of free cyanide by distillation followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS

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The results included within the report are representative of the samples submitted for analysis.

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**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Phenols, speciated, in leachate, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate in leachates	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Total cyanide in leachate	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total Hardness of leachates	Determination of hardness in leachates by calculation from calcium and magnesium.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	NONE
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
CP200		S	19-49924	1267372	c	Free cyanide in soil	L080-PL	c
CP200		S	19-49924	1267372	c	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	c
CP200		S	19-49924	1267372	c	Total cyanide in soil	L080-PL	c
CP200		S	19-49924	1267372	c	Volatile organic compounds in soil	L073B-PL	c
CP200		S	19-49924	1267373	c	Free cyanide in soil	L080-PL	c
CP200		S	19-49924	1267373	c	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	c
CP200		S	19-49924	1267373	c	Total cyanide in soil	L080-PL	c
CP200		S	19-49924	1267373	c	Volatile organic compounds in soil	L073B-PL	c



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## Analytical Report Number : 19-53280

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	06/08/2019
<b>Your job number:</b>	35371	<b>Samples instructed on:</b>	06/08/2019
<b>Your order number:</b>	35371-DO	<b>Analysis completed by:</b>	13/08/2019
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	13/08/2019
<b>Samples Analysed:</b>	2 leachate samples - 2 soil samples		

**Signed:** 

Karolina Marek  
 Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.



**Analytical Report Number: 19-53280**  
**Project / Site name: A417 Missing Link**  
**Your Order No: 35371-DO**

<b>Lab Sample Number</b>				1284787	1284788			
<b>Sample Reference</b>				CP215	CP215			
<b>Sample Number</b>				None Supplied	None Supplied			
<b>Depth (m)</b>				0.30	1.00			
<b>Date Sampled</b>				30/07/2019	30/07/2019			
<b>Time Taken</b>				None Supplied	None Supplied			
<b>Analytical Parameter (Soil Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					
Stone Content	%	0.1	NONE	< 0.1	< 0.1			
Moisture Content	%	N/A	NONE	21	25			
Total mass of sample received	kg	0.001	NONE	2.0	2.0			

**General Inorganics**

pH - Automated	pH Units	N/A	MCERTS	7.8	7.8			
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1			

**Total Phenols**

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0			
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**Speciated PAHs**

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05			
Phenanthrene	mg/kg	0.05	MCERTS	3.0	0.50			
Anthracene	mg/kg	0.05	MCERTS	0.28	< 0.05			
Fluoranthene	mg/kg	0.05	MCERTS	5.4	1.7			
Pyrene	mg/kg	0.05	MCERTS	4.9	1.7			
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.6	0.66			
Chrysene	mg/kg	0.05	MCERTS	2.0	0.60			
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	2.8	0.97			
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.1	0.30			
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.3	0.71			
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.4	0.35			
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.42	< 0.05			
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.6	0.49			

**Total PAH**

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	27.6	7.96			
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**Heavy Metals / Metalloids**

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	15	12			
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.6	0.2			
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	33	24			
Copper (aqua regia extractable)	mg/kg	1	MCERTS	38	20			
Lead (aqua regia extractable)	mg/kg	1	MCERTS	250	96			
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.9	< 0.3			
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	15	16			
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	370	140			

**Analytical Report Number: 19-53280**  
**Project / Site name: A417 Missing Link**  
**Your Order No: 35371-DO**

<b>Lab Sample Number</b>				1284787	1284788			
<b>Sample Reference</b>				CP215	CP215			
<b>Sample Number</b>				None Supplied	None Supplied			
<b>Depth (m)</b>				0.30	1.00			
<b>Date Sampled</b>				30/07/2019	30/07/2019			
<b>Time Taken</b>				None Supplied	None Supplied			
<b>Analytical Parameter (Soil Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Monoaromatics & Oxygenates**

Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0			
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0			
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0			
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0			

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0			
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0			
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0			
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0			
TPH-CWG - Aliphatic >EC35 - EC40	mg/kg	10	NONE	< 10	< 10			

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001			
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0			
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	2.2	2.4			
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	46	17			
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	110	32			
TPH-CWG - Aromatic >EC35 - EC40	mg/kg	10	NONE	15	< 10			
<b>TPH Total C5 - C40</b>	mg/kg	10	MCERTS	180	52			



Analytical Report Number: 19-53280  
 Project / Site name: A417 Missing Link

Your Order No: 35371-DO

<b>Lab Sample Number</b>				1284789	1284790			
<b>Sample Reference</b>				CP215	CP215			
<b>Sample Number</b>				None Supplied	None Supplied			
<b>Depth (m)</b>				0.30	1.00			
<b>Date Sampled</b>				30/07/2019	30/07/2019			
<b>Time Taken</b>				None Supplied	None Supplied			
<b>Analytical Parameter (Leachate Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.9	8.0			
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Ammoniacal Nitrogen as N	µg/l	15	NONE	21	28			

**Total Phenols**

Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10	< 10			
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**Heavy Metals / Metalloids**

Arsenic (dissolved)	µg/l	1.1	ISO 17025	1.2	8.4			
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08			
Chromium (dissolved)	µg/l	0.4	ISO 17025	3.6	1.6			
Copper (dissolved)	µg/l	0.7	ISO 17025	12	12			
Lead (dissolved)	µg/l	1	ISO 17025	8.4	5.3			
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5			
Nickel (dissolved)	µg/l	0.3	ISO 17025	2.9	1.0			
Zinc (dissolved)	µg/l	0.4	ISO 17025	26	4.8			



**Analytical Report Number : 19-53280**

**Project / Site name: A417 Missing Link**

\* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1284787	CP215	None Supplied	0.30	Brown clay with vegetation.
1284788	CP215	None Supplied	1.00	Brown clay and sand with gravel.

**Analytical Report Number : 19-53280**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammoniacal Nitrogen as N in leachate	Determination of Ammonium/Ammonia/Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	NONE
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in leachate	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
NRA Leachate Prep	10:1 extract with de-ionised water shaken for 24 hours then filtered.	In-house method based on National Rivers Authority	L020-PL	W	NONE
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in leachate	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
CP215		S	19-53280	1284787	c	Total cyanide in soil	L080-PL	c
CP215		S	19-53280	1284788	c	Total cyanide in soil	L080-PL	c



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## Analytical Report Number : 19-58270

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	05/09/2019
<b>Your job number:</b>	35371	<b>Samples instructed on:</b>	05/09/2019
<b>Your order number:</b>		<b>Analysis completed by:</b>	12/09/2019
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	12/09/2019
<b>Samples Analysed:</b>	1 soil sample 1 Leachate sample		

**Signed:** 

Rexona Rahman  
 Head of Customer Services  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Iss No 19-58270-1 A417 Missing Link 35371

This certificate should not be reproduced, except in full, without the express permission of the laboratory.

The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 19-58270  
Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1309709				
<b>Sample Reference</b>				CP213				
<b>Sample Number</b>				None Supplied				
<b>Depth (m)</b>				0.50				
<b>Date Sampled</b>				06/08/2019				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Soil Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	19				
Total mass of sample received	kg	0.001	NONE	2.0				
<b>Asbestos in Soil</b>	Type	N/A	ISO 17025	Not-detected				
<b>General Inorganics</b>								
pH - Automated	pH Units	N/A	MCERTS	7.2				
Total Cyanide	mg/kg	1	MCERTS	< 1				
<b>Total Phenols</b>								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0				
<b>Speciated PAHs</b>								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05				
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05				
Fluorene	mg/kg	0.05	MCERTS	< 0.05				
Phenanthrene	mg/kg	0.05	MCERTS	< 0.05				
Anthracene	mg/kg	0.05	MCERTS	< 0.05				
Fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Pyrene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Chrysene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05				
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05				
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05				
<b>Total PAH</b>								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	< 0.80				
<b>Heavy Metals / Metalloids</b>								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	5.4				
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2				
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	41				
Copper (aqua regia extractable)	mg/kg	1	MCERTS	11				
Lead (aqua regia extractable)	mg/kg	1	MCERTS	13				
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3				
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	19				
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	49				





Analytical Report Number: 19-58270  
 Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1309709				
<b>Sample Reference</b>				CP213				
<b>Sample Number</b>				None Supplied				
<b>Depth (m)</b>				0.50				
<b>Date Sampled</b>				06/08/2019				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Soil Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Monoaromatics & Oxygenates**

Benzene	µg/kg	1	MCERTS	< 1.0				
Toluene	µg/kg	1	MCERTS	< 1.0				
Ethylbenzene	µg/kg	1	MCERTS	< 1.0				
p & m-xylene	µg/kg	1	MCERTS	< 1.0				
o-xylene	µg/kg	1	MCERTS	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0				
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0				
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0				
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0				
TPH-CWG - Aliphatic >EC35 - EC40	mg/kg	10	NONE	< 10				
<b>TPH-CWG - Aliphatic (EC8 - EC40)</b>	mg/kg	10	NONE	< 10				

TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001				
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0				
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0				
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10				
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10				
TPH-CWG - Aromatic >EC35 - EC40	mg/kg	10	NONE	< 10				
<b>TPH-CWG - Aromatic (EC8 - EC40)</b>	mg/kg	10	NONE	< 10				



**Analytical Report Number: 19-58270**  
**Project / Site name: A417 Missing Link**

<b>Lab Sample Number</b>				1309710				
<b>Sample Reference</b>				CP213				
<b>Sample Number</b>				None Supplied				
<b>Depth (m)</b>				0.50				
<b>Date Sampled</b>				06/08/2019				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Leachate Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.4				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Ammoniacal Nitrogen as N	µg/l	15	NONE	< 15				

**Total Phenols**

Total Phenols (monohydric)	µg/l	10	ISO 17025	< 10				
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**Heavy Metals / Metalloids**

Arsenic (dissolved)	µg/l	1.1	ISO 17025	< 1.1				
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08				
Chromium (dissolved)	µg/l	0.4	ISO 17025	3.3				
Copper (dissolved)	µg/l	0.7	ISO 17025	3.9				
Lead (dissolved)	µg/l	1	ISO 17025	< 1.0				
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5				
Nickel (dissolved)	µg/l	0.3	ISO 17025	2.0				
Zinc (dissolved)	µg/l	0.4	ISO 17025	4.5				



**Analytical Report Number : 19-58270**

**Project / Site name: A417 Missing Link**

\* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1309709	CP213	None Supplied	0.50	Brown clay.

**Analytical Report Number : 19-58270**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Ammoniacal Nitrogen as N in leachate	Determination of Ammonium/Ammonia/Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L0738-PL	W	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in leachate	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
NRA Leachate Prep	10:1 extract with de-ionised water shaken for 24 hours then filtered.	In-house method based on National Rivers Authority	L020-PL	W	NONE
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total cyanide in leachate	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS

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The results included within the report are representative of the samples submitted for analysis.



**Analytical Report Number : 19-58270**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
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For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
CP213		S	19-58270	1309709	c	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	c
CP213		S	19-58270	1309709	c	Monohydric phenols in soil	L080-PL	c
CP213		S	19-58270	1309709	c	Speciated EPA-16 PAHs in soil	L064-PL	c
CP213		S	19-58270	1309709	c	TPH in (Soil)	L076-PL	c
CP213		S	19-58270	1309709	c	TPHCWG (Soil)	L088/76-PL	c
CP213		S	19-58270	1309709	c	Total cyanide in soil	L080-PL	c
CP213		S	19-58270	1309709	c	pH in soil (automated)	L099-PL	c



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## Analytical Report Number : 19-67116

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	16/10/2019
<b>Your job number:</b>	35560	<b>Samples instructed on:</b>	21/10/2019
<b>Your order number:</b>		<b>Analysis completed by:</b>	28/10/2019
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	28/10/2019
<b>Samples Analysed:</b>	1 water sample		

**Signed:** 

Zina Abdul Razzak  
 Senior Quality Specialist  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 19-67116  
 Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1336879				
<b>Sample Reference</b>				DSRC110				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				32.2				
<b>Date Sampled</b>				16/10/2019				
<b>Time Taken</b>				1325				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	8.0				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	420				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	µg/l	45	ISO 17025	35600				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	35.6				
Total Sulphur	µg/l	15	NONE	12000				
Chloride	mg/l	0.15	ISO 17025	44				
Fluoride	µg/l	50	ISO 17025	180				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	28				
Nitrate as N	mg/l	0.01	ISO 17025	2.53				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	11.2				
Nitrite as N	µg/l	1	ISO 17025	480				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	1600				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	110				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	3.0				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	300				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	153				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	0.6				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	2.30				
Barium (dissolved)	µg/l	0.06	ISO 17025	14				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	20				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	56				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	1.4				
Chromium (dissolved)	µg/l	0.2	ISO 17025	1.4				
Copper (dissolved)	µg/l	0.5	ISO 17025	1.9				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.21				
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	3.3				
Manganese (dissolved)	µg/l	0.05	ISO 17025	21				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	11				
Nickel (dissolved)	µg/l	0.5	ISO 17025	4.4				
Potassium (dissolved)	mg/l	0.025	ISO 17025	2.9				
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6				
Sodium (dissolved)	mg/l	0.01	ISO 17025	30				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.9				
Zinc (dissolved)	µg/l	0.5	ISO 17025	1.2				



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<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10				

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10				



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<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**VOCs**

Compound	Units	Limit of detection	Accreditation Status	Result				
Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 19-67116**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	W	ISO 17025



**Analytical Report Number : 19-67116**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil"	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30°C.**

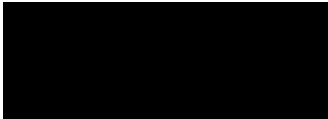
Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSRC110	1	W	19-67116	1336879	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC110	1	W	19-67116	1336879	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC110	1	W	19-67116	1336879	c	pH at 20oC in water (automated)	L099-PL	c



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## **Analytical Report Number : 19-71674**

<b>Project / Site name:</b>	A417 Missing Link - Palmer	<b>Samples received on:</b>	12/11/2019
<b>Your job number:</b>	35560	<b>Samples instructed on:</b>	14/11/2019
<b>Your order number:</b>		<b>Analysis completed by:</b>	20/11/2019
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	20/11/2019
<b>Samples Analysed:</b>	1 water sample		

**Signed:** 

Vineetha Meethale-Vettil  
 Reporting Manager

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 19-71674

Project / Site name: A417 Missing Link - Palmer

<b>Lab Sample Number</b>				1361091			
<b>Sample Reference</b>				DSRCOH110			
<b>Sample Number</b>				1			
<b>Depth (m)</b>				34.00-34.50			
<b>Date Sampled</b>				11/11/2019			
<b>Time Taken</b>				1450			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.6			
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	460			
Total Cyanide	µg/l	10	ISO 17025	< 10			
Free Cyanide	µg/l	10	ISO 17025	< 10			
Sulphate as SO <sub>4</sub>	µg/l	45	ISO 17025	22600			
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	22.6			
Total Sulphur	µg/l	15	NONE	7500			
Chloride	mg/l	0.15	ISO 17025	34			
Fluoride	µg/l	50	ISO 17025	< 50			
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	18			
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	1.63			
Nitrate as N	mg/l	0.01	ISO 17025	5.12			
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	22.7			
Nitrite as N	µg/l	1	ISO 17025	11			
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	170			
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	5.1			
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	70			
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	182			

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5			
Resorcinol	µg/l	0.5	NONE	< 0.5			
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5			
Cresols	µg/l	0.5	NONE	< 0.5			
Naphthols	µg/l	0.5	NONE	< 0.5			
Isopropylphenol	µg/l	0.5	NONE	< 0.5			
Phenol	µg/l	0.5	NONE	< 0.5			
Trimethylphenol	µg/l	0.5	NONE	< 0.5			

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5			
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<b>Lab Sample Number</b>				1361091			
<b>Sample Reference</b>				DSRCOH110			
<b>Sample Number</b>				1			
<b>Depth (m)</b>				34.00-34.50			
<b>Date Sampled</b>				11/11/2019			
<b>Time Taken</b>				1450			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01			
Fluorene	µg/l	0.01	ISO 17025	< 0.01			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01			

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16			
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**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4			
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.60			
Barium (dissolved)	µg/l	0.06	ISO 17025	8.3			
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1			
Boron (dissolved)	µg/l	10	ISO 17025	< 10			
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02			
Calcium (dissolved)	mg/l	0.012	ISO 17025	67			
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0			
Chromium (III)	µg/l	1	NONE	< 1.0			
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.4			
Copper (dissolved)	µg/l	0.5	ISO 17025	1.3			
Iron (dissolved)	mg/l	0.004	ISO 17025	0.19			
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2			
Magnesium (dissolved)	mg/l	0.005	ISO 17025	3.3			
Manganese (dissolved)	µg/l	0.05	ISO 17025	1.9			
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05			
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.48			
Nickel (dissolved)	µg/l	0.5	ISO 17025	0.9			
Potassium (dissolved)	mg/l	0.025	ISO 17025	1.3			
Selenium (dissolved)	µg/l	0.6	ISO 17025	0.6			
Sodium (dissolved)	mg/l	0.01	ISO 17025	19			
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.2			
Zinc (dissolved)	µg/l	0.5	ISO 17025	3.0			

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0			
p & m-xylene	µg/l	1	ISO 17025	< 1.0			
o-xylene	µg/l	1	ISO 17025	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0			



Analytical Report Number: 19-71674

Project / Site name: A417 Missing Link - Palmer

<b>Lab Sample Number</b>				1361091			
<b>Sample Reference</b>				DSRCOH110			
<b>Sample Number</b>				1			
<b>Depth (m)</b>				34.00-34.50			
<b>Date Sampled</b>				11/11/2019			
<b>Time Taken</b>				1450			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10			
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10			
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10			
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10			
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10			

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10			
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10			
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10			
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10			
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10			



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Project / Site name: A417 Missing Link - Palmer

Lab Sample Number				1361091			
Sample Reference				DSRCOH110			
Sample Number				1			
Depth (m)				34.00-34.50			
Date Sampled				11/11/2019			
Time Taken				1450			
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				

**VOCs**

Compound	Units	Limit of detection	Accreditation Status	Result			
Chloromethane	µg/l	1	ISO 17025	< 1.0			
Chloroethane	µg/l	1	ISO 17025	< 1.0			
Bromomethane	µg/l	1	ISO 17025	< 1.0			
Vinyl Chloride	µg/l	1	NONE	< 1.0			
Trichlorofluoromethane	µg/l	1	NONE	< 1.0			
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0			
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0			
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0			
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0			
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0			
Trichloromethane	µg/l	1	ISO 17025	< 1.0			
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0			
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0			
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0			
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0			
Benzene	µg/l	1	ISO 17025	< 1.0			
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0			
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0			
Trichloroethene	µg/l	1	ISO 17025	< 1.0			
Dibromomethane	µg/l	1	ISO 17025	< 1.0			
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0			
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0			
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0			
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0			
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0			
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0			
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0			
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0			
Chlorobenzene	µg/l	1	ISO 17025	< 1.0			
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0			
p & m-Xylene	µg/l	1	ISO 17025	< 1.0			
Styrene	µg/l	1	ISO 17025	< 1.0			
Tribromomethane	µg/l	1	ISO 17025	< 1.0			
o-Xylene	µg/l	1	ISO 17025	< 1.0			
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0			
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0			
Bromobenzene	µg/l	1	ISO 17025	< 1.0			
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0			
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0			
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0			
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0			
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0			
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0			
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0			
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0			
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0			
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0			
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0			
Butylbenzene	µg/l	1	ISO 17025	< 1.0			
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0			
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0			
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0			
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0			

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 19-71674

Project / Site name: A417 Missing Link - Palmer

<b>Lab Sample Number</b>				
<b>Sample Reference</b>				
<b>Sample Number</b>				
<b>Depth (m)</b>				
<b>Date Sampled</b>				
<b>Time Taken</b>				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>	

**General Inorganics**

pH	pH Units	N/A	ISO 17025	
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	
Total Cyanide	µg/l	10	ISO 17025	
Free Cyanide	µg/l	10	ISO 17025	
Sulphate as SO <sub>4</sub>	µg/l	45	ISO 17025	
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	
Total Sulphur	µg/l	15	NONE	
Chloride	mg/l	0.15	ISO 17025	
Fluoride	µg/l	50	ISO 17025	
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	
Nitrate as N	mg/l	0.01	ISO 17025	
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	
Nitrite as N	µg/l	1	ISO 17025	
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	
Resorcinol	µg/l	0.5	NONE	
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	
Cresols	µg/l	0.5	NONE	
Naphthols	µg/l	0.5	NONE	
Isopropylphenol	µg/l	0.5	NONE	
Phenol	µg/l	0.5	NONE	
Trimethylphenol	µg/l	0.5	NONE	

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	
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Analytical Report Number: 19-71674

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<b>Lab Sample Number</b>				
<b>Sample Reference</b>				
<b>Sample Number</b>				
<b>Depth (m)</b>				
<b>Date Sampled</b>				
<b>Time Taken</b>				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>	

**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	
Acenaphthylene	µg/l	0.01	ISO 17025	
Acenaphthene	µg/l	0.01	ISO 17025	
Fluorene	µg/l	0.01	ISO 17025	
Phenanthrene	µg/l	0.01	ISO 17025	
Anthracene	µg/l	0.01	ISO 17025	
Fluoranthene	µg/l	0.01	ISO 17025	
Pyrene	µg/l	0.01	ISO 17025	
Benzo(a)anthracene	µg/l	0.01	ISO 17025	
Chrysene	µg/l	0.01	ISO 17025	
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	
Benzo(a)pyrene	µg/l	0.01	ISO 17025	
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	
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**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	
Arsenic (dissolved)	µg/l	0.15	ISO 17025	
Barium (dissolved)	µg/l	0.06	ISO 17025	
Beryllium (dissolved)	µg/l	0.1	ISO 17025	
Boron (dissolved)	µg/l	10	ISO 17025	
Cadmium (dissolved)	µg/l	0.02	ISO 17025	
Calcium (dissolved)	mg/l	0.012	ISO 17025	
Chromium (hexavalent)	µg/l	5	ISO 17025	
Chromium (III)	µg/l	1	NONE	
Chromium (dissolved)	µg/l	0.2	ISO 17025	
Copper (dissolved)	µg/l	0.5	ISO 17025	
Iron (dissolved)	mg/l	0.004	ISO 17025	
Lead (dissolved)	µg/l	0.2	ISO 17025	
Magnesium (dissolved)	mg/l	0.005	ISO 17025	
Manganese (dissolved)	µg/l	0.05	ISO 17025	
Mercury (dissolved)	µg/l	0.05	ISO 17025	
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	
Nickel (dissolved)	µg/l	0.5	ISO 17025	
Potassium (dissolved)	mg/l	0.025	ISO 17025	
Selenium (dissolved)	µg/l	0.6	ISO 17025	
Sodium (dissolved)	mg/l	0.01	ISO 17025	
Vanadium (dissolved)	µg/l	0.2	ISO 17025	
Zinc (dissolved)	µg/l	0.5	ISO 17025	

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	
Toluene	µg/l	1	ISO 17025	
Ethylbenzene	µg/l	1	ISO 17025	
p & m-xylene	µg/l	1	ISO 17025	
o-xylene	µg/l	1	ISO 17025	
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	



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<b>Lab Sample Number</b>				
<b>Sample Reference</b>				
<b>Sample Number</b>				
<b>Depth (m)</b>				
<b>Date Sampled</b>				
<b>Time Taken</b>				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>	

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	



Analytical Report Number: 19-71674

Project / Site name: A417 Missing Link - Palmer

<b>Lab Sample Number</b>				
<b>Sample Reference</b>				
<b>Sample Number</b>				
<b>Depth (m)</b>				
<b>Date Sampled</b>				
<b>Time Taken</b>				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>	

**VOCs**

Chloromethane	µg/l	1	ISO 17025	
Chloroethane	µg/l	1	ISO 17025	
Bromomethane	µg/l	1	ISO 17025	
Vinyl Chloride	µg/l	1	NONE	
Trichlorofluoromethane	µg/l	1	NONE	
1,1-Dichloroethene	µg/l	1	ISO 17025	
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	
1,1-Dichloroethane	µg/l	1	ISO 17025	
2,2-Dichloropropane	µg/l	1	ISO 17025	
Trichloromethane	µg/l	1	ISO 17025	
1,1,1-Trichloroethane	µg/l	1	ISO 17025	
1,2-Dichloroethane	µg/l	1	ISO 17025	
1,1-Dichloropropene	µg/l	1	ISO 17025	
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	
Benzene	µg/l	1	ISO 17025	
Tetrachloromethane	µg/l	1	ISO 17025	
1,2-Dichloropropane	µg/l	1	ISO 17025	
Trichloroethene	µg/l	1	ISO 17025	
Dibromomethane	µg/l	1	ISO 17025	
Bromodichloromethane	µg/l	1	ISO 17025	
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	
Toluene	µg/l	1	ISO 17025	
1,1,2-Trichloroethane	µg/l	1	ISO 17025	
1,3-Dichloropropane	µg/l	1	ISO 17025	
Dibromochloromethane	µg/l	1	ISO 17025	
Tetrachloroethene	µg/l	1	ISO 17025	
1,2-Dibromoethane	µg/l	1	ISO 17025	
Chlorobenzene	µg/l	1	ISO 17025	
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	
Ethylbenzene	µg/l	1	ISO 17025	
p & m-Xylene	µg/l	1	ISO 17025	
Styrene	µg/l	1	ISO 17025	
Tribromomethane	µg/l	1	ISO 17025	
o-Xylene	µg/l	1	ISO 17025	
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	
Isopropylbenzene	µg/l	1	ISO 17025	
Bromobenzene	µg/l	1	ISO 17025	
n-Propylbenzene	µg/l	1	ISO 17025	
2-Chlorotoluene	µg/l	1	ISO 17025	
4-Chlorotoluene	µg/l	1	ISO 17025	
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	
tert-Butylbenzene	µg/l	1	ISO 17025	
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	
sec-Butylbenzene	µg/l	1	ISO 17025	
1,3-Dichlorobenzene	µg/l	1	ISO 17025	
p-Isopropyltoluene	µg/l	1	ISO 17025	
1,2-Dichlorobenzene	µg/l	1	ISO 17025	
1,4-Dichlorobenzene	µg/l	1	ISO 17025	
Butylbenzene	µg/l	1	ISO 17025	
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	
Hexachlorobutadiene	µg/l	1	ISO 17025	
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 19-71674**

**Project / Site name: A417 Missing Link - Palmer**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	W	ISO 17025





**Analytical Report Number : 19-71674**

**Project / Site name: A417 Missing Link - Palmer**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil <sup>100</sup>	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



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## **Analytical Report Number : 19-71708**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	12/11/2019
<b>Your job number:</b>	35560	<b>Samples instructed on:</b>	14/11/2019
<b>Your order number:</b>		<b>Analysis completed by:</b>	20/11/2019
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	20/11/2019
<b>Samples Analysed:</b>	1 water sample		

**Signed:** 

Vineetha Meethale-Vettil  
Reporting Manager

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Iss No 19-71708-1 A417 Missing Link

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 19-71708

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1361171				
<b>Sample Reference</b>				DSRC205				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				11.00-11.50				
<b>Date Sampled</b>				11/11/2019				
<b>Time Taken</b>				1030				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.3				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	740				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	µg/l	45	ISO 17025	104000				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	104				
Total Sulphur	µg/l	15	NONE	35000				
Chloride	mg/l	0.15	ISO 17025	34				
Fluoride	µg/l	50	ISO 17025	230				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	62				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	2.80				
Nitrate as N	mg/l	0.01	ISO 17025	1.19				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	5.27				
Nitrite as N	µg/l	1	ISO 17025	36				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	120				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	350				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	1.2				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	520				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	262				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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Analytical Report Number: 19-71708

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1361171				
<b>Sample Reference</b>				DSRC205				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				11.00-11.50				
<b>Date Sampled</b>				11/11/2019				
<b>Time Taken</b>				1030				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	0.4				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.47				
Barium (dissolved)	µg/l	0.06	ISO 17025	21				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	42				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	89				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.4				
Copper (dissolved)	µg/l	0.5	ISO 17025	1.7				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.44				
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	9.7				
Manganese (dissolved)	µg/l	0.05	ISO 17025	130				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	3.2				
Nickel (dissolved)	µg/l	0.5	ISO 17025	2.0				
Potassium (dissolved)	mg/l	0.025	ISO 17025	2.8				
Selenium (dissolved)	µg/l	0.6	ISO 17025	1.0				
Sodium (dissolved)	mg/l	0.01	ISO 17025	55				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.4				
Zinc (dissolved)	µg/l	0.5	ISO 17025	2.2				



Analytical Report Number: 19-71708

Project / Site name: A417 Missing Link

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<b>Depth (m)</b>				11.00-11.50				
<b>Date Sampled</b>				11/11/2019				
<b>Time Taken</b>				1030				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10				

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10				



Analytical Report Number: 19-71708

Project / Site name: A417 Missing Link

Lab Sample Number				1361171				
Sample Reference				DSRC205				
Sample Number				1				
Depth (m)				11.00-11.50				
Date Sampled				11/11/2019				
Time Taken				1030				
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
<b>VOCs</b>								
Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 19-71708**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination*	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphaniilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphaniilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025



**Analytical Report Number : 19-71708**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**





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## **Analytical Report Number : 19-71709**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	12/11/2019
<b>Your job number:</b>	35560	<b>Samples instructed on:</b>	14/11/2019
<b>Your order number:</b>		<b>Analysis completed by:</b>	20/11/2019
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	20/11/2019
<b>Samples Analysed:</b>	1 water sample		

**Signed:**

Katarzyna Lewicka  
Head of Reporting Section

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Iss No 19-71709-1 A417 Missing Link

35560

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The results included within the report are representative of the samples submitted for analysis.

Page 1 of 7



Analytical Report Number: 19-71709

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1361172				
<b>Sample Reference</b>				CP210				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				14.00-14.50				
<b>Date Sampled</b>				11/11/2019				
<b>Time Taken</b>				1100				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.2				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	830				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	92.4				
Total Sulphur	µg/l	15	NONE	31000				
Chloride	mg/l	0.15	ISO 17025	74				
Fluoride	µg/l	50	ISO 17025	300				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	15				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	2.61				
Nitrate as N	mg/l	0.01	ISO 17025	3.20				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	14.2				
Nitrite as N	µg/l	1	ISO 17025	460				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	1500				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	230				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	3.7				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	310				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	318				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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Analytical Report Number: 19-71709

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1361172				
<b>Sample Reference</b>				CP210				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				14.00-14.50				
<b>Date Sampled</b>				11/11/2019				
<b>Time Taken</b>				1100				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	< 0.15				
Barium (dissolved)	µg/l	0.06	ISO 17025	8.8				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	110				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	110				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Copper (dissolved)	µg/l	0.5	ISO 17025	< 0.5				
Iron (dissolved)	mg/l	0.004	ISO 17025	< 0.004				
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	11				
Manganese (dissolved)	µg/l	0.05	ISO 17025	38				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	1.7				
Nickel (dissolved)	µg/l	0.5	ISO 17025	5.0				
Potassium (dissolved)	mg/l	0.025	ISO 17025	1.8				
Selenium (dissolved)	µg/l	0.6	ISO 17025	1.0				
Sodium (dissolved)	mg/l	0.01	ISO 17025	43				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Zinc (dissolved)	µg/l	0.5	ISO 17025	0.7				



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<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10				

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10				



Analytical Report Number: 19-71709  
 Project / Site name: A417 Missing Link

Lab Sample Number				1361172				
Sample Reference				CP210				
Sample Number				1				
Depth (m)				14.00-14.50				
Date Sampled				11/11/2019				
Time Taken				1100				
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
<b>VOCs</b>								
Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 19-71709**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination*	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphaniilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphaniilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025



**Analytical Report Number : 19-71709**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



**Edward Crimp**

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## **Analytical Report Number : 19-72170**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	
<b>Your job number:</b>	35560	<b>Samples instructed on:</b>	18/11/2019
<b>Your order number:</b>		<b>Analysis completed by:</b>	22/11/2019
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	22/11/2019
<b>Samples Analysed:</b>	3 water samples		

**Signed:** 

Rachel Bradley

Deputy Quality Manager  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.





Analytical Report Number: 19-72170

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1363945	1363946	1363947		
<b>Sample Reference</b>				CP200	CP202	CP102		
<b>Sample Number</b>				None Supplied	None Supplied	None Supplied		
<b>Depth (m)</b>				10.50-11.00	4.50-5.00	4.00-4.50		
<b>Date Sampled</b>				13/11/2019	13/11/2019	13/11/2019		
<b>Time Taken</b>				1115	1200	1230		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.1	7.3	7.6		
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	960	420	760		
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10		
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10		
Sulphate as SO <sub>4</sub>	µg/l	45	ISO 17025	123000	29300	12200		
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	123	29.3	12.2		
Total Sulphur	µg/l	15	NONE	41000	9800	4100		
Chloride	mg/l	0.15	ISO 17025	35	4.8	40		
Fluoride	µg/l	50	ISO 17025	510	330	630		
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	4700	19	180		
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	2.13	6.32	53.5		
Nitrate as N	mg/l	0.01	ISO 17025	0.28	0.30	0.32		
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	1.22	1.33	1.44		
Nitrite as N	µg/l	1	ISO 17025	6.2	13	17		
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	20	42	57		
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	420	200	410		
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	< 0.3	0.3	0.3		
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	720	410	630		
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	403	259	280		

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5		
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5		
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5		
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5		
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5		
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5		
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5		
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5		

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5	< 3.5		
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Analytical Report Number: 19-72170

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1363945	1363946	1363947		
<b>Sample Reference</b>				CP200	CP202	CP102		
<b>Sample Number</b>				None Supplied	None Supplied	None Supplied		
<b>Depth (m)</b>				10.50-11.00	4.50-5.00	4.00-4.50		
<b>Date Sampled</b>				13/11/2019	13/11/2019	13/11/2019		
<b>Time Taken</b>				1115	1200	1230		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16		
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**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4	0.5	0.6		
Arsenic (dissolved)	µg/l	0.15	ISO 17025	10.2	7.32	8.83		
Barium (dissolved)	µg/l	0.06	ISO 17025	10	20	45		
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1		
Boron (dissolved)	µg/l	10	ISO 17025	230	24	84		
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02	< 0.02		
Calcium (dissolved)	mg/l	0.012	ISO 17025	130	93	100		
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0		
Chromium (III)	µg/l	1	NONE	2.2	3.4	2.1		
Chromium (dissolved)	µg/l	0.2	ISO 17025	2.2	3.4	2.1		
Copper (dissolved)	µg/l	0.5	ISO 17025	9.8	3.5	0.9		
Iron (dissolved)	mg/l	0.004	ISO 17025	1.5	1.6	1.2		
Lead (dissolved)	µg/l	0.2	ISO 17025	1.1	0.4	0.2		
Magnesium (dissolved)	mg/l	0.005	ISO 17025	17	6.6	6.8		
Manganese (dissolved)	µg/l	0.05	ISO 17025	180	730	1300		
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05		
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.80	1.9	1.6		
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.9	4.8	4.6		
Potassium (dissolved)	mg/l	0.025	ISO 17025	2.7	3.4	4.9		
Selenium (dissolved)	µg/l	0.6	ISO 17025	0.8	< 0.6	1.1		
Sodium (dissolved)	mg/l	0.01	ISO 17025	42	12	64		
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.8	1.2		
Zinc (dissolved)	µg/l	0.5	ISO 17025	1.3	4.8	1.1		



Analytical Report Number: 19-72170

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1363945	1363946	1363947		
<b>Sample Reference</b>				CP200	CP202	CP102		
<b>Sample Number</b>				None Supplied	None Supplied	None Supplied		
<b>Depth (m)</b>				10.50-11.00	4.50-5.00	4.00-4.50		
<b>Date Sampled</b>				13/11/2019	13/11/2019	13/11/2019		
<b>Time Taken</b>				1115	1200	1230		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10		
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10	< 10		

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10		
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10	< 10		



Analytical Report Number: 19-72170

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1363945	1363946	1363947		
<b>Sample Reference</b>				CP200	CP202	CP102		
<b>Sample Number</b>				None Supplied	None Supplied	None Supplied		
<b>Depth (m)</b>				10.50-11.00	4.50-5.00	4.00-4.50		
<b>Date Sampled</b>				13/11/2019	13/11/2019	13/11/2019		
<b>Time Taken</b>				1115	1200	1230		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0	< 1.0		
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0	< 1.0		
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 19-72170**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.

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**Analytical Report Number : 19-72170**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
CP102		W	19-72170	1363947	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP102		W	19-72170	1363947	c	Electrical conductivity at 20oC of water	L031-PL	c
CP102		W	19-72170	1363947	c	pH at 20oC in water (automated)	L099-PL	c
CP200		W	19-72170	1363945	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP200		W	19-72170	1363945	c	Electrical conductivity at 20oC of water	L031-PL	c
CP200		W	19-72170	1363945	c	pH at 20oC in water (automated)	L099-PL	c
CP202		W	19-72170	1363946	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP202		W	19-72170	1363946	c	Electrical conductivity at 20oC of water	L031-PL	c
CP202		W	19-72170	1363946	c	pH at 20oC in water (automated)	L099-PL	c



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## **Analytical Report Number : 19-78505**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	18/12/2019
<b>Your job number:</b>	35371	<b>Samples instructed on:</b>	19/12/2019
<b>Your order number:</b>		<b>Analysis completed by:</b>	02/01/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	02/01/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed:** 

Katarzyna Lewicka  
Head of Reporting Section

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.





Analytical Report Number: 19-78505

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1398123				
<b>Sample Reference</b>				CP104				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				None Supplied				
<b>Date Sampled</b>				17/12/2019				
<b>Time Taken</b>				1130				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.8				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	1400				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	392				
Total Sulphur	µg/l	15	NONE	130000				
Chloride	mg/l	0.15	ISO 17025	14				
Fluoride	µg/l	50	ISO 17025	650				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	150				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	8.20				
Nitrate as N	mg/l	0.01	ISO 17025	0.12				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	0.54				
Nitrite as N	µg/l	1	ISO 17025	7.3				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	24				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	240				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	< 0.3				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	1300				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	405				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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Analytical Report Number: 19-78505

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1398123				
<b>Sample Reference</b>				CP104				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				None Supplied				
<b>Date Sampled</b>				17/12/2019				
<b>Time Taken</b>				1130				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Analytical Parameter	Units	Limit of detection	Accreditation Status	Result				
Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	1.29				
Barium (dissolved)	µg/l	0.06	ISO 17025	14				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	180				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	140				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.7				
Copper (dissolved)	µg/l	0.5	ISO 17025	4.3				
Iron (dissolved)	mg/l	0.004	ISO 17025	1.7				
Lead (dissolved)	µg/l	0.2	ISO 17025	0.7				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	14				
Manganese (dissolved)	µg/l	0.05	ISO 17025	720				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	5.2				
Nickel (dissolved)	µg/l	0.5	ISO 17025	5.2				
Potassium (dissolved)	mg/l	0.025	ISO 17025	4.3				
Selenium (dissolved)	µg/l	0.6	ISO 17025	3.0				
Sodium (dissolved)	mg/l	0.01	ISO 17025	190				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Zinc (dissolved)	µg/l	0.5	ISO 17025	5.6				

**Monoaromatics & Oxygenates**

Analytical Parameter	Units	Limit of detection	Accreditation Status	Result				
Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

**Petroleum Hydrocarbons**

Analytical Parameter	Units	Limit of detection	Accreditation Status	Result				
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10				

Analytical Parameter	Units	Limit of detection	Accreditation Status	Result				
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10				



Analytical Report Number: 19-78505

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1398123				
<b>Sample Reference</b>				CP104				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				None Supplied				
<b>Date Sampled</b>				17/12/2019				
<b>Time Taken</b>				1130				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**VOCs**

Compound	Units	Limit of detection	Accreditation Status	Result				
Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 19-78505**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

Iss No 19-78505-1 A417 Missing Link 35371

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The results included within the report are representative of the samples submitted for analysis.



**Analytical Report Number : 19-78505**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil"	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



**Edward Crimp**

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## Analytical Report Number : 20-15432

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	22/06/2020
<b>Your job number:</b>	35371-01	<b>Sample instructed/ Analysis started on:</b>	23/06/2020
<b>Your order number:</b>		<b>Analysis completed by:</b>	16/07/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	16/07/2020
<b>Samples Analysed:</b>	2 water samples		

**Signed:** 

Joanna Wawrzeczko  
Technical Reviewer (Reporting Team)

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing.

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Analytical Report Number: 20-15432

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1540524	1540525			
<b>Sample Reference</b>				CP200	CP202			
<b>Sample Number</b>				3	3			
<b>Depth (m)</b>				3.00	0.50			
<b>Date Sampled</b>				18/06/2020	18/06/2020			
<b>Time Taken</b>				None Supplied	None Supplied			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.1	7.2			
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	870	620			
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	57.3	88.0			
Total Sulphur	µg/l	15	NONE	19000	29000			
Chloride	mg/l	0.15	ISO 17025	31	9.5			
Fluoride	µg/l	50	ISO 17025	510	500			
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	< 15	< 15			
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	9.06	2.42			
Nitrate as N	mg/l	0.01	ISO 17025	0.07	0.08			
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	0.29	0.34			
Nitrite as N	µg/l	1	ISO 17025	5.4	4.5			
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	18	15			
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	390	290			
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	< 0.3	< 0.3			
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	500	440			
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	337	307			

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5	< 0.5			
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5			
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5			
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5			
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5			
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16			
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Analytical Report Number: 20-15432

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1540524	1540525			
<b>Sample Reference</b>				CP200	CP202			
<b>Sample Number</b>				3	3			
<b>Depth (m)</b>				3.00	0.50			
<b>Date Sampled</b>				18/06/2020	18/06/2020			
<b>Time Taken</b>				None Supplied	None Supplied			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4	< 0.4			
Arsenic (dissolved)	µg/l	0.15	ISO 17025	13.5	0.65			
Barium (dissolved)	µg/l	0.06	ISO 17025	20	18			
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1			
Boron (dissolved)	µg/l	10	ISO 17025	250	110			
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02			
Calcium (dissolved)	mg/l	0.012	ISO 17025	110	110			
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0			
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0			
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Copper (dissolved)	µg/l	0.5	ISO 17025	6.2	1.9			
Iron (dissolved)	mg/l	0.004	ISO 17025	0.036	0.022			
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Magnesium (dissolved)	mg/l	0.005	ISO 17025	15	9.5			
Manganese (dissolved)	µg/l	0.05	ISO 17025	170	130			
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05			
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	1.7	1.6			
Nickel (dissolved)	µg/l	0.5	ISO 17025	2.0	3.6			
Potassium (dissolved)	mg/l	0.025	ISO 17025	2.9	1.7			
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6	< 0.6			
Sodium (dissolved)	mg/l	0.01	ISO 17025	40	12			
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Zinc (dissolved)	µg/l	0.5	ISO 17025	9.4	4.0			

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0			

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10			

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10			





Analytical Report Number: 20-15432

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1540524	1540525		
<b>Sample Reference</b>				CP200	CP202		
<b>Sample Number</b>				3	3		
<b>Depth (m)</b>				3.00	0.50		
<b>Date Sampled</b>				18/06/2020	18/06/2020		
<b>Time Taken</b>				None Supplied	None Supplied		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**VOCS**

Analytical Parameter	Units	Limit of detection	Accreditation Status	1540524	1540525		
Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0		
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0		
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-15432**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report relate only to the sample(s) submitted for testing.



**Analytical Report Number : 20-15432**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
CP200	3	W	20-15432	1540524	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP200	3	W	20-15432	1540524	c	Electrical conductivity at 20oC of water	L031-PL	c
CP200	3	W	20-15432	1540524	c	pH at 20oC in water (automated)	L099-PL	c
CP202	3	W	20-15432	1540525	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP202	3	W	20-15432	1540525	c	Electrical conductivity at 20oC of water	L031-PL	c
CP202	3	W	20-15432	1540525	c	pH at 20oC in water (automated)	L099-PL	c



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## Analytical Report Number : 20-15435

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	22/06/2020
<b>Your job number:</b>	35560-10	<b>Sample instructed/ Analysis started on:</b>	23/06/2020
<b>Your order number:</b>		<b>Analysis completed by:</b>	16/07/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	16/07/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed:** 

Joanna Wawrzeczko  
Technical Reviewer (Reporting Team)

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing.

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Analytical Report Number: 20-15435

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1540529				
<b>Sample Reference</b>				DSRC312				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				12.90				
<b>Date Sampled</b>				18/06/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.6				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	600				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	61.5				
Total Sulphur	µg/l	15	NONE	21000				
Chloride	mg/l	0.15	ISO 17025	15				
Fluoride	µg/l	50	ISO 17025	110				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	< 15				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	3.79				
Nitrate as N	mg/l	0.01	ISO 17025	1.19				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	5.29				
Nitrite as N	µg/l	1	ISO 17025	14				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	46				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	250				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	1.2				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	410				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	289				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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Analytical Report Number: 20-15435

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1540529				
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<b>Depth (m)</b>				12.90				
<b>Date Sampled</b>				18/06/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	0.5				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.60				
Barium (dissolved)	µg/l	0.06	ISO 17025	27				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	21				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	110				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Copper (dissolved)	µg/l	0.5	ISO 17025	2.3				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.013				
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	4.5				
Manganese (dissolved)	µg/l	0.05	ISO 17025	0.49				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	3.2				
Nickel (dissolved)	µg/l	0.5	ISO 17025	2.6				
Potassium (dissolved)	mg/l	0.025	ISO 17025	1.5				
Selenium (dissolved)	µg/l	0.6	ISO 17025	8.1				
Sodium (dissolved)	mg/l	0.01	ISO 17025	21				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.3				
Zinc (dissolved)	µg/l	0.5	ISO 17025	< 0.5				

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10				

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10				



Analytical Report Number: 20-15435

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1540529				
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<b>Depth (m)</b>				12.90				
<b>Date Sampled</b>				18/06/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

U/S = Unsuitable Sample I/S = Insufficient Sample





**Analytical Report Number : 20-15435**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

Iss No 20-15435-1 A417 Missing Link 35560-10

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The results included within the report relate only to the sample(s) submitted for testing.



**Analytical Report Number : 20-15435**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSRC312	1	W	20-15435	1540529	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC312	1	W	20-15435	1540529	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC312	1	W	20-15435	1540529	c	pH at 20oC in water (automated)	L099-PL	c



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## **Analytical Report Number : 20-16505**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	29/06/2020
<b>Your job number:</b>	35371-01	<b>Sample instructed/ Analysis started on:</b>	29/06/2020
<b>Your order number:</b>		<b>Analysis completed by:</b>	16/07/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	16/07/2020
<b>Samples Analysed:</b>	3 water samples		

**Signed:** [Redacted]

Agnieszka Czerwińska

Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Iss No 20-16505-1 A417 Missing Link 35371-01

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The results included within the report relate only to the sample(s) submitted for testing.

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Analytical Report Number: 20-16505

Project / Site name: A417 Missing Link

Lab Sample Number				1546459	1546460	1546461		
Sample Reference				CP104A	CP202	CP204		
Sample Number				2	3	3		
Depth (m)				10.00	0.50	11.00		
Date Sampled				25/06/2020	25/06/2020	25/06/2020		
Time Taken				1000	1330	1100		
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					

**General Inorganics**

	pH Units	N/A	ISO 17025	7.5	7.2	7.3		
pH								
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	1200	590	830		
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10		
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10		
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	338	84.9	42.7		
Total Sulphur	µg/l	15	NONE	110000	28000	14000		
Chloride	mg/l	0.15	ISO 17025	12	8.6	75		
Fluoride	µg/l	50	ISO 17025	490	490	360		
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	220	32	< 15		
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	5.94	1.72	5.86		
Nitrate as N	mg/l	0.01	ISO 17025	0.13	0.08	2.09		
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	0.59	0.34	9.26		
Nitrite as N	µg/l	1	ISO 17025	14	35	12		
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	44	110	39		
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	300	240	82		
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	< 0.3	< 0.3	2.1		
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	920	390	630		
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	351	320	452		

**Phenols by HPLC**

	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5		
Catechol								
Resorcinol								
Ethylphenol & Dimethylphenol								
Cresols								
Naphthols								
Isopropylphenol								
Phenol								
Trimethylphenol								

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5	< 3.5		
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**Speciated PAHs**

	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Naphthalene								
Acenaphthylene								
Acenaphthene								
Fluorene								
Phenanthrene								
Anthracene								
Fluoranthene								
Pyrene								
Benzo(a)anthracene								
Chrysene								
Benzo(b)fluoranthene								
Benzo(k)fluoranthene								
Benzo(a)pyrene								
Indeno(1,2,3-cd)pyrene								
Dibenz(a,h)anthracene								
Benzo(ghi)perylene								

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16		
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Analytical Report Number: 20-16505

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1546459	1546460	1546461		
<b>Sample Reference</b>				CP104A	CP202	CP204		
<b>Sample Number</b>				2	3	3		
<b>Depth (m)</b>				10.00	0.50	11.00		
<b>Date Sampled</b>				25/06/2020	25/06/2020	25/06/2020		
<b>Time Taken</b>				1000	1330	1100		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	0.6	< 0.4	< 0.4		
Arsenic (dissolved)	µg/l	0.15	ISO 17025	1.21	1.02	0.73		
Barium (dissolved)	µg/l	0.06	ISO 17025	26	12	29		
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1		
Boron (dissolved)	µg/l	10	ISO 17025	220	100	370		
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02	< 0.02		
Calcium (dissolved)	mg/l	0.012	ISO 17025	120	110	150		
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0		
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0		
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.3	< 0.2		
Copper (dissolved)	µg/l	0.5	ISO 17025	12	58	5.9		
Iron (dissolved)	mg/l	0.004	ISO 17025	0.19	0.016	0.49		
Lead (dissolved)	µg/l	0.2	ISO 17025	0.4	0.7	< 0.2		
Magnesium (dissolved)	mg/l	0.005	ISO 17025	15	10	21		
Manganese (dissolved)	µg/l	0.05	ISO 17025	780	140	4.0		
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05		
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	2.9	0.33	9.5		
Nickel (dissolved)	µg/l	0.5	ISO 17025	5.5	3.9	1.1		
Potassium (dissolved)	mg/l	0.025	ISO 17025	4.5	1.8	3.1		
Selenium (dissolved)	µg/l	0.6	ISO 17025	1.1	0.7	1.5		
Sodium (dissolved)	mg/l	0.01	ISO 17025	180	13	29		
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.5	0.7	< 0.2		
Zinc (dissolved)	µg/l	0.5	ISO 17025	15	5.5	0.7		

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10		
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10	< 10		

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10		
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10	< 10		



Analytical Report Number: 20-16505  
 Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1546459	1546460	1546461		
<b>Sample Reference</b>				CP104A	CP202	CP204		
<b>Sample Number</b>				2	3	3		
<b>Depth (m)</b>				10.00	0.50	11.00		
<b>Date Sampled</b>				25/06/2020	25/06/2020	25/06/2020		
<b>Time Taken</b>				1000	1330	1100		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0	< 1.0		
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0	< 1.0		
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-16505**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report relate only to the sample(s) submitted for testing.





**Analytical Report Number : 20-16505**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
CP104A	2	W	20-16505	1546459	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP104A	2	W	20-16505	1546459	c	Electrical conductivity at 20oC of water	L031-PL	c
CP104A	2	W	20-16505	1546459	c	pH at 20oC in water (automated)	L099-PL	c
CP202	3	W	20-16505	1546460	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP202	3	W	20-16505	1546460	c	Electrical conductivity at 20oC of water	L031-PL	c
CP202	3	W	20-16505	1546460	c	pH at 20oC in water (automated)	L099-PL	c
CP204	3	W	20-16505	1546461	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP204	3	W	20-16505	1546461	c	Electrical conductivity at 20oC of water	L031-PL	c
CP204	3	W	20-16505	1546461	c	pH at 20oC in water (automated)	L099-PL	c



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## Analytical Report Number : 20-16520

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	29/06/2020
<b>Your job number:</b>	35560-10	<b>Sample instructed/ Analysis started on:</b>	29/06/2020
<b>Your order number:</b>		<b>Analysis completed by:</b>	16/07/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	16/07/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed:** 

Agnieszka Czerwińska

Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing.

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Analytical Report Number: 20-16520

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1546510				
<b>Sample Reference</b>				DSRC312				
<b>Sample Number</b>				2				
<b>Depth (m)</b>				None Supplied				
<b>Date Sampled</b>				25/06/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.6				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	500				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	31.5				
Total Sulphur	µg/l	15	NONE	10000				
Chloride	mg/l	0.15	ISO 17025	9.8				
Fluoride	µg/l	50	ISO 17025	190				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	22				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	2.48				
Nitrate as N	mg/l	0.01	ISO 17025	1.06				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	4.70				
Nitrite as N	µg/l	1	ISO 17025	27				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	88				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	180				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	1.1				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	470				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	238				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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Analytical Report Number: 20-16520

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1546510				
<b>Sample Reference</b>				DSRC312				
<b>Sample Number</b>				2				
<b>Depth (m)</b>				None Supplied				
<b>Date Sampled</b>				25/06/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	0.4				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.58				
Barium (dissolved)	µg/l	0.06	ISO 17025	28				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	19				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	89				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Copper (dissolved)	µg/l	0.5	ISO 17025	6.1				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.014				
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	3.6				
Manganese (dissolved)	µg/l	0.05	ISO 17025	6.8				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.79				
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.3				
Potassium (dissolved)	mg/l	0.025	ISO 17025	1.1				
Selenium (dissolved)	µg/l	0.6	ISO 17025	1.4				
Sodium (dissolved)	mg/l	0.01	ISO 17025	9.0				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.3				
Zinc (dissolved)	µg/l	0.5	ISO 17025	2.9				

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10				

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10				



Analytical Report Number: 20-16520

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1546510				
<b>Sample Reference</b>				DSRC312				
<b>Sample Number</b>				2				
<b>Depth (m)</b>				None Supplied				
<b>Date Sampled</b>				25/06/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-16520**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

Iss No 20-16520-1 A417 Missing Link 35560-10

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**Analytical Report Number : 20-16520**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSRC312	2	W	20-16520	1546510	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC312	2	W	20-16520	1546510	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC312	2	W	20-16520	1546510	c	pH at 20oC in water (automated)	L099-PL	c



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## **Analytical Report Number : 20-16524**

<b>Project / Site name:</b>	A17 Missing Link	<b>Samples received on:</b>	29/06/2020
<b>Your job number:</b>	35560-03	<b>Sample instructed/ Analysis started on:</b>	29/06/2020
<b>Your order number:</b>		<b>Analysis completed by:</b>	16/07/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	16/07/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed:** 

Agnieszka Czerwińska

Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Iss No 20-16524-1 A17 Missing Link 35560-03

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The results included within the report relate only to the sample(s) submitted for testing.

Page 1 of 7



Analytical Report Number: 20-16524

Project / Site name: A17 Missing Link

<b>Lab Sample Number</b>				1546519				
<b>Sample Reference</b>				DSRC315A				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				None Supplied				
<b>Date Sampled</b>				25/06/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.4				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	550				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	35.5				
Total Sulphur	µg/l	15	NONE	12000				
Chloride	mg/l	0.15	ISO 17025	15				
Fluoride	µg/l	50	ISO 17025	120				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	20				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	2.61				
Nitrate as N	mg/l	0.01	ISO 17025	1.05				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	4.65				
Nitrite as N	µg/l	1	ISO 17025	880				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	2900				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	220				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	1.9				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	450				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	278				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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Analytical Report Number: 20-16524

Project / Site name: A17 Missing Link

<b>Lab Sample Number</b>				1546519				
<b>Sample Reference</b>				DSRC315A				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				None Supplied				
<b>Date Sampled</b>				25/06/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	0.5				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.78				
Barium (dissolved)	µg/l	0.06	ISO 17025	39				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	20				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	97				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Copper (dissolved)	µg/l	0.5	ISO 17025	11				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.016				
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	8.4				
Manganese (dissolved)	µg/l	0.05	ISO 17025	34				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.93				
Nickel (dissolved)	µg/l	0.5	ISO 17025	2.2				
Potassium (dissolved)	mg/l	0.025	ISO 17025	2.0				
Selenium (dissolved)	µg/l	0.6	ISO 17025	1.1				
Sodium (dissolved)	mg/l	0.01	ISO 17025	9.4				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Zinc (dissolved)	µg/l	0.5	ISO 17025	2.1				

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10				

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10				



Analytical Report Number: 20-16524

Project / Site name: A17 Missing Link

<b>Lab Sample Number</b>				1546519				
<b>Sample Reference</b>				DSRC315A				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				None Supplied				
<b>Date Sampled</b>				25/06/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-16524**

**Project / Site name: A17 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

Iss No 20-16524-1 A17 Missing Link 35560-03

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The results included within the report relate only to the sample(s) submitted for testing.



**Analytical Report Number : 20-16524**

**Project / Site name: A17 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



Sample ID	Other ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSRC315A	1	W	20-16524	1546519	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC315A	1	W	20-16524	1546519	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC315A	1	W	20-16524	1546519	c	pH at 20oC in water (automated)	L099-PL	c





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## **Analytical Report Number : 20-21538**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	27/07/2020
<b>Your job number:</b>	35371-01	<b>Sample instructed/ Analysis started on:</b>	27/07/2020
<b>Your order number:</b>		<b>Analysis completed by:</b>	03/08/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	03/08/2020
<b>Samples Analysed:</b>	2 water samples		

**Signed:** 

Agnieszka Czerwińska

Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing.

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Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1573860	1573861			
<b>Sample Reference</b>				CP104A	CP204			
<b>Sample Number</b>				3	3			
<b>Depth (m)</b>				10.18	12.68			
<b>Date Sampled</b>				22/07/2020	22/07/2020			
<b>Time Taken</b>				1018	1118			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.4	7.3			
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	910	860			
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	189	45.6			
Total Sulphur	µg/l	15	NONE	63000	15000			
Chloride	mg/l	0.15	ISO 17025	10	71			
Fluoride	µg/l	50	ISO 17025	360	290			
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	100	50			
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	5.84	6.81			
Nitrate as N	mg/l	0.01	ISO 17025	0.06	1.15			
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	0.25	5.10			
Nitrite as N	µg/l	1	ISO 17025	10	34			
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	33	110			
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	340	290			
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	< 0.3	1.2			
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	620	580			
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	383	393			

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5	< 0.5			
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5			
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5			
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5			
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5			
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Project / Site name: A417 Missing Link

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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16			
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**Heavy Metals / Metalloids**

	Units	Limit of detection	Accreditation Status	1573860	1573861		
Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4	< 0.4		
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.38	0.55		
Barium (dissolved)	µg/l	0.06	ISO 17025	7.6	23		
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1		
Boron (dissolved)	µg/l	10	ISO 17025	210	350		
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02		
Calcium (dissolved)	mg/l	0.012	ISO 17025	130	130		
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0		
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0		
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2		
Copper (dissolved)	µg/l	0.5	ISO 17025	2.1	2.3		
Iron (dissolved)	mg/l	0.004	ISO 17025	< 0.004	0.031		
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2		
Magnesium (dissolved)	mg/l	0.005	ISO 17025	14	17		
Manganese (dissolved)	µg/l	0.05	ISO 17025	290	22		
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05		
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.37	6.1		
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.6	1.2		
Potassium (dissolved)	mg/l	0.025	ISO 17025	2.8	2.8		
Selenium (dissolved)	µg/l	0.6	ISO 17025	0.9	< 0.6		
Sodium (dissolved)	mg/l	0.01	ISO 17025	61	24		
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.3		
Zinc (dissolved)	µg/l	0.5	ISO 17025	6.0	6.4		



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<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0		

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10		
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10		

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10		
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10		



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**VOCS**

Analytical Parameter	Units	Limit of detection	Accreditation Status	1573860	1573861		
Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0		
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0		
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-21538**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
CP104A	3	W	20-21538	1573860	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP104A	3	W	20-21538	1573860	c	Electrical conductivity at 20oC of water	L031-PL	c
CP104A	3	W	20-21538	1573860	c	Nitrate as N in water	L078-PL	c
CP104A	3	W	20-21538	1573860	c	Nitrate in water	L078-PL	c
CP104A	3	W	20-21538	1573860	c	Nitrite as N in water	L082-PL	c
CP104A	3	W	20-21538	1573860	c	Nitrite in water	L082-PL	c
CP104A	3	W	20-21538	1573860	c	Total oxidised nitrogen in water	L078/82-PL	c
CP104A	3	W	20-21538	1573860	c	pH at 20oC in water (automated)	L099-PL	c
CP204	3	W	20-21538	1573861	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP204	3	W	20-21538	1573861	c	Electrical conductivity at 20oC of water	L031-PL	c
CP204	3	W	20-21538	1573861	c	Nitrate as N in water	L078-PL	c
CP204	3	W	20-21538	1573861	c	Nitrate in water	L078-PL	c
CP204	3	W	20-21538	1573861	c	Nitrite as N in water	L082-PL	c
CP204	3	W	20-21538	1573861	c	Nitrite in water	L082-PL	c
CP204	3	W	20-21538	1573861	c	Total oxidised nitrogen in water	L078/82-PL	c
CP204	3	W	20-21538	1573861	c	pH at 20oC in water (automated)	L099-PL	c



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## **Analytical Report Number : 20-21541**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	27/07/2020
<b>Your job number:</b>	35560-03	<b>Sample instructed/ Analysis started on:</b>	27/07/2020
<b>Your order number:</b>		<b>Analysis completed by:</b>	03/08/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	03/08/2020
<b>Samples Analysed:</b>	2 water samples		

**Signed:** 

Agnieszka Czerwińska

Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing.

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Analytical Report Number: 20-21541

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1573879	1573880		
<b>Sample Reference</b>				DSRC315A	DSRC220		
<b>Sample Number</b>				2	3		
<b>Depth (m)</b>				51.24	3.57		
<b>Date Sampled</b>				22/07/2020	22/07/2020		
<b>Time Taken</b>				0944	0926		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.5	7.5		
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	610	650		
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10		
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10		
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	68.9	34.9		
Total Sulphur	µg/l	15	NONE	23000	12000		
Chloride	mg/l	0.15	ISO 17025	20	12		
Fluoride	µg/l	50	ISO 17025	170	150		
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	120	170		
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	2.99	4.93		
Nitrate as N	mg/l	0.01	ISO 17025	1.55	0.04		
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	6.86	0.20		
Nitrite as N	µg/l	1	ISO 17025	3.9	4.2		
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	13	14		
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	190	240		
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	1.6	< 0.3		
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	400	400		
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	299	368		

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5	< 0.5		
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5		
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5		
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5		
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5		
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5		
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5		
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5		

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5		
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16		
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Analytical Report Number: 20-21541

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1573879	1573880		
<b>Sample Reference</b>				DSRC315A	DSRC220		
<b>Sample Number</b>				2	3		
<b>Depth (m)</b>				51.24	3.57		
<b>Date Sampled</b>				22/07/2020	22/07/2020		
<b>Time Taken</b>				0944	0926		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	1.8	< 0.4		
Arsenic (dissolved)	µg/l	0.15	ISO 17025	1.39	0.25		
Barium (dissolved)	µg/l	0.06	ISO 17025	29	11		
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1		
Boron (dissolved)	µg/l	10	ISO 17025	18	31		
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02		
Calcium (dissolved)	mg/l	0.012	ISO 17025	96	130		
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0		
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0		
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2		
Copper (dissolved)	µg/l	0.5	ISO 17025	0.6	2.0		
Iron (dissolved)	mg/l	0.004	ISO 17025	< 0.004	< 0.004		
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2		
Magnesium (dissolved)	mg/l	0.005	ISO 17025	14	10		
Manganese (dissolved)	µg/l	0.05	ISO 17025	7.7	17		
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05		
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.82	0.07		
Nickel (dissolved)	µg/l	0.5	ISO 17025	2.5	1.1		
Potassium (dissolved)	mg/l	0.025	ISO 17025	1.9	1.7		
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6	< 0.6		
Sodium (dissolved)	mg/l	0.01	ISO 17025	12	6.0		
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2		
Zinc (dissolved)	µg/l	0.5	ISO 17025	1.6	3.9		

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0		

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10		
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10		

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10		
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10		



Analytical Report Number: 20-21541

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1573879	1573880		
<b>Sample Reference</b>				DSRC315A	DSRC220		
<b>Sample Number</b>				2	3		
<b>Depth (m)</b>				51.24	3.57		
<b>Date Sampled</b>				22/07/2020	22/07/2020		
<b>Time Taken</b>				0944	0926		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0		
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0		
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-21541**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSRC220		3 W	20-21541	1573880	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC220		3 W	20-21541	1573880	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC220		3 W	20-21541	1573880	c	Nitrate as N in water	L078-PL	c
DSRC220		3 W	20-21541	1573880	c	Nitrate in water	L078-PL	c
DSRC220		3 W	20-21541	1573880	c	Nitrite as N in water	L082-PL	c
DSRC220		3 W	20-21541	1573880	c	Nitrite in water	L082-PL	c
DSRC220		3 W	20-21541	1573880	c	Total oxidised nitrogen in water	L078/82-PL	c
DSRC220		3 W	20-21541	1573880	c	pH at 20oC in water (automated)	L099-PL	c
DSRC315A		2 W	20-21541	1573879	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC315A		2 W	20-21541	1573879	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC315A		2 W	20-21541	1573879	c	Nitrate as N in water	L078-PL	c
DSRC315A		2 W	20-21541	1573879	c	Nitrate in water	L078-PL	c
DSRC315A		2 W	20-21541	1573879	c	Nitrite as N in water	L082-PL	c
DSRC315A		2 W	20-21541	1573879	c	Nitrite in water	L082-PL	c
DSRC315A		2 W	20-21541	1573879	c	Total oxidised nitrogen in water	L078/82-PL	c
DSRC315A		2 W	20-21541	1573879	c	pH at 20oC in water (automated)	L099-PL	c





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## **Analytical Report Number : 20-22119**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	29/07/2020
<b>Your job number:</b>	35560-10	<b>Sample instructed/ Analysis started on:</b>	30/07/2020
<b>Your order number:</b>		<b>Analysis completed by:</b>	06/08/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	07/08/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed:** 

Agnieszka Czerwińska

Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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The results included within the report relate only to the sample(s) submitted for testing.

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Analytical Report Number: 20-22119

Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1577813				
<b>Sample Reference</b>				DSRC312				
<b>Sample Number</b>				3				
<b>Depth (m)</b>				12.95				
<b>Date Sampled</b>				28/07/2020				
<b>Time Taken</b>				1000				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.8				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	470				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	32.4				
Total Sulphur	µg/l	15	NONE	11000				
Chloride	mg/l	0.15	ISO 17025	7.3				
Fluoride	µg/l	50	ISO 17025	120				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	36				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	2.01				
Nitrate as N	mg/l	0.01	ISO 17025	1.06				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	4.71				
Nitrite as N	µg/l	1	ISO 17025	5.5				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	18				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	230				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	1.1				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	330				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	266				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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<b>Time Taken</b>				1000				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.69				
Barium (dissolved)	µg/l	0.06	ISO 17025	19				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	< 10				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	100				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Copper (dissolved)	µg/l	0.5	ISO 17025	0.6				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.005				
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	3.0				
Manganese (dissolved)	µg/l	0.05	ISO 17025	2.0				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.29				
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.4				
Potassium (dissolved)	mg/l	0.025	ISO 17025	0.88				
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6				
Sodium (dissolved)	mg/l	0.01	ISO 17025	7.5				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.4				
Zinc (dissolved)	µg/l	0.5	ISO 17025	1.7				

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10				

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10				



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 Project / Site name: A417 Missing Link

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<b>Time Taken</b>				1000				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**VOCS**

Analytical Parameter	Units	Limit of detection	Accreditation Status	Result				
Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-22119**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



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## **Analytical Report Number : 20-80295**

<b>Project / Site name:</b>	A417 Missing Link - Crickley Tractors	<b>Samples received on:</b>	08/01/2020
<b>Your job number:</b>	35560	<b>Samples instructed on:</b>	10/01/2020
<b>Your order number:</b>		<b>Analysis completed by:</b>	17/01/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	17/01/2020
<b>Samples Analysed:</b>	5 water samples		

**Signed:** 

Katarzyna Lewicka  
Head of Reporting Section

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 20-80295

Project / Site name: A417 Missing Link - Crickley Tractors

Lab Sample Number	1408184	1408185	1408186	1408187	1408188
Sample Reference	CP206	CP216	DSRC224	CP212	CP223
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled	08/01/2020	08/01/2020	08/01/2020	08/01/2020	08/01/2020
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status		

**General Inorganics**

	pH Units	N/A	ISO 17025	7.1	12.2	12.5	7.5	12.1
pH								
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	570	2800	4800	570	2300
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	7.27	3.66	25.9	18.4	26.5
Total Sulphur	µg/l	15	NONE	2400	1200	8600	6100	8800
Chloride	mg/l	0.15	ISO 17025	2.6	16	25	9.5	9.4
Fluoride	µg/l	50	ISO 17025	110	220	650	360	170
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	< 15	550	14000	180	620
Nitrate as N	mg/l	0.01	ISO 17025	0.87	0.64	0.76	0.97	1.07
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	3.87	2.85	3.39	4.30	4.73
Nitrite as N	µg/l	1	ISO 17025	39	130	3800	49	60
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	130	420	12000	160	200
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	220	510	730	450	420
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	0.9	0.8	4.5	1.0	1.1
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	130	630	1100	110	540
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	339	374	734	255	341
Dissolved Oxygen	mg/l	1	NONE	5.7	4.6	6.2	7.3	5.4

**Phenols by HPLC**

	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Catechol								
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5	< 3.5	< 3.5	< 3.5

**Speciated PAHs**

	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Naphthalene								
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16





Analytical Report Number: 20-80295

Project / Site name: A417 Missing Link - Crickley Tractors

Lab Sample Number	1408184	1408185	1408186	1408187	1408188
Sample Reference	CP206	CP216	DSRC224	CP212	CP223
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled	08/01/2020	08/01/2020	08/01/2020	08/01/2020	08/01/2020
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status		

**Heavy Metals / Metalloids**

Element	Unit	Limit of detection	Accreditation Status	1408184	1408185	1408186	1408187	1408188
Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4	0.4	0.6	< 0.4	0.7
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.25	1.62	0.56	0.44	0.87
Barium (dissolved)	µg/l	0.06	ISO 17025	17	220	72	11	52
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Boron (dissolved)	µg/l	10	ISO 17025	15	15	340	440	66
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.02	0.02	< 0.02	< 0.02	0.06
Calcium (dissolved)	mg/l	0.012	ISO 17025	130	150	290	78	140
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.2	< 0.2	0.5	< 0.2	1.0
Copper (dissolved)	µg/l	0.5	ISO 17025	0.7	2.6	6.9	0.7	5.6
Iron (dissolved)	mg/l	0.004	ISO 17025	0.47	0.65	0.18	0.42	0.46
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.3	1.4	< 0.2	2.0
Magnesium (dissolved)	mg/l	0.005	ISO 17025	2.2	0.52	0.022	15	0.33
Manganese (dissolved)	µg/l	0.05	ISO 17025	64	1.5	1.5	110	11
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	0.14	< 0.05	< 0.05
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.65	6.5	5.3	2.2	5.7
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.2	24	3.7	4.1	5.5
Potassium (dissolved)	mg/l	0.025	ISO 17025	1.6	44	12	3.5	110
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6	2.0	1.3	< 0.6	0.9
Sodium (dissolved)	mg/l	0.01	ISO 17025	4.3	140	260	53	110
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.3	1.7	0.9	< 0.2	8.5
Zinc (dissolved)	µg/l	0.5	ISO 17025	2.3	9.5	6.1	11	3.7

**Monoaromatics & Oxygenates**

Compound	Unit	Limit of detection	Accreditation Status	1408184	1408185	1408186	1408187	1408188
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	6.4	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	6.4	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10



Analytical Report Number: 20-80295

Project / Site name: A417 Missing Link - Crickley Tractors

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Sample Reference	CP206	CP216	DSRC224	CP212	CP223
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled	08/01/2020	08/01/2020	08/01/2020	08/01/2020	08/01/2020
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status		

**VOCS**

Compound	Units	Limit of detection	Accreditation Status	1408184	1408185	1408186	1408187	1408188
Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	6.4	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-80295**

**Project / Site name: A417 Missing Link - Crickley Tractors**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Oxygen in water	Determination of dissolved oxygen.	In-house method	L086-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

Iss No 20-80295-1 A417 Missing Link - Crickley Tractors 35560

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The results included within the report are representative of the samples submitted for analysis.



**Analytical Report Number : 20-80295**

**Project / Site name: A417 Missing Link - Crickley Tractors**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil"	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

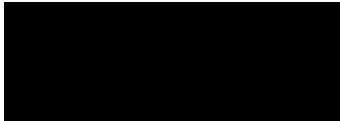
## Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
CP206		W	20-80295	1408184	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP206		W	20-80295	1408184	c	Dissolved Oxygen in water	L086-PL	c
CP206		W	20-80295	1408184	c	Electrical conductivity at 20oC of water	L031-PL	c
CP206		W	20-80295	1408184	c	pH at 20oC in water (automated)	L099-PL	c
CP212		W	20-80295	1408187	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP212		W	20-80295	1408187	c	Dissolved Oxygen in water	L086-PL	c
CP212		W	20-80295	1408187	c	Electrical conductivity at 20oC of water	L031-PL	c
CP212		W	20-80295	1408187	c	pH at 20oC in water (automated)	L099-PL	c
CP216		W	20-80295	1408185	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP216		W	20-80295	1408185	c	Dissolved Oxygen in water	L086-PL	c
CP216		W	20-80295	1408185	c	Electrical conductivity at 20oC of water	L031-PL	c
CP216		W	20-80295	1408185	c	pH at 20oC in water (automated)	L099-PL	c
CP223		W	20-80295	1408188	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP223		W	20-80295	1408188	c	Dissolved Oxygen in water	L086-PL	c
CP223		W	20-80295	1408188	c	Electrical conductivity at 20oC of water	L031-PL	c
CP223		W	20-80295	1408188	c	pH at 20oC in water (automated)	L099-PL	c
DSRC224		W	20-80295	1408186	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC224		W	20-80295	1408186	c	Dissolved Oxygen in water	L086-PL	c
DSRC224		W	20-80295	1408186	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC224		W	20-80295	1408186	c	pH at 20oC in water (automated)	L099-PL	c



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## **Analytical Report Number : 20-80420**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	09/01/2020
<b>Your job number:</b>	35371	<b>Samples instructed on:</b>	10/01/2020
<b>Your order number:</b>		<b>Analysis completed by:</b>	17/01/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	17/01/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed:**



Agnieszka Czerwińska

Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 20-80420  
Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1408805				
<b>Sample Reference</b>				CP204				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				12.00-12.50				
<b>Date Sampled</b>				08/01/2020				
<b>Time Taken</b>				1442				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.3				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	830				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	29.6				
Total Sulphur	µg/l	15	NONE	9900				
Chloride	mg/l	0.15	ISO 17025	75				
Fluoride	µg/l	50	ISO 17025	460				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	480				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	4.86				
Nitrate as N	mg/l	0.01	ISO 17025	0.86				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	3.82				
Nitrite as N	µg/l	1	ISO 17025	73				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	240				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	320				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	0.9				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	390				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	418				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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Analytical Report Number: 20-80420  
 Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1408805				
<b>Sample Reference</b>				CP204				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				12.00-12.50				
<b>Date Sampled</b>				08/01/2020				
<b>Time Taken</b>				1442				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

	Units	Limit of detection	Accreditation Status					
Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.49				
Barium (dissolved)	µg/l	0.06	ISO 17025	20				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	400				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	140				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.2				
Copper (dissolved)	µg/l	0.5	ISO 17025	1.6				
Iron (dissolved)	mg/l	0.004	ISO 17025	30				
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	17				
Manganese (dissolved)	µg/l	0.05	ISO 17025	160				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	4.8				
Nickel (dissolved)	µg/l	0.5	ISO 17025	0.7				
Potassium (dissolved)	mg/l	0.025	ISO 17025	2.8				
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6				
Sodium (dissolved)	mg/l	0.01	ISO 17025	23				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Zinc (dissolved)	µg/l	0.5	ISO 17025	1.5				

**Monoaromatics & Oxygenates**

	Units	Limit of detection	Accreditation Status					
Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

**Petroleum Hydrocarbons**

	Units	Limit of detection	Accreditation Status					
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10				

	Units	Limit of detection	Accreditation Status					
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10				





Analytical Report Number: 20-80420  
 Project / Site name: A417 Missing Link

<b>Lab Sample Number</b>				1408805				
<b>Sample Reference</b>				CP204				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				12.00-12.50				
<b>Date Sampled</b>				08/01/2020				
<b>Time Taken</b>				1442				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**VOCs**

Compound	Units	Limit of detection	Accreditation Status	Result				
Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-80420**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.



**Analytical Report Number : 20-80420**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil"	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
CP204	1	W	20-80420	1408805	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP204	1	W	20-80420	1408805	c	Electrical conductivity at 20oC of water	L031-PL	c
CP204	1	W	20-80420	1408805	c	pH at 20oC in water (automated)	L099-PL	c



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## **Analytical Report Number : 20-92649**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	13/03/2020
<b>Your job number:</b>	35560	<b>Samples instructed on:</b>	16/03/2020
<b>Your order number:</b>	35560-DO	<b>Analysis completed by:</b>	24/03/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	24/03/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed:** [Redacted]

Agnieszka Czerwińska

Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 20-92649

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1472620				
<b>Sample Reference</b>				DSRC110				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				30.15				
<b>Date Sampled</b>				04/03/2020				
<b>Time Taken</b>				1415				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	8.0				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	450				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	17.8				
Total Sulphur	µg/l	15	NONE	5900				
Chloride	mg/l	0.15	ISO 17025	26				
Fluoride	µg/l	50	ISO 17025	100				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	< 15				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	7.90				
Nitrate as N	mg/l	0.01	ISO 17025	6.09				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	27.0				
Nitrite as N	µg/l	1	ISO 17025	13				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	43				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	170				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	6.1				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	340				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	163				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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Analytical Report Number: 20-92649

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1472620				
<b>Sample Reference</b>				DSRC110				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				30.15				
<b>Date Sampled</b>				04/03/2020				
<b>Time Taken</b>				1415				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.59				
Barium (dissolved)	µg/l	0.06	ISO 17025	7.5				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	< 10				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	62				
Chromium (hexavalent)	µg/l	5	ISO 17025	U/S**				
Chromium (III)	µg/l	1	NONE	U/S**				
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.5				
Copper (dissolved)	µg/l	0.5	ISO 17025	2.6				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.15				
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	2.2				
Manganese (dissolved)	µg/l	0.05	ISO 17025	1.6				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.50				
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.2				
Potassium (dissolved)	mg/l	0.025	ISO 17025	0.71				
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6				
Sodium (dissolved)	mg/l	0.01	ISO 17025	12				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.5				
Zinc (dissolved)	µg/l	0.5	ISO 17025	3.6				

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10				

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10				



Analytical Report Number: 20-92649

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1472620				
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<b>Sample Number</b>				1				
<b>Depth (m)</b>				30.15				
<b>Date Sampled</b>				04/03/2020				
<b>Time Taken</b>				1415				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

\*\* Due to method variation, results for Hexavalent Chromium and Total Chromium do not agree.





Analytical Report Number: 20-92649

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1472620				
<b>Sample Reference</b>				DSRC110				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				30.15				
<b>Date Sampled</b>				04/03/2020				
<b>Time Taken</b>				1415				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-92649**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.

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**Analytical Report Number : 20-92649**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

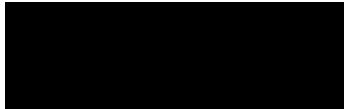
## Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSRC110	1	W	20-92649	1472620	c	BTEX and MTBE in water (Monoaromatics)	L073B-PL	c
DSRC110	1	W	20-92649	1472620	c	Hexavalent chromium in water	L080-PL	c
DSRC110	1	W	20-92649	1472620	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC110	1	W	20-92649	1472620	c	Boron in water	L039-PL	c
DSRC110	1	W	20-92649	1472620	c	Cr (III) in water	L080-PL	c
DSRC110	1	W	20-92649	1472620	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC110	1	W	20-92649	1472620	c	Free cyanide in water	L080-PL	c
DSRC110	1	W	20-92649	1472620	c	Metals in water by ICP-MS (dissolved)	L012-PL	c
DSRC110	1	W	20-92649	1472620	c	Metals in water by ICP-OES (dissolved)	L039-PL	c
DSRC110	1	W	20-92649	1472620	c	Nitrate as N in water	L078-PL	c
DSRC110	1	W	20-92649	1472620	c	Nitrate in water	L078-PL	c
DSRC110	1	W	20-92649	1472620	c	Nitrite as N in water	L082-PL	c
DSRC110	1	W	20-92649	1472620	c	Nitrite in water	L082-PL	c
DSRC110	1	W	20-92649	1472620	c	Sulphate in water	L039-PL	c
DSRC110	1	W	20-92649	1472620	c	Total Hardness of water	L045-PL	c
DSRC110	1	W	20-92649	1472620	c	Total cyanide in water	L080-PL	c
DSRC110	1	W	20-92649	1472620	c	Total oxidised nitrogen in water	L078/82-PL	c
DSRC110	1	W	20-92649	1472620	c	Volatile organic compounds in water	L073B-PL	c
DSRC110	1	W	20-92649	1472620	c	pH at 20oC in water (automated)	L099-PL	c



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## **Analytical Report Number : 20-92651**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	13/03/2020
<b>Your job number:</b>	35560	<b>Samples instructed on:</b>	13/03/2020
<b>Your order number:</b>	35560-DO	<b>Analysis completed by:</b>	20/03/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	20/03/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed:**



Karolina Marek  
PL Head of Reporting Team

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Iss No 20-92651-1 A417 Missing Link 35560

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 20-92651  
Project / Site name: A417 Missing Link

Your Order No: 35560-DO

Lab Sample Number	1472631						
Sample Reference	CP106						
Sample Number	1						
Depth (m)	15.74						
Date Sampled	04/03/2020						
Time Taken	1510						
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				

**General Inorganics**

pH	pH Units	N/A	ISO 17025	12.4			
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	3400			
Total Cyanide	µg/l	10	ISO 17025	< 10			
Free Cyanide	µg/l	10	ISO 17025	< 10			
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	15.4			
Total Sulphur	µg/l	15	NONE	5100			
Chloride	mg/l	0.15	ISO 17025	24			
Fluoride	µg/l	50	ISO 17025	820			
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	1700			
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	46.4			
Nitrate as N	mg/l	0.01	ISO 17025	0.98			
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	4.33			
Nitrite as N	µg/l	1	ISO 17025	43			
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	140			
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	970			
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	1.0			
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	940			
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	958			

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5			
Resorcinol	µg/l	0.5	NONE	< 0.5			
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5			
Cresols	µg/l	0.5	NONE	< 0.5			
Naphthols	µg/l	0.5	NONE	< 0.5			
Isopropylphenol	µg/l	0.5	NONE	< 0.5			
Phenol	µg/l	0.5	NONE	< 0.5			
Trimethylphenol	µg/l	0.5	NONE	< 0.5			

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5			
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01			
Fluorene	µg/l	0.01	ISO 17025	< 0.01			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01			

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16			
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Analytical Report Number: 20-92651  
 Project / Site name: A417 Missing Link

Your Order No: 35560-DO

Lab Sample Number	1472631						
Sample Reference	CP106						
Sample Number	1						
Depth (m)	15.74						
Date Sampled	04/03/2020						
Time Taken	1510						
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				

**Heavy Metals / Metalloids**

Element	Units	Limit of detection	Accreditation Status	Result			
Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4			
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.56			
Barium (dissolved)	µg/l	0.06	ISO 17025	77			
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1			
Boron (dissolved)	µg/l	10	ISO 17025	170			
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02			
Calcium (dissolved)	mg/l	0.012	ISO 17025	380			
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0			
Chromium (III)	µg/l	1	NONE	< 1.0			
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.3			
Copper (dissolved)	µg/l	0.5	ISO 17025	4.6			
Iron (dissolved)	mg/l	0.004	ISO 17025	0.039			
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2			
Magnesium (dissolved)	mg/l	0.005	ISO 17025	0.009			
Manganese (dissolved)	µg/l	0.05	ISO 17025	0.22			
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05			
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	5.0			
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.8			
Potassium (dissolved)	mg/l	0.025	ISO 17025	10			
Selenium (dissolved)	µg/l	0.6	ISO 17025	1.6			
Sodium (dissolved)	mg/l	0.01	ISO 17025	41			
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.4			
Zinc (dissolved)	µg/l	0.5	ISO 17025	1.1			

**Monoaromatics & Oxygenates**

Compound	Units	Limit of detection	Accreditation Status	Result			
Benzene	µg/l	1	ISO 17025	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0			
p & m-xylene	µg/l	1	ISO 17025	< 1.0			
o-xylene	µg/l	1	ISO 17025	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0			

**Petroleum Hydrocarbons**

Parameter	Units	Limit of detection	Accreditation Status	Result			
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10			
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10			
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10			
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10			
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10			

Parameter	Units	Limit of detection	Accreditation Status	Result			
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10			
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10			
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10			
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10			
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10			



Analytical Report Number: 20-92651  
 Project / Site name: A417 Missing Link

Your Order No: 35560-DO

Lab Sample Number	1472631						
Sample Reference	CP106						
Sample Number	1						
Depth (m)	15.74						
Date Sampled	04/03/2020						
Time Taken	1510						
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				

**VOCs**

Compound	Units	Limit of detection	Accreditation Status	Result			
Chloromethane	µg/l	1	ISO 17025	< 1.0			
Chloroethane	µg/l	1	ISO 17025	< 1.0			
Bromomethane	µg/l	1	ISO 17025	< 1.0			
Vinyl Chloride	µg/l	1	NONE	< 1.0			
Trichlorofluoromethane	µg/l	1	NONE	< 1.0			
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0			
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0			
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0			
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0			
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0			
Trichloromethane	µg/l	1	ISO 17025	< 1.0			
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0			
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0			
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0			
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0			
Benzene	µg/l	1	ISO 17025	< 1.0			
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0			
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0			
Trichloroethene	µg/l	1	ISO 17025	< 1.0			
Dibromomethane	µg/l	1	ISO 17025	< 1.0			
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0			
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0			
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0			
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0			
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0			
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0			
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0			
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0			
Chlorobenzene	µg/l	1	ISO 17025	< 1.0			
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0			
p & m-Xylene	µg/l	1	ISO 17025	< 1.0			
Styrene	µg/l	1	ISO 17025	< 1.0			
Tribromomethane	µg/l	1	ISO 17025	< 1.0			
o-Xylene	µg/l	1	ISO 17025	< 1.0			
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0			
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0			
Bromobenzene	µg/l	1	ISO 17025	< 1.0			
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0			
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0			
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0			
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0			
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0			
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0			
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0			
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0			
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0			
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0			
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0			
Butylbenzene	µg/l	1	ISO 17025	< 1.0			
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0			
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0			
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0			
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0			

U/S = Unsuitable Sample I/S = Insufficient Sample





**Analytical Report Number : 20-92651**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

Iss No 20-92651-1 A417 Missing Link 35560

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The results included within the report are representative of the samples submitted for analysis.

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**Analytical Report Number : 20-92651**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil"	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

## Sample Deviation Report



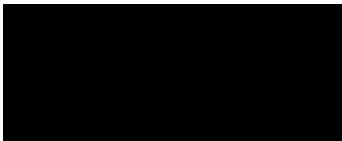
Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
CP106	1	W	20-92651	1472631	c	BTEX and MTBE in water (Monoaromatics)	L073B-PL	c
CP106	1	W	20-92651	1472631	c	Hexavalent chromium in water	L080-PL	c
CP106	1	W	20-92651	1472631	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP106	1	W	20-92651	1472631	c	Boron in water	L039-PL	c
CP106	1	W	20-92651	1472631	c	Cr (III) in water	L080-PL	c
CP106	1	W	20-92651	1472631	c	Electrical conductivity at 20oC of water	L031-PL	c
CP106	1	W	20-92651	1472631	c	Free cyanide in water	L080-PL	c
CP106	1	W	20-92651	1472631	c	Metals in water by ICP-MS (dissolved)	L012-PL	c
CP106	1	W	20-92651	1472631	c	Metals in water by ICP-OES (dissolved)	L039-PL	c
CP106	1	W	20-92651	1472631	c	Nitrate as N in water	L078-PL	c
CP106	1	W	20-92651	1472631	c	Nitrate in water	L078-PL	c
CP106	1	W	20-92651	1472631	c	Nitrite as N in water	L082-PL	c
CP106	1	W	20-92651	1472631	c	Nitrite in water	L082-PL	c
CP106	1	W	20-92651	1472631	c	Sulphate in water	L039-PL	c
CP106	1	W	20-92651	1472631	c	Total Hardness of water	L045-PL	c
CP106	1	W	20-92651	1472631	c	Total cyanide in water	L080-PL	c
CP106	1	W	20-92651	1472631	c	Total oxidised nitrogen in water	L078/82-PL	c
CP106	1	W	20-92651	1472631	c	Volatile organic compounds in water	L073B-PL	c
CP106	1	W	20-92651	1472631	c	pH at 20oC in water (automated)	L099-PL	c



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## Analytical Report Number : 20-92655

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	16/03/2020
<b>Your job number:</b>	35560	<b>Samples instructed on:</b>	16/03/2020
<b>Your order number:</b>	35560-DO	<b>Analysis completed by:</b>	20/03/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	20/03/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed:** 

Karolina Marek  
 PL Head of Reporting Team

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :	soils	- 4 weeks from reporting
	leachates	- 2 weeks from reporting
	waters	- 2 weeks from reporting
	asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 20-92655  
Project / Site name: A417 Missing Link

Your Order No: 35560-DO

Lab Sample Number	1472650						
Sample Reference	DSRC401						
Sample Number	1						
Depth (m)	None Supplied						
Date Sampled	12/03/2020						
Time Taken	1600						
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.7			
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	620			
Total Cyanide	µg/l	10	ISO 17025	< 10			
Free Cyanide	µg/l	10	ISO 17025	< 10			
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	12.5			
Total Sulphur	µg/l	15	NONE	4200			
Chloride	mg/l	0.15	ISO 17025	6.5			
Fluoride	µg/l	50	ISO 17025	170			
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	< 15			
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	11.4			
Nitrate as N	mg/l	0.01	ISO 17025	1.82			
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	8.07			
Nitrite as N	µg/l	1	ISO 17025	< 1.0			
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	< 5.0			
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	320			
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	1.8			
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	240			
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	281			

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5			
Resorcinol	µg/l	0.5	NONE	< 0.5			
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5			
Cresols	µg/l	0.5	NONE	< 0.5			
Naphthols	µg/l	0.5	NONE	< 0.5			
Isopropylphenol	µg/l	0.5	NONE	< 0.5			
Phenol	µg/l	0.5	NONE	< 0.5			
Trimethylphenol	µg/l	0.5	NONE	< 0.5			

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5			
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01			
Fluorene	µg/l	0.01	ISO 17025	< 0.01			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01			

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16			
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Analytical Report Number: 20-92655  
 Project / Site name: A417 Missing Link

Your Order No: 35560-DO

Lab Sample Number	1472650						
Sample Reference	DSRC401						
Sample Number	1						
Depth (m)	None Supplied						
Date Sampled	12/03/2020						
Time Taken	1600						
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				

**Heavy Metals / Metalloids**

Element	Units	Limit of detection	Accreditation Status	Result			
Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4			
Arsenic (dissolved)	µg/l	0.15	ISO 17025	< 0.15			
Barium (dissolved)	µg/l	0.06	ISO 17025	16			
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1			
Boron (dissolved)	µg/l	10	ISO 17025	20			
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02			
Calcium (dissolved)	mg/l	0.012	ISO 17025	110			
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0			
Chromium (III)	µg/l	1	NONE	< 1.0			
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.3			
Copper (dissolved)	µg/l	0.5	ISO 17025	2.2			
Iron (dissolved)	mg/l	0.004	ISO 17025	0.084			
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2			
Magnesium (dissolved)	mg/l	0.005	ISO 17025	2.3			
Manganese (dissolved)	µg/l	0.05	ISO 17025	58			
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05			
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.30			
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.8			
Potassium (dissolved)	mg/l	0.025	ISO 17025	1.7			
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6			
Sodium (dissolved)	mg/l	0.01	ISO 17025	5.2			
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2			
Zinc (dissolved)	µg/l	0.5	ISO 17025	6.0			

**Monoaromatics & Oxygenates**

Compound	Units	Limit of detection	Accreditation Status	Result			
Benzene	µg/l	1	ISO 17025	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0			
p & m-xylene	µg/l	1	ISO 17025	< 1.0			
o-xylene	µg/l	1	ISO 17025	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0			

**Petroleum Hydrocarbons**

Parameter	Units	Limit of detection	Accreditation Status	Result			
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10			
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10			
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10			
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10			
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10			

Parameter	Units	Limit of detection	Accreditation Status	Result			
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10			
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10			
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10			
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10			
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10			



Analytical Report Number: 20-92655  
 Project / Site name: A417 Missing Link

Your Order No: 35560-DO

Lab Sample Number	1472650						
Sample Reference	DSRC401						
Sample Number	1						
Depth (m)	None Supplied						
Date Sampled	12/03/2020						
Time Taken	1600						
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				

**VOCs**

Compound	Units	Limit of detection	Accreditation Status	Result			
Chloromethane	µg/l	1	ISO 17025	< 1.0			
Chloroethane	µg/l	1	ISO 17025	< 1.0			
Bromomethane	µg/l	1	ISO 17025	< 1.0			
Vinyl Chloride	µg/l	1	NONE	< 1.0			
Trichlorofluoromethane	µg/l	1	NONE	< 1.0			
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0			
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0			
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0			
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0			
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0			
Trichloromethane	µg/l	1	ISO 17025	< 1.0			
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0			
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0			
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0			
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0			
Benzene	µg/l	1	ISO 17025	< 1.0			
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0			
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0			
Trichloroethene	µg/l	1	ISO 17025	< 1.0			
Dibromomethane	µg/l	1	ISO 17025	< 1.0			
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0			
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0			
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0			
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0			
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0			
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0			
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0			
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0			
Chlorobenzene	µg/l	1	ISO 17025	< 1.0			
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0			
p & m-Xylene	µg/l	1	ISO 17025	< 1.0			
Styrene	µg/l	1	ISO 17025	< 1.0			
Tribromomethane	µg/l	1	ISO 17025	< 1.0			
o-Xylene	µg/l	1	ISO 17025	< 1.0			
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0			
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0			
Bromobenzene	µg/l	1	ISO 17025	< 1.0			
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0			
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0			
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0			
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0			
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0			
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0			
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0			
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0			
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0			
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0			
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0			
Butylbenzene	µg/l	1	ISO 17025	< 1.0			
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0			
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0			
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0			
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0			

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-92655**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.





**Analytical Report Number : 20-92655**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil"	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSCR 401	1	W	20-92655	1472650	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSCR 401	1	W	20-92655	1472650	c	Electrical conductivity at 20oC of water	L031-PL	c
DSCR 401	1	W	20-92655	1472650	c	pH at 20oC in water (automated)	L099-PL	c



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## Analytical Report Number : 20-92657

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	16/03/2020
<b>Your job number:</b>	35560	<b>Samples instructed on:</b>	16/03/2020
<b>Your order number:</b>	3556-DO	<b>Analysis completed by:</b>	20/03/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	20/03/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed:** 

Zina Abdul Razzak  
 Senior Quality Specialist

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :	soils	- 4 weeks from reporting
	leachates	- 2 weeks from reporting
	waters	- 2 weeks from reporting
	asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 20-92657  
 Project / Site name: A417 Missing Link

Your Order No: 3556-DO

<b>Lab Sample Number</b>				1472651				
<b>Sample Reference</b>				DSCR 205				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				None Supplied				
<b>Date Sampled</b>				12/03/2020				
<b>Time Taken</b>				1510				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.9				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	660				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	µg/l	45	ISO 17025	78000				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	78.0				
Total Sulphur	µg/l	15	NONE	26000				
Chloride	mg/l	0.15	ISO 17025	29				
Fluoride	µg/l	50	ISO 17025	590				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	< 15				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	40.7				
Nitrate as N	mg/l	0.01	ISO 17025	1.31				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	5.78				
Nitrite as N	µg/l	1	ISO 17025	7.8				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	26				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	220				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	1.3				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	440				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	246				



Analytical Report Number: 20-92657  
 Project / Site name: A417 Missing Link

Your Order No: 3556-DO

<b>Lab Sample Number</b>				1472651				
<b>Sample Reference</b>				DSCR 205				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				None Supplied				
<b>Date Sampled</b>				12/03/2020				
<b>Time Taken</b>				1510				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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Analytical Report Number: 20-92657  
 Project / Site name: A417 Missing Link

Your Order No: 3556-DO

Lab Sample Number	1472651						
Sample Reference	DSCR 205						
Sample Number	1						
Depth (m)	None Supplied						
Date Sampled	12/03/2020						
Time Taken	1510						
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				

**Heavy Metals / Metalloids**

Element	Units	Limit of detection	Accreditation Status	Result			
Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4			
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.22			
Barium (dissolved)	µg/l	0.06	ISO 17025	17			
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1			
Boron (dissolved)	µg/l	10	ISO 17025	59			
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02			
Calcium (dissolved)	mg/l	0.012	ISO 17025	86			
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0			
Chromium (III)	µg/l	1	NONE	< 1.0			
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.3			
Copper (dissolved)	µg/l	0.5	ISO 17025	2.1			
Iron (dissolved)	mg/l	0.004	ISO 17025	< 0.004			
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2			
Magnesium (dissolved)	mg/l	0.005	ISO 17025	7.3			
Manganese (dissolved)	µg/l	0.05	ISO 17025	55			
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05			
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.67			
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.3			
Potassium (dissolved)	mg/l	0.025	ISO 17025	1.6			
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6			
Sodium (dissolved)	mg/l	0.01	ISO 17025	42			
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2			
Zinc (dissolved)	µg/l	0.5	ISO 17025	5.3			

**Monoaromatics & Oxygenates**

Compound	Units	Limit of detection	Accreditation Status	Result			
Benzene	µg/l	1	ISO 17025	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0			
p & m-xylene	µg/l	1	ISO 17025	< 1.0			
o-xylene	µg/l	1	ISO 17025	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0			

**Petroleum Hydrocarbons**

Parameter	Units	Limit of detection	Accreditation Status	Result			
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10			
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10			
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10			
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10			
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10			

Parameter	Units	Limit of detection	Accreditation Status	Result			
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0			
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10			
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10			
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10			
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10			
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10			



Analytical Report Number: 20-92657  
 Project / Site name: A417 Missing Link

Your Order No: 3556-DO

Lab Sample Number	1472651						
Sample Reference	DSCR 205						
Sample Number	1						
Depth (m)	None Supplied						
Date Sampled	12/03/2020						
Time Taken	1510						
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				

**VOCs**

Compound	Units	Limit of detection	Accreditation Status	Result			
Chloromethane	µg/l	1	ISO 17025	< 1.0			
Chloroethane	µg/l	1	ISO 17025	< 1.0			
Bromomethane	µg/l	1	ISO 17025	< 1.0			
Vinyl Chloride	µg/l	1	NONE	< 1.0			
Trichlorofluoromethane	µg/l	1	NONE	< 1.0			
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0			
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0			
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0			
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0			
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0			
Trichloromethane	µg/l	1	ISO 17025	< 1.0			
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0			
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0			
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0			
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0			
Benzene	µg/l	1	ISO 17025	< 1.0			
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0			
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0			
Trichloroethene	µg/l	1	ISO 17025	< 1.0			
Dibromomethane	µg/l	1	ISO 17025	< 1.0			
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0			
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0			
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0			
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0			
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0			
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0			
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0			
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0			
Chlorobenzene	µg/l	1	ISO 17025	< 1.0			
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0			
p & m-Xylene	µg/l	1	ISO 17025	< 1.0			
Styrene	µg/l	1	ISO 17025	< 1.0			
Tribromomethane	µg/l	1	ISO 17025	< 1.0			
o-Xylene	µg/l	1	ISO 17025	< 1.0			
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0			
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0			
Bromobenzene	µg/l	1	ISO 17025	< 1.0			
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0			
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0			
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0			
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0			
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0			
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0			
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0			
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0			
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0			
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0			
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0			
Butylbenzene	µg/l	1	ISO 17025	< 1.0			
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0			
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0			
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0			
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0			

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-92657**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.

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**Analytical Report Number : 20-92657**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil"	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSCR 205	1	W	20-92657	1472651	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSCR 205	1	W	20-92657	1472651	c	Electrical conductivity at 20oC of water	L031-PL	c
DSCR 205	1	W	20-92657	1472651	c	pH at 20oC in water (automated)	L099-PL	c



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## Analytical Report Number : 20-92659

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	16/03/2020
<b>Your job number:</b>	35560	<b>Samples instructed on:</b>	16/03/2020
<b>Your order number:</b>	35560-DO	<b>Analysis completed by:</b>	20/03/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	20/03/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed:** 

Agnieszka Czerwińska

Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 20-92659  
Project / Site name: A417 Missing Link

Your Order No: 35560-DO

Lab Sample Number	1472653						
Sample Reference	CP215						
Sample Number	1						
Depth (m)	None Supplied						
Date Sampled	12/03/2020						
Time Taken	1320						
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				

#### General Inorganics

pH	pH Units	N/A	ISO 17025	7.5			
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	680			
Total Cyanide	µg/l	10	ISO 17025	< 10			
Free Cyanide	µg/l	10	ISO 17025	< 10			
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	19.4			
Total Sulphur	µg/l	15	NONE	6500			
Chloride	mg/l	0.15	ISO 17025	17			
Fluoride	µg/l	50	ISO 17025	950			
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	340			
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	57.6			
Nitrate as N	mg/l	0.01	ISO 17025	0.66			
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	2.92			
Nitrite as N	µg/l	1	ISO 17025	29			
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	95			
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	420			
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	0.7			
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	380			
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	263			

#### Phenols by HPLC

Catechol	µg/l	0.5	NONE	< 0.5			
Resorcinol	µg/l	0.5	NONE	< 0.5			
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5			
Cresols	µg/l	0.5	NONE	< 0.5			
Naphthols	µg/l	0.5	NONE	< 0.5			
Isopropylphenol	µg/l	0.5	NONE	< 0.5			
Phenol	µg/l	0.5	NONE	< 0.5			
Trimethylphenol	µg/l	0.5	NONE	< 0.5			

#### Total Phenols

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5			
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#### Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	< 0.01			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01			
Fluorene	µg/l	0.01	ISO 17025	< 0.01			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01			

#### Total PAH

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16			
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#### Heavy Metals / Metalloids

Antimony (dissolved)	µg/l	0.4	ISO 17025	0.6			
Arsenic (dissolved)	µg/l	0.15	ISO 17025	2.73			
Barium (dissolved)	µg/l	0.06	ISO 17025	40			
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1			



Analytical Report Number: 20-92659  
 Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1472653				
<b>Sample Reference</b>				CP215				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				None Supplied				
<b>Date Sampled</b>				12/03/2020				
<b>Time Taken</b>				1320				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					
Boron (dissolved)	µg/l	10	ISO 17025	360				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	90				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.9				
Copper (dissolved)	µg/l	0.5	ISO 17025	0.9				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.21				
Lead (dissolved)	µg/l	0.2	ISO 17025	1.0				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	9.1				
Manganese (dissolved)	µg/l	0.05	ISO 17025	500				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	4.5				
Nickel (dissolved)	µg/l	0.5	ISO 17025	6.3				
Potassium (dissolved)	mg/l	0.025	ISO 17025	2.1				
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6				
Sodium (dissolved)	mg/l	0.01	ISO 17025	28				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.8				
Zinc (dissolved)	µg/l	0.5	ISO 17025	4.7				

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				



Analytical Report Number: 20-92659  
 Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1472653				
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<b>Sample Number</b>				1				
<b>Depth (m)</b>				None Supplied				
<b>Date Sampled</b>				12/03/2020				
<b>Time Taken</b>				1320				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10				

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10				



Analytical Report Number: 20-92659  
 Project / Site name: A417 Missing Link

Your Order No: 35560-DO

Lab Sample Number	1472653						
Sample Reference	CP215						
Sample Number	1						
Depth (m)	None Supplied						
Date Sampled	12/03/2020						
Time Taken	1320						
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				

**VOCs**

Compound	Units	Limit of detection	Accreditation Status	Result			
Chloromethane	µg/l	1	ISO 17025	< 1.0			
Chloroethane	µg/l	1	ISO 17025	< 1.0			
Bromomethane	µg/l	1	ISO 17025	< 1.0			
Vinyl Chloride	µg/l	1	NONE	< 1.0			
Trichlorofluoromethane	µg/l	1	NONE	< 1.0			
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0			
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0			
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0			
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0			
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0			
Trichloromethane	µg/l	1	ISO 17025	< 1.0			
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0			
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0			
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0			
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0			
Benzene	µg/l	1	ISO 17025	< 1.0			
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0			
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0			
Trichloroethene	µg/l	1	ISO 17025	< 1.0			
Dibromomethane	µg/l	1	ISO 17025	< 1.0			
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0			
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0			
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0			
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0			
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0			
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0			
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0			
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0			
Chlorobenzene	µg/l	1	ISO 17025	< 1.0			
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0			
p & m-Xylene	µg/l	1	ISO 17025	< 1.0			
Styrene	µg/l	1	ISO 17025	< 1.0			
Tribromomethane	µg/l	1	ISO 17025	< 1.0			
o-Xylene	µg/l	1	ISO 17025	< 1.0			
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0			
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0			
Bromobenzene	µg/l	1	ISO 17025	< 1.0			
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0			
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0			
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0			
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0			
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0			
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0			
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0			
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0			
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0			
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0			
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0			
Butylbenzene	µg/l	1	ISO 17025	< 1.0			
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0			
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0			
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0			
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0			

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-92659**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.

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**Analytical Report Number : 20-92659**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil"	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
CP215	1	W	20-92659	1472653	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP215	1	W	20-92659	1472653	c	Electrical conductivity at 20oC of water	L031-PL	c
CP215	1	W	20-92659	1472653	c	pH at 20oC in water (automated)	L099-PL	c



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## **Analytical Report Number : 20-92660**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	16/03/2020
<b>Your job number:</b>	35560	<b>Samples instructed on:</b>	16/03/2020
<b>Your order number:</b>	35560-DO	<b>Analysis completed by:</b>	20/03/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	20/03/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed:** 

Zina Abdul Razzak  
Senior Quality Specialist

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Iss No 20-92660-1 A417 Missing Link 35560

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 20-92660  
 Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1472654				
<b>Sample Reference</b>				OH416				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				None Supplied				
<b>Date Sampled</b>				12/03/2020				
<b>Time Taken</b>				1215				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.6				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	720				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	µg/l	45	ISO 17025	14500				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	14.5				
Total Sulphur	µg/l	15	NONE	4800				
Chloride	mg/l	0.15	ISO 17025	15				
Fluoride	µg/l	50	ISO 17025	340				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	260				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	49.2				
Nitrate as N	mg/l	0.01	ISO 17025	0.71				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	3.16				
Nitrite as N	µg/l	1	ISO 17025	25				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	83				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	400				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	0.7				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	520				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	301				



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**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	6.70				
Acenaphthylene	µg/l	0.01	ISO 17025	0.14				
Acenaphthene	µg/l	0.01	ISO 17025	1.89				
Fluorene	µg/l	0.01	ISO 17025	1.39				
Phenanthrene	µg/l	0.01	ISO 17025	4.50				
Anthracene	µg/l	0.01	ISO 17025	0.85				
Fluoranthene	µg/l	0.01	ISO 17025	3.76				
Pyrene	µg/l	0.01	ISO 17025	2.91				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	1.04				
Chrysene	µg/l	0.01	ISO 17025	0.82				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	1.07				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	0.41				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	0.84				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	0.36				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	0.59				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	27.3				
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<b>Date Sampled</b>				12/03/2020				
<b>Time Taken</b>				1215				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

	Units	Limit of detection	Accreditation Status	Result				
Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	7.47				
Barium (dissolved)	µg/l	0.06	ISO 17025	70				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	460				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	110				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.3				
Copper (dissolved)	µg/l	0.5	ISO 17025	0.9				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.49				
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	3.6				
Manganese (dissolved)	µg/l	0.05	ISO 17025	160				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	2.0				
Nickel (dissolved)	µg/l	0.5	ISO 17025	3.9				
Potassium (dissolved)	mg/l	0.025	ISO 17025	2.7				
Selenium (dissolved)	µg/l	0.6	ISO 17025	0.6				
Sodium (dissolved)	mg/l	0.01	ISO 17025	35				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.3				
Zinc (dissolved)	µg/l	0.5	ISO 17025	3.0				



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<b>Sample Number</b>				1				
<b>Depth (m)</b>				None Supplied				
<b>Date Sampled</b>				12/03/2020				
<b>Time Taken</b>				1215				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

**Petroleum Hydrocarbons**



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<b>Sample Number</b>				1				
<b>Depth (m)</b>				None Supplied				
<b>Date Sampled</b>				12/03/2020				
<b>Time Taken</b>				1215				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	300				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	12				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	310				





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Lab Sample Number	1472654						
Sample Reference	OH416						
Sample Number	1						
Depth (m)	None Supplied						
Date Sampled	12/03/2020						
Time Taken	1215						
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				

**VOCs**

Compound	Units	Limit of detection	Accreditation Status	Result			
Chloromethane	µg/l	1	ISO 17025	< 1.0			
Chloroethane	µg/l	1	ISO 17025	< 1.0			
Bromomethane	µg/l	1	ISO 17025	< 1.0			
Vinyl Chloride	µg/l	1	NONE	< 1.0			
Trichlorofluoromethane	µg/l	1	NONE	< 1.0			
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0			
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0			
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0			
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0			
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0			
Trichloromethane	µg/l	1	ISO 17025	< 1.0			
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0			
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0			
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0			
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0			
Benzene	µg/l	1	ISO 17025	< 1.0			
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0			
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0			
Trichloroethene	µg/l	1	ISO 17025	< 1.0			
Dibromomethane	µg/l	1	ISO 17025	< 1.0			
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0			
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0			
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0			
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0			
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0			
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0			
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0			
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0			
Chlorobenzene	µg/l	1	ISO 17025	< 1.0			
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0			
p & m-Xylene	µg/l	1	ISO 17025	< 1.0			
Styrene	µg/l	1	ISO 17025	< 1.0			
Tribromomethane	µg/l	1	ISO 17025	< 1.0			
o-Xylene	µg/l	1	ISO 17025	< 1.0			
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0			
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0			
Bromobenzene	µg/l	1	ISO 17025	< 1.0			
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0			
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0			
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0			
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0			
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0			
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0			
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0			
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0			
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0			
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0			
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0			
Butylbenzene	µg/l	1	ISO 17025	< 1.0			
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0			
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0			
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0			
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0			

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-92660**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.

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**Analytical Report Number : 20-92660**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil"	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
OH416	1	W	20-92660	1472654	c	Ammoniacal Nitrogen as N in water	L082-PL	c
OH416	1	W	20-92660	1472654	c	Electrical conductivity at 20oC of water	L031-PL	c
OH416	1	W	20-92660	1472654	c	pH at 20oC in water (automated)	L099-PL	c



**Edward Crimp**

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**Analytical Report Number : 20-93368**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	17/03/2020
<b>Your job number:</b>	35560	<b>Samples instructed on:</b>	18/03/2020
<b>Your order number:</b>	35560-DO	<b>Analysis completed by:</b>	26/03/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	26/03/2020
<b>Samples Analysed:</b>	2 water samples		

**Signed:** 

Rachel Bradley

Deputy Quality Manager  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

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soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 20-93368

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1476338	1476339			
<b>Sample Reference</b>				DSRC107	DSRC108			
<b>Sample Number</b>				2	2			
<b>Depth (m)</b>				2.45	2.15			
<b>Date Sampled</b>				13/03/2020	13/03/2020			
<b>Time Taken</b>				1240	1315			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.8	7.7			
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	560	870			
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Sulphate as SO <sub>4</sub>	µg/l	45	ISO 17025	31300	5980			
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	31.3	5.98			
Total Sulphur	µg/l	15	NONE	10000	2000			
Chloride	mg/l	0.15	ISO 17025	39	33			
Fluoride	µg/l	50	ISO 17025	290	210			
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	< 15	650			
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	13.8	253			
Nitrate as N	mg/l	0.01	ISO 17025	2.38	1.00			
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	10.6	4.42			
Nitrite as N	µg/l	1	ISO 17025	46	24			
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	150	80			
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	200	570			
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	2.4	1.0			
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	480	520			
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	220	106			

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5	< 0.5			
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5			
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5			
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5			
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5			
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			



Analytical Report Number: 20-93368

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<b>Lab Sample Number</b>				1476338	1476339		
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<b>Sample Number</b>				2	2		
<b>Depth (m)</b>				2.45	2.15		
<b>Date Sampled</b>				13/03/2020	13/03/2020		
<b>Time Taken</b>				1240	1315		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16		
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**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4	0.5		
Arsenic (dissolved)	µg/l	0.15	ISO 17025	4.99	11.1		
Barium (dissolved)	µg/l	0.06	ISO 17025	14	16		
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1		
Boron (dissolved)	µg/l	10	ISO 17025	16	570		
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02		
Calcium (dissolved)	mg/l	0.012	ISO 17025	78	32		
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	U/S*		
Chromium (III)	µg/l	1	NONE	< 1.0	U/S*		
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.6		
Copper (dissolved)	µg/l	0.5	ISO 17025	3.1	0.9		
Iron (dissolved)	mg/l	0.004	ISO 17025	0.083	0.25		
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2		
Magnesium (dissolved)	mg/l	0.005	ISO 17025	6.0	6.2		
Manganese (dissolved)	µg/l	0.05	ISO 17025	110	200		
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05		
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	5.3	14		
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.1	2.7		
Potassium (dissolved)	mg/l	0.025	ISO 17025	1.5	3.7		
Selenium (dissolved)	µg/l	0.6	ISO 17025	0.8	1.4		
Sodium (dissolved)	mg/l	0.01	ISO 17025	35	200		
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.6	0.9		
Zinc (dissolved)	µg/l	0.5	ISO 17025	1.5	1.5		

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0		

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10		
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10		

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10		
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10		



Analytical Report Number: 20-93368

Project / Site name: A417 Missing Link

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<b>Lab Sample Number</b>				1476338	1476339		
<b>Sample Reference</b>				DSRC107	DSRC108		
<b>Sample Number</b>				2	2		
<b>Depth (m)</b>				2.45	2.15		
<b>Date Sampled</b>				13/03/2020	13/03/2020		
<b>Time Taken</b>				1240	1315		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0		
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0		
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		

U/S = Unsuitable Sample I/S = Insufficient Sample





Analytical Report Number: 20-93368

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1476338	1476339			
<b>Sample Reference</b>				DSRC107	DSRC108			
<b>Sample Number</b>				2	2			
<b>Depth (m)</b>				2.45	2.15			
<b>Date Sampled</b>				13/03/2020	13/03/2020			
<b>Time Taken</b>				1240	1315			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

\*Due to method difference, results between chromium (hexavalent) and chromium (dissolved) do not agree.



**Analytical Report Number : 20-93368**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.

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**Analytical Report Number : 20-93368**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

## Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSRC107	2	W	20-93368	1476338	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC107	2	W	20-93368	1476338	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC107	2	W	20-93368	1476338	c	Nitrate as N in water	L078-PL	c
DSRC107	2	W	20-93368	1476338	c	Nitrate in water	L078-PL	c
DSRC107	2	W	20-93368	1476338	c	Nitrite as N in water	L082-PL	c
DSRC107	2	W	20-93368	1476338	c	Nitrite in water	L082-PL	c
DSRC107	2	W	20-93368	1476338	c	Total oxidised nitrogen in water	L078/82-PL	c
DSRC107	2	W	20-93368	1476338	c	pH at 20oC in water (automated)	L099-PL	c
DSRC108	2	W	20-93368	1476339	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC108	2	W	20-93368	1476339	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC108	2	W	20-93368	1476339	c	Nitrate as N in water	L078-PL	c
DSRC108	2	W	20-93368	1476339	c	Nitrate in water	L078-PL	c
DSRC108	2	W	20-93368	1476339	c	Nitrite as N in water	L082-PL	c
DSRC108	2	W	20-93368	1476339	c	Nitrite in water	L082-PL	c
DSRC108	2	W	20-93368	1476339	c	Total oxidised nitrogen in water	L078/82-PL	c
DSRC108	2	W	20-93368	1476339	c	pH at 20oC in water (automated)	L099-PL	c



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## Analytical Report Number : 20-95054

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	26/03/2020
<b>Your job number:</b>	35560	<b>Samples instructed on:</b>	27/03/2020
<b>Your order number:</b>	35560-DO	<b>Analysis completed by:</b>	03/04/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	03/04/2020
<b>Samples Analysed:</b>	2 water samples		

**Signed:** 

Agnieszka Czerwińska

Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 20-95054

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1485826	1485827		
<b>Sample Reference</b>				CP200	CP202		
<b>Sample Number</b>				2	2		
<b>Depth (m)</b>				1.11	0.00		
<b>Date Sampled</b>				24/03/2020	24/03/2020		
<b>Time Taken</b>				None Supplied	None Supplied		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.3	7.2		
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	860	570		
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10		
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10		
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	171	95.2		
Total Sulphur	µg/l	15	NONE	57000	32000		
Chloride	mg/l	0.15	ISO 17025	34	9.0		
Fluoride	µg/l	50	ISO 17025	1000	990		
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	5300	18		
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	5.72	1.79		
Nitrate as N	mg/l	0.01	ISO 17025	0.13	0.30		
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	0.58	1.31		
Nitrite as N	µg/l	1	ISO 17025	1.1	11		
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	< 5.0	37		
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	500	230		
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	< 0.3	0.3		
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	680	360		
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	428	292		



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<b>Sample Number</b>				2	2		
<b>Depth (m)</b>				1.11	0.00		
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<b>Time Taken</b>				None Supplied	None Supplied		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5	< 0.5		
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5		
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5		
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5		
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5		
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5		
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5		
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5		

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5		
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16		
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**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4	< 0.4		
Arsenic (dissolved)	µg/l	0.15	ISO 17025	3.91	0.35		
Barium (dissolved)	µg/l	0.06	ISO 17025	13	4.3		
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1		
Boron (dissolved)	µg/l	10	ISO 17025	270	100		
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02		
Calcium (dissolved)	mg/l	0.012	ISO 17025	140	100		
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0		
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0		
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.5		
Copper (dissolved)	µg/l	0.5	ISO 17025	< 0.5	2.1		
Iron (dissolved)	mg/l	0.004	ISO 17025	0.93	0.12		
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.3		
Magnesium (dissolved)	mg/l	0.005	ISO 17025	16	8.7		
Manganese (dissolved)	µg/l	0.05	ISO 17025	130	33		
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05		
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	< 0.05	0.20		
Nickel (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5		
Potassium (dissolved)	mg/l	0.025	ISO 17025	2.6	1.4		
Selenium (dissolved)	µg/l	0.6	ISO 17025	1.4	< 0.6		
Sodium (dissolved)	mg/l	0.01	ISO 17025	45	12		
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.6		
Zinc (dissolved)	µg/l	0.5	ISO 17025	5.4	2.4		



Analytical Report Number: 20-95054

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1485826	1485827			
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<b>Sample Number</b>				2	2			
<b>Depth (m)</b>				1.11	0.00			
<b>Date Sampled</b>				24/03/2020	24/03/2020			
<b>Time Taken</b>				None Supplied	None Supplied			
<b>Analytical Parameter (Water Analysis)</b>				<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>		
<b>Monoaromatics &amp; Oxygenates</b>								
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0			





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<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10		
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10		

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0		
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10		
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10		
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10		

**VOCs**

Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0		
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0		
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		



Analytical Report Number: 20-95054

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

Lab Sample Number				1485826	1485827		
Sample Reference				CP200	CP202		
Sample Number				2	2		
Depth (m)				1.11	0.00		
Date Sampled				24/03/2020	24/03/2020		
Time Taken				None Supplied	None Supplied		
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status				
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-95054**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphaniamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphaniamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.

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**Analytical Report Number : 20-95054**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
CP200	2	W	20-95054	1485826	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP200	2	W	20-95054	1485826	c	Electrical conductivity at 20oC of water	L031-PL	c
CP200	2	W	20-95054	1485826	c	Nitrate as N in water	L078-PL	c
CP200	2	W	20-95054	1485826	c	Nitrate in water	L078-PL	c
CP200	2	W	20-95054	1485826	c	Nitrite as N in water	L082-PL	c
CP200	2	W	20-95054	1485826	c	Nitrite in water	L082-PL	c
CP200	2	W	20-95054	1485826	c	Total oxidised nitrogen in water	L078/82-PL	c
CP200	2	W	20-95054	1485826	c	pH at 20oC in water (automated)	L099-PL	c
CP202	2	W	20-95054	1485827	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP202	2	W	20-95054	1485827	c	Electrical conductivity at 20oC of water	L031-PL	c
CP202	2	W	20-95054	1485827	c	Nitrate as N in water	L078-PL	c
CP202	2	W	20-95054	1485827	c	Nitrate in water	L078-PL	c
CP202	2	W	20-95054	1485827	c	Nitrite as N in water	L082-PL	c
CP202	2	W	20-95054	1485827	c	Nitrite in water	L082-PL	c
CP202	2	W	20-95054	1485827	c	Total oxidised nitrogen in water	L078/82-PL	c
CP202	2	W	20-95054	1485827	c	pH at 20oC in water (automated)	L099-PL	c



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## **Analytical Report Number : 20-95057**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	26/03/2020
<b>Your job number:</b>	35560	<b>Samples instructed on:</b>	27/03/2020
<b>Your order number:</b>	35560-DO	<b>Analysis completed by:</b>	03/04/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	03/04/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed:** [Redacted]

Agnieszka Czerwińska

Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 20-95057

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1485830				
<b>Sample Reference</b>				CP216				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				1.11				
<b>Date Sampled</b>				23/03/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.2				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	540				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	7.29				
Total Sulphur	µg/l	15	NONE	2400				
Chloride	mg/l	0.15	ISO 17025	3.3				
Fluoride	µg/l	50	ISO 17025	340				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	21				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	2.34				
Nitrate as N	mg/l	0.01	ISO 17025	0.35				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	1.56				
Nitrite as N	µg/l	1	ISO 17025	3.1				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	10				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	440				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	0.4				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	240				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	291				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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Analytical Report Number: 20-95057

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<b>Lab Sample Number</b>				1485830				
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<b>Depth (m)</b>				1.11				
<b>Date Sampled</b>				23/03/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.49				
Barium (dissolved)	µg/l	0.06	ISO 17025	14				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	14				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	110				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.6				
Copper (dissolved)	µg/l	0.5	ISO 17025	1.5				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.009				
Lead (dissolved)	µg/l	0.2	ISO 17025	0.3				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	2.0				
Manganese (dissolved)	µg/l	0.05	ISO 17025	40				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Nickel (dissolved)	µg/l	0.5	ISO 17025	< 0.5				
Potassium (dissolved)	mg/l	0.025	ISO 17025	0.40				
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6				
Sodium (dissolved)	mg/l	0.01	ISO 17025	3.7				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.7				
Zinc (dissolved)	µg/l	0.5	ISO 17025	2.2				





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Project / Site name: A417 Missing Link

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<b>Sample Number</b>				1				
<b>Depth (m)</b>				1.11				
<b>Date Sampled</b>				23/03/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10				

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10				



Analytical Report Number: 20-95057

Project / Site name: A417 Missing Link

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<b>Sample Number</b>				1				
<b>Depth (m)</b>				1.11				
<b>Date Sampled</b>				23/03/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-95057**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

Iss No 20-95057-1 A417 Missing Link 35560

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The results included within the report are representative of the samples submitted for analysis.

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**Analytical Report Number : 20-95057**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
CP216	1	W	20-95057	1485830	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP216	1	W	20-95057	1485830	c	Electrical conductivity at 20oC of water	L031-PL	c
CP216	1	W	20-95057	1485830	c	Nitrate as N in water	L078-PL	c
CP216	1	W	20-95057	1485830	c	Nitrate in water	L078-PL	c
CP216	1	W	20-95057	1485830	c	Nitrite as N in water	L082-PL	c
CP216	1	W	20-95057	1485830	c	Nitrite in water	L082-PL	c
CP216	1	W	20-95057	1485830	c	Total oxidised nitrogen in water	L078/82-PL	c
CP216	1	W	20-95057	1485830	c	pH at 20oC in water (automated)	L099-PL	c



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## **Analytical Report Number : 20-95058**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	26/03/2020
<b>Your job number:</b>	35560	<b>Samples instructed on:</b>	27/03/2020
<b>Your order number:</b>	35560-DO	<b>Analysis completed by:</b>	03/04/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	03/04/2020
<b>Samples Analysed:</b>	3 water samples		

**Signed:** [Redacted]

Agnieszka Czerwińska

Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 20-95058

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

Lab Sample Number				1485831	1485832	1485833		
Sample Reference				DSRC220	DSRC402	DSRC401		
Sample Number				2	2	2		
Depth (m)				1.46	2.51	4.14		
Date Sampled				25/03/2020	25/03/2020	25/03/2020		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.2	7.6	7.3		
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	640	560	590		
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10		
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10		
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	44.0	13.3	10.5		
Total Sulphur	µg/l	15	NONE	15000	4400	3500		
Chloride	mg/l	0.15	ISO 17025	9.6	8.3	6.2		
Fluoride	µg/l	50	ISO 17025	350	140	170		
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	19	22	620		
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	1.39	2.50	1.68		
Nitrate as N	mg/l	0.01	ISO 17025	0.13	9.91	1.64		
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	0.58	43.9	7.24		
Nitrite as N	µg/l	1	ISO 17025	20	6.0	4.3		
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	64	20	14		
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	430	400	310		
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	< 0.3	9.9	1.6		
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	340	420	120		
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	334	269	323		

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5		
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5		
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5		
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5		
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5		
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5		
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5		
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5		

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5	< 3.5		
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Analytical Report Number: 20-95058

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1485831	1485832	1485833		
<b>Sample Reference</b>				DSRC220	DSRC402	DSRC401		
<b>Sample Number</b>				2	2	2		
<b>Depth (m)</b>				1.46	2.51	4.14		
<b>Date Sampled</b>				25/03/2020	25/03/2020	25/03/2020		
<b>Time Taken</b>				None Supplied	None Supplied	None Supplied		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16		
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**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4	< 0.4	< 0.4		
Arsenic (dissolved)	µg/l	0.15	ISO 17025	< 0.15	0.28	< 0.15		
Barium (dissolved)	µg/l	0.06	ISO 17025	13	15	12		
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1		
Boron (dissolved)	µg/l	10	ISO 17025	25	17	25		
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02	< 0.02		
Calcium (dissolved)	mg/l	0.012	ISO 17025	120	100	130		
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0		
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0		
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.4	0.3		
Copper (dissolved)	µg/l	0.5	ISO 17025	0.9	1.9	2.4		
Iron (dissolved)	mg/l	0.004	ISO 17025	< 0.004	0.006	0.014		
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	1.0	< 0.2		
Magnesium (dissolved)	mg/l	0.005	ISO 17025	8.8	2.3	2.2		
Manganese (dissolved)	µg/l	0.05	ISO 17025	15	13	32		
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05		
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	< 0.05	1.3	9.9		
Nickel (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5		
Potassium (dissolved)	mg/l	0.025	ISO 17025	1.6	0.61	1.3		
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6	< 0.6	< 0.6		
Sodium (dissolved)	mg/l	0.01	ISO 17025	6.2	7.3	4.9		
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.5	< 0.2		
Zinc (dissolved)	µg/l	0.5	ISO 17025	0.7	1.1	2.7		

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		





Analytical Report Number: 20-95058

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1485831	1485832	1485833		
<b>Sample Reference</b>				DSRC220	DSRC402	DSRC401		
<b>Sample Number</b>				2	2	2		
<b>Depth (m)</b>				1.46	2.51	4.14		
<b>Date Sampled</b>				25/03/2020	25/03/2020	25/03/2020		
<b>Time Taken</b>				None Supplied	None Supplied	None Supplied		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10		
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10	< 10		

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10		
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10	< 10		

**VOCs**

Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0	< 1.0		
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0	< 1.0		
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		



Analytical Report Number: 20-95058

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

Lab Sample Number				1485831	1485832	1485833		
Sample Reference				DSRC220	DSRC402	DSRC401		
Sample Number				2	2	2		
Depth (m)				1.46	2.51	4.14		
Date Sampled				25/03/2020	25/03/2020	25/03/2020		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-95058**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.

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**Analytical Report Number : 20-95058**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



Sample ID	Other ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSR220	2	W	20-95058	1485831	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSR220	2	W	20-95058	1485831	c	Electrical conductivity at 20oC of water	L031-PL	c
DSR220	2	W	20-95058	1485831	c	pH at 20oC in water (automated)	L099-PL	c
DSR401	2	W	20-95058	1485833	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSR401	2	W	20-95058	1485833	c	Electrical conductivity at 20oC of water	L031-PL	c
DSR401	2	W	20-95058	1485833	c	pH at 20oC in water (automated)	L099-PL	c
DSR402	2	W	20-95058	1485832	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSR402	2	W	20-95058	1485832	c	Electrical conductivity at 20oC of water	L031-PL	c
DSR402	2	W	20-95058	1485832	c	pH at 20oC in water (automated)	L099-PL	c



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## **Analytical Report Number : 20-95058**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	26/03/2020
<b>Your job number:</b>	35560	<b>Samples instructed on:</b>	27/03/2020
<b>Your order number:</b>	35560-DO	<b>Analysis completed by:</b>	03/04/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	03/04/2020
<b>Samples Analysed:</b>	3 water samples		

**Signed:** 

Agnieszka Czerwińska

Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 20-95058

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

Lab Sample Number	1485831			1485832			1485833		
Sample Reference	DSR220			DSR402			DSR401		
Sample Number	2			2			2		
Depth (m)	1.46			2.51			4.14		
Date Sampled	25/03/2020			25/03/2020			25/03/2020		
Time Taken	None Supplied			None Supplied			None Supplied		
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status						

**General Inorganics**

Parameter	Units	Limit of detection	Accreditation Status	1485831	1485832	1485833
pH	pH Units	N/A	ISO 17025	7.2	7.6	7.3
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	640	560	590
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	44.0	13.3	10.5
Total Sulphur	µg/l	15	NONE	15000	4400	3500
Chloride	mg/l	0.15	ISO 17025	9.6	8.3	6.2
Fluoride	µg/l	50	ISO 17025	350	140	170
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	19	22	620
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	1.39	2.50	1.68
Nitrate as N	mg/l	0.01	ISO 17025	0.13	9.91	1.64
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	0.58	43.9	7.24
Nitrite as N	µg/l	1	ISO 17025	20	6.0	4.3
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	64	20	14
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	430	400	310
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	< 0.3	9.9	1.6
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	340	420	120
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	334	269	323

**Phenols by HPLC**

Parameter	Units	Limit of detection	Accreditation Status	1485831	1485832	1485833
Catechol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5

**Total Phenols**

Parameter	Units	Limit of detection	Accreditation Status	1485831	1485832	1485833
Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5	< 3.5



Analytical Report Number: 20-95058

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1485831	1485832	1485833		
<b>Sample Reference</b>				DSR220	DSR402	DSR401		
<b>Sample Number</b>				2	2	2		
<b>Depth (m)</b>				1.46	2.51	4.14		
<b>Date Sampled</b>				25/03/2020	25/03/2020	25/03/2020		
<b>Time Taken</b>				None Supplied	None Supplied	None Supplied		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01		

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16		
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**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4	< 0.4	< 0.4		
Arsenic (dissolved)	µg/l	0.15	ISO 17025	< 0.15	0.28	< 0.15		
Barium (dissolved)	µg/l	0.06	ISO 17025	13	15	12		
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1		
Boron (dissolved)	µg/l	10	ISO 17025	25	17	25		
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02	< 0.02		
Calcium (dissolved)	mg/l	0.012	ISO 17025	120	100	130		
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0		
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0		
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.4	0.3		
Copper (dissolved)	µg/l	0.5	ISO 17025	0.9	1.9	2.4		
Iron (dissolved)	mg/l	0.004	ISO 17025	< 0.004	0.006	0.014		
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	1.0	< 0.2		
Magnesium (dissolved)	mg/l	0.005	ISO 17025	8.8	2.3	2.2		
Manganese (dissolved)	µg/l	0.05	ISO 17025	15	13	32		
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05		
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	< 0.05	1.3	9.9		
Nickel (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5		
Potassium (dissolved)	mg/l	0.025	ISO 17025	1.6	0.61	1.3		
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6	< 0.6	< 0.6		
Sodium (dissolved)	mg/l	0.01	ISO 17025	6.2	7.3	4.9		
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.5	< 0.2		
Zinc (dissolved)	µg/l	0.5	ISO 17025	0.7	1.1	2.7		

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		





Analytical Report Number: 20-95058

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1485831	1485832	1485833		
<b>Sample Reference</b>				DSR220	DSR402	DSR401		
<b>Sample Number</b>				2	2	2		
<b>Depth (m)</b>				1.46	2.51	4.14		
<b>Date Sampled</b>				25/03/2020	25/03/2020	25/03/2020		
<b>Time Taken</b>				None Supplied	None Supplied	None Supplied		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10		
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10	< 10		

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10		
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10		
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10	< 10		

**VOCs**

Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0	< 1.0		
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0	< 1.0		
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		



Analytical Report Number: 20-95058

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

Lab Sample Number				1485831	1485832	1485833		
Sample Reference				DSR220	DSR402	DSR401		
Sample Number				2	2	2		
Depth (m)				1.46	2.51	4.14		
Date Sampled				25/03/2020	25/03/2020	25/03/2020		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-95058**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.

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**Analytical Report Number : 20-95058**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSR220	2	W	20-95058	1485831	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSR220	2	W	20-95058	1485831	c	Electrical conductivity at 20oC of water	L031-PL	c
DSR220	2	W	20-95058	1485831	c	pH at 20oC in water (automated)	L099-PL	c
DSR401	2	W	20-95058	1485833	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSR401	2	W	20-95058	1485833	c	Electrical conductivity at 20oC of water	L031-PL	c
DSR401	2	W	20-95058	1485833	c	pH at 20oC in water (automated)	L099-PL	c
DSR402	2	W	20-95058	1485832	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSR402	2	W	20-95058	1485832	c	Electrical conductivity at 20oC of water	L031-PL	c
DSR402	2	W	20-95058	1485832	c	pH at 20oC in water (automated)	L099-PL	c



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## **Analytical Report Number : 20-96133**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	09/04/2020
<b>Your job number:</b>	34888	<b>Samples instructed on:</b>	09/04/2020
<b>Your order number:</b>	35560	<b>Analysis completed by:</b>	20/04/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	20/04/2020
<b>Samples Analysed:</b>	2 water samples		

**Signed:** 

Karolina Marek  
PL Head of Reporting Team

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Iss No 20-96133-1 A417 Missing Link 34888

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 20-96133

Project / Site name: A417 Missing Link

Your Order No: 35560

<b>Lab Sample Number</b>				1492296	1492297			
<b>Sample Reference</b>				DSRC406	OH416			
<b>Sample Number</b>				None Supplied	None Supplied			
<b>Depth (m)</b>				33.00	3.00			
<b>Date Sampled</b>				08/04/2020	08/04/2020			
<b>Time Taken</b>				1300	1330			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.8	7.4			
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	510	610			
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	76.1	15.5			
Total Sulphur	µg/l	15	NONE	25000	5200			
Chloride	mg/l	0.15	ISO 17025	8.5	12			
Fluoride	µg/l	50	ISO 17025	2900	250			
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	60	< 15			
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	3.66	40.1			
Nitrate as N	mg/l	0.01	ISO 17025	0.06	0.08			
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	0.24	0.34			
Nitrite as N	µg/l	1	ISO 17025	2.1	1.1			
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	6.9	< 5.0			
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	220	510			
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	< 0.3	< 0.3			
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	390	340			
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	259	280			

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5	< 0.5			
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5			
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5			
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5			
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5			
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	0.45			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	0.18			
Fluorene	µg/l	0.01	ISO 17025	< 0.01	0.17			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	0.41			
Anthracene	µg/l	0.01	ISO 17025	< 0.01	0.13			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	0.48			
Pyrene	µg/l	0.01	ISO 17025	< 0.01	0.41			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	0.18			
Chrysene	µg/l	0.01	ISO 17025	< 0.01	0.16			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	2.57			
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Analytical Report Number: 20-96133  
 Project / Site name: A417 Missing Link

Your Order No: 35560

<b>Lab Sample Number</b>				1492296	1492297			
<b>Sample Reference</b>				DSRC406	OH416			
<b>Sample Number</b>				None Supplied	None Supplied			
<b>Depth (m)</b>				33.00	3.00			
<b>Date Sampled</b>				08/04/2020	08/04/2020			
<b>Time Taken</b>				1300	1330			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4	< 0.4			
Arsenic (dissolved)	µg/l	0.15	ISO 17025	2.59	2.27			
Barium (dissolved)	µg/l	0.06	ISO 17025	9.3	26			
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1			
Boron (dissolved)	µg/l	10	ISO 17025	75	59			
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	0.02			
Calcium (dissolved)	mg/l	0.012	ISO 17025	75	110			
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0			
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0			
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Copper (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5			
Iron (dissolved)	mg/l	0.004	ISO 17025	0.008	0.21			
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Magnesium (dissolved)	mg/l	0.005	ISO 17025	17	2.0			
Manganese (dissolved)	µg/l	0.05	ISO 17025	29	24			
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05			
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.82	0.61			
Nickel (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5			
Potassium (dissolved)	mg/l	0.025	ISO 17025	1.5	4.6			
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6	< 0.6			
Sodium (dissolved)	mg/l	0.01	ISO 17025	8.2	20			
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.3	0.2			
Zinc (dissolved)	µg/l	0.5	ISO 17025	< 0.5	0.5			

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0			

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10			

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10			





Analytical Report Number: 20-96133  
 Project / Site name: A417 Missing Link

Your Order No: 35560

<b>Lab Sample Number</b>				1492296	1492297		
<b>Sample Reference</b>				DSRC406	OH416		
<b>Sample Number</b>				None Supplied	None Supplied		
<b>Depth (m)</b>				33.00	3.00		
<b>Date Sampled</b>				08/04/2020	08/04/2020		
<b>Time Taken</b>				1300	1330		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0		
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0		
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-96133**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.

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**Analytical Report Number : 20-96133**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



**Edward Crimp**

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## **Analytical Report Number : 20-96135**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	09/04/2020
<b>Your job number:</b>	35205	<b>Samples instructed on:</b>	09/04/2020
<b>Your order number:</b>	35560	<b>Analysis completed by:</b>	20/04/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	20/04/2020
<b>Samples Analysed:</b>	8 water samples		

**Signed:** 

Karolina Marek  
PL Head of Reporting Team

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 20-96135  
Project / Site name: A417 Missing Link

Your Order No: 35560

Lab Sample Number	1492301	1492302	1492303	1492304	1492305
Sample Reference	C105	CP206	C212	C216	C223
Sample Number	3	3	3	3	3
Depth (m)	7.00	6.00	20.00	5.00	21.00
Date Sampled	02/04/2020	02/04/2020	02/04/2020	02/04/2020	02/04/2020
Time Taken	1030	1100	1230	1000	1130
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status		

**General Inorganics**

	pH Units	N/A	ISO 17025	7.4	12.1	7.8	7.3	12.1
pH								
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	540	1500	580	560	1800
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	7.10	3.76	16.3	7.16	6.49
Total Sulphur	µg/l	15	NONE	2400	1300	5400	2400	2200
Chloride	mg/l	0.15	ISO 17025	3.8	14	10	2.6	10
Fluoride	µg/l	50	ISO 17025	360	1200	1500	610	540
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	49	60	520	< 15	550
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	5.07	76.3	2.35	4.43	49.5
Nitrate as N	mg/l	0.01	ISO 17025	0.72	0.14	1.14	0.61	0.06
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	3.17	0.63	5.07	2.68	0.24
Nitrite as N	µg/l	1	ISO 17025	4.6	2.8	< 1.0	9.0	36
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	15	9.2	< 5.0	30	120
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	280	470	270	140	640
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	0.7	< 0.3	1.1	0.6	< 0.3
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	390	410	360	280	480
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	306	247	217	110	207

**Phenols by HPLC**

	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Catechol								
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5	< 3.5	< 3.5	< 3.5
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**Speciated PAHs**

	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Naphthalene								
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16
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Analytical Report Number: 20-96135  
 Project / Site name: A417 Missing Link

Your Order No: 35560

Lab Sample Number	1492301				1492302				1492303				1492304				1492305			
Sample Reference	C105				CP206				C212				C216				C223			
Sample Number	3				3				3				3				3			
Depth (m)	7.00				6.00				20.00				5.00				21.00			
Date Sampled	02/04/2020				02/04/2020				02/04/2020				02/04/2020				02/04/2020			
Time Taken	1030				1100				1230				1000				1130			
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status																	

**Heavy Metals / Metalloids**

Parameter	Units	Limit of detection	Accreditation Status	1492301	1492302	1492303	1492304	1492305
Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4	0.5	< 0.4	< 0.4	0.4
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.65	0.65	2.03	0.24	0.32
Barium (dissolved)	µg/l	0.06	ISO 17025	7.3	190	21	3.3	71
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Boron (dissolved)	µg/l	10	ISO 17025	14	19	400	15	84
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Calcium (dissolved)	mg/l	0.012	ISO 17025	120	99	65	41	83
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.3	< 0.2	0.2	0.5
Copper (dissolved)	µg/l	0.5	ISO 17025	1.2	3.8	< 0.5	0.6	2.2
Iron (dissolved)	mg/l	0.004	ISO 17025	0.39	0.21	0.14	0.009	0.13
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.2	< 0.2	< 0.2	< 0.2
Magnesium (dissolved)	mg/l	0.005	ISO 17025	2.3	0.030	13	2.0	0.034
Manganese (dissolved)	µg/l	0.05	ISO 17025	4.0	1.7	470	0.30	0.55
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	1.2	9.7	1.5	1.1	2.8
Nickel (dissolved)	µg/l	0.5	ISO 17025	< 0.5	12	< 0.5	< 0.5	1.8
Potassium (dissolved)	mg/l	0.025	ISO 17025	0.34	26	5.7	0.37	87
Selenium (dissolved)	µg/l	0.6	ISO 17025	0.7	1.0	< 0.6	< 0.6	0.7
Sodium (dissolved)	mg/l	0.01	ISO 17025	5.3	110	61	3.7	90
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.6	< 0.2	< 0.2	1.3
Zinc (dissolved)	µg/l	0.5	ISO 17025	1.5	3.1	4.3	< 0.5	< 0.5

**Monoaromatics & Oxygenates**

Parameter	Units	Limit of detection	Accreditation Status	1492301	1492302	1492303	1492304	1492305
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

**Petroleum Hydrocarbons**

Parameter	Units	Limit of detection	Accreditation Status	1492301	1492302	1492303	1492304	1492305
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

Parameter	Units	Limit of detection	Accreditation Status	1492301	1492302	1492303	1492304	1492305
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10



Analytical Report Number: 20-96135  
 Project / Site name: A417 Missing Link

Your Order No: 35560

Lab Sample Number	1492301	1492302	1492303	1492304	1492305
Sample Reference	C105	CP206	C212	C216	C223
Sample Number	3	3	3	3	3
Depth (m)	7.00	6.00	20.00	5.00	21.00
Date Sampled	02/04/2020	02/04/2020	02/04/2020	02/04/2020	02/04/2020
Time Taken	1030	1100	1230	1000	1130
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status		

**VOCS**

Analytical Parameter	Units	Limit of detection	Accreditation Status	1492301	1492302	1492303	1492304	1492305
Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 20-96135  
 Project / Site name: A417 Missing Link

Your Order No: 35560

Lab Sample Number	1492306			1492307			1492308		
Sample Reference	DSRC107			DSRC108			DSRC224		
Sample Number	3			3			3		
Depth (m)	4.00			5.00			30.00		
Date Sampled	02/04/2020			02/04/2020			02/04/2020		
Time Taken	0930			0900			1200		
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status						

**General Inorganics**

Parameter	Units	Limit of detection	Accreditation Status	1492306	1492307	1492308
pH	pH Units	N/A	ISO 17025	8.2	7.7	12.2
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	520	780	2300
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	37.2	3.43	25.7
Total Sulphur	µg/l	15	NONE	12000	1100	8600
Chloride	mg/l	0.15	ISO 17025	38	32	17
Fluoride	µg/l	50	ISO 17025	510	3600	1100
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	< 15	270	3500
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	13.0	120	5.29
Nitrate as N	mg/l	0.01	ISO 17025	0.53	0.18	2.89
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	2.34	0.78	12.8
Nitrite as N	µg/l	1	ISO 17025	41	6.3	3000
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	140	21	9800
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	220	680	730
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	0.6	< 0.3	5.9
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	350	730	540
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	227	116	479

**Phenols by HPLC**

Parameter	Units	Limit of detection	Accreditation Status	1492306	1492307	1492308
Catechol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5	1100
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5

**Total Phenols**

Parameter	Units	Limit of detection	Accreditation Status	1492306	1492307	1492308
Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5	1100

**Speciated PAHs**

Parameter	Units	Limit of detection	Accreditation Status	1492306	1492307	1492308
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01

**Total PAH**

Parameter	Units	Limit of detection	Accreditation Status	1492306	1492307	1492308
Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16





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 Project / Site name: A417 Missing Link

Your Order No: 35560

Lab Sample Number	1492306			1492307			1492308		
Sample Reference	DSRC107			DSRC108			DSRC224		
Sample Number	3			3			3		
Depth (m)	4.00			5.00			30.00		
Date Sampled	02/04/2020			02/04/2020			02/04/2020		
Time Taken	0930			0900			1200		
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status						

**Heavy Metals / Metalloids**

Element	Units	Limit of detection	Accreditation Status	1492306	1492307	1492308
Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4	< 0.4	0.4
Arsenic (dissolved)	µg/l	0.15	ISO 17025	1.22	9.24	0.16
Barium (dissolved)	µg/l	0.06	ISO 17025	14	22	47
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1
Boron (dissolved)	µg/l	10	ISO 17025	24	600	58
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	0.02	< 0.02
Calcium (dissolved)	mg/l	0.012	ISO 17025	78	35	190
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.5	0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	0.7	1.9	2.3
Iron (dissolved)	mg/l	0.004	ISO 17025	0.20	0.40	0.076
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.4	0.4
Magnesium (dissolved)	mg/l	0.005	ISO 17025	8.0	6.8	0.014
Manganese (dissolved)	µg/l	0.05	ISO 17025	140	200	0.15
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	6.8	9.9	2.9
Nickel (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	0.7
Potassium (dissolved)	mg/l	0.025	ISO 17025	1.6	3.4	6.6
Selenium (dissolved)	µg/l	0.6	ISO 17025	0.8	0.9	1.1
Sodium (dissolved)	mg/l	0.01	ISO 17025	36	170	97
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.2	0.7	2.1
Zinc (dissolved)	µg/l	0.5	ISO 17025	2.6	2.0	1.0

**Monoaromatics & Oxygenates**

Compound	Units	Limit of detection	Accreditation Status	1492306	1492307	1492308
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0

**Petroleum Hydrocarbons**

TPH-CWG Category	Units	Limit of detection	Accreditation Status	1492306	1492307	1492308
TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10	< 10

TPH-CWG Category	Units	Limit of detection	Accreditation Status	1492306	1492307	1492308
TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10	< 10



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Your Order No: 35560

<b>Lab Sample Number</b>		1492306	1492307	1492308		
<b>Sample Reference</b>		DSRC107	DSRC108	DSRC224		
<b>Sample Number</b>		3	3	3		
<b>Depth (m)</b>		4.00	5.00	30.00		
<b>Date Sampled</b>		02/04/2020	02/04/2020	02/04/2020		
<b>Time Taken</b>		0930	0900	1200		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>			

**VOCS**

Compound	Units	Limit of detection	Accreditation Status	1492306	1492307	1492308
Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-96135**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025



**Analytical Report Number : 20-96135**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

## Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
C105		3 W	20-96135	1492301	c	BTEX and MTBE in water (Monoaromatics)	L073B-PL	c
C105		3 W	20-96135	1492301	c	Hexavalent chromium in water	L080-PL	c
C105		3 W	20-96135	1492301	c	Ammoniacal Nitrogen as N in water	L082-PL	c
C105		3 W	20-96135	1492301	c	Boron in water	L039-PL	c
C105		3 W	20-96135	1492301	c	Cr (III) in water	L080-PL	c
C105		3 W	20-96135	1492301	c	Electrical conductivity at 20oC of water	L031-PL	c
C105		3 W	20-96135	1492301	c	Free cyanide in water	L080-PL	c
C105		3 W	20-96135	1492301	c	Metals in water by ICP-MS (dissolved)	L012-PL	c
C105		3 W	20-96135	1492301	c	Metals in water by ICP-OES (dissolved)	L039-PL	c
C105		3 W	20-96135	1492301	c	Nitrate as N in water	L078-PL	c
C105		3 W	20-96135	1492301	c	Nitrate in water	L078-PL	c
C105		3 W	20-96135	1492301	c	Nitrite as N in water	L082-PL	c
C105		3 W	20-96135	1492301	c	Nitrite in water	L082-PL	c
C105		3 W	20-96135	1492301	c	Sulphate in water	L039-PL	c
C105		3 W	20-96135	1492301	c	Total Hardness of water	L045-PL	c
C105		3 W	20-96135	1492301	c	Total cyanide in water	L080-PL	c
C105		3 W	20-96135	1492301	c	Total oxidised nitrogen in water	L078/82-PL	c
C105		3 W	20-96135	1492301	c	Volatile organic compounds in water	L073B-PL	c
C105		3 W	20-96135	1492301	c	pH at 20oC in water (automated)	L099-PL	c
C212		3 W	20-96135	1492303	c	BTEX and MTBE in water (Monoaromatics)	L073B-PL	c
C212		3 W	20-96135	1492303	c	Hexavalent chromium in water	L080-PL	c
C212		3 W	20-96135	1492303	c	Ammoniacal Nitrogen as N in water	L082-PL	c
C212		3 W	20-96135	1492303	c	Boron in water	L039-PL	c
C212		3 W	20-96135	1492303	c	Cr (III) in water	L080-PL	c
C212		3 W	20-96135	1492303	c	Electrical conductivity at 20oC of water	L031-PL	c
C212		3 W	20-96135	1492303	c	Free cyanide in water	L080-PL	c
C212		3 W	20-96135	1492303	c	Metals in water by ICP-MS (dissolved)	L012-PL	c
C212		3 W	20-96135	1492303	c	Metals in water by ICP-OES (dissolved)	L039-PL	c
C212		3 W	20-96135	1492303	c	Nitrate as N in water	L078-PL	c
C212		3 W	20-96135	1492303	c	Nitrate in water	L078-PL	c
C212		3 W	20-96135	1492303	c	Nitrite as N in water	L082-PL	c
C212		3 W	20-96135	1492303	c	Nitrite in water	L082-PL	c
C212		3 W	20-96135	1492303	c	Sulphate in water	L039-PL	c
C212		3 W	20-96135	1492303	c	Total Hardness of water	L045-PL	c
C212		3 W	20-96135	1492303	c	Total cyanide in water	L080-PL	c
C212		3 W	20-96135	1492303	c	Total oxidised nitrogen in water	L078/82-PL	c
C212		3 W	20-96135	1492303	c	Volatile organic compounds in water	L073B-PL	c
C212		3 W	20-96135	1492303	c	pH at 20oC in water (automated)	L099-PL	c
C216		3 W	20-96135	1492304	c	BTEX and MTBE in water (Monoaromatics)	L073B-PL	c
C216		3 W	20-96135	1492304	c	Hexavalent chromium in water	L080-PL	c
C216		3 W	20-96135	1492304	c	Ammoniacal Nitrogen as N in water	L082-PL	c
C216		3 W	20-96135	1492304	c	Boron in water	L039-PL	c
C216		3 W	20-96135	1492304	c	Cr (III) in water	L080-PL	c
C216		3 W	20-96135	1492304	c	Electrical conductivity at 20oC of water	L031-PL	c
C216		3 W	20-96135	1492304	c	Free cyanide in water	L080-PL	c
C216		3 W	20-96135	1492304	c	Metals in water by ICP-MS (dissolved)	L012-PL	c
C216		3 W	20-96135	1492304	c	Metals in water by ICP-OES (dissolved)	L039-PL	c
C216		3 W	20-96135	1492304	c	Nitrate as N in water	L078-PL	c
C216		3 W	20-96135	1492304	c	Nitrate in water	L078-PL	c
C216		3 W	20-96135	1492304	c	Nitrite as N in water	L082-PL	c
C216		3 W	20-96135	1492304	c	Nitrite in water	L082-PL	c

Key: a - No sampling date b - Incorrect container  
c - Holding time d - Headspace e - Temperature

## Sample Deviation Report



C216	3	W	20-96135	1492304	c	Sulphate in water	L039-PL	c
C216	3	W	20-96135	1492304	c	Total Hardness of water	L045-PL	c
C216	3	W	20-96135	1492304	c	Total cyanide in water	L080-PL	c
C216	3	W	20-96135	1492304	c	Total oxidised nitrogen in water	L078/82-PL	c
C216	3	W	20-96135	1492304	c	Volatile organic compounds in water	L073B-PL	c
C216	3	W	20-96135	1492304	c	pH at 20oC in water (automated)	L099-PL	c
C223	3	W	20-96135	1492305	c	BTEX and MTBE in water (Monoaromatics)	L073B-PL	c
C223	3	W	20-96135	1492305	c	Hexavalent chromium in water	L080-PL	c
C223	3	W	20-96135	1492305	c	Ammoniacal Nitrogen as N in water	L082-PL	c
C223	3	W	20-96135	1492305	c	Boron in water	L039-PL	c
C223	3	W	20-96135	1492305	c	Cr (III) in water	L080-PL	c
C223	3	W	20-96135	1492305	c	Electrical conductivity at 20oC of water	L031-PL	c
C223	3	W	20-96135	1492305	c	Free cyanide in water	L080-PL	c
C223	3	W	20-96135	1492305	c	Metals in water by ICP-MS (dissolved)	L012-PL	c
C223	3	W	20-96135	1492305	c	Metals in water by ICP-OES (dissolved)	L039-PL	c
C223	3	W	20-96135	1492305	c	Nitrate as N in water	L078-PL	c
C223	3	W	20-96135	1492305	c	Nitrate in water	L078-PL	c
C223	3	W	20-96135	1492305	c	Nitrite as N in water	L082-PL	c
C223	3	W	20-96135	1492305	c	Nitrite in water	L082-PL	c
C223	3	W	20-96135	1492305	c	Sulphate in water	L039-PL	c
C223	3	W	20-96135	1492305	c	Total Hardness of water	L045-PL	c
C223	3	W	20-96135	1492305	c	Total cyanide in water	L080-PL	c
C223	3	W	20-96135	1492305	c	Total oxidised nitrogen in water	L078/82-PL	c
C223	3	W	20-96135	1492305	c	Volatile organic compounds in water	L073B-PL	c
C223	3	W	20-96135	1492305	c	pH at 20oC in water (automated)	L099-PL	c
CP206	3	W	20-96135	1492302	c	BTEX and MTBE in water (Monoaromatics)	L073B-PL	c
CP206	3	W	20-96135	1492302	c	Hexavalent chromium in water	L080-PL	c
CP206	3	W	20-96135	1492302	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP206	3	W	20-96135	1492302	c	Boron in water	L039-PL	c
CP206	3	W	20-96135	1492302	c	Cr (III) in water	L080-PL	c
CP206	3	W	20-96135	1492302	c	Electrical conductivity at 20oC of water	L031-PL	c
CP206	3	W	20-96135	1492302	c	Free cyanide in water	L080-PL	c
CP206	3	W	20-96135	1492302	c	Metals in water by ICP-MS (dissolved)	L012-PL	c
CP206	3	W	20-96135	1492302	c	Metals in water by ICP-OES (dissolved)	L039-PL	c
CP206	3	W	20-96135	1492302	c	Nitrate as N in water	L078-PL	c
CP206	3	W	20-96135	1492302	c	Nitrate in water	L078-PL	c
CP206	3	W	20-96135	1492302	c	Nitrite as N in water	L082-PL	c
CP206	3	W	20-96135	1492302	c	Nitrite in water	L082-PL	c
CP206	3	W	20-96135	1492302	c	Sulphate in water	L039-PL	c
CP206	3	W	20-96135	1492302	c	Total Hardness of water	L045-PL	c
CP206	3	W	20-96135	1492302	c	Total cyanide in water	L080-PL	c
CP206	3	W	20-96135	1492302	c	Total oxidised nitrogen in water	L078/82-PL	c
CP206	3	W	20-96135	1492302	c	Volatile organic compounds in water	L073B-PL	c
CP206	3	W	20-96135	1492302	c	pH at 20oC in water (automated)	L099-PL	c
DSRC107	3	W	20-96135	1492306	c	BTEX and MTBE in water (Monoaromatics)	L073B-PL	c
DSRC107	3	W	20-96135	1492306	c	Hexavalent chromium in water	L080-PL	c
DSRC107	3	W	20-96135	1492306	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC107	3	W	20-96135	1492306	c	Boron in water	L039-PL	c
DSRC107	3	W	20-96135	1492306	c	Cr (III) in water	L080-PL	c
DSRC107	3	W	20-96135	1492306	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC107	3	W	20-96135	1492306	c	Free cyanide in water	L080-PL	c
DSRC107	3	W	20-96135	1492306	c	Metals in water by ICP-MS (dissolved)	L012-PL	c
DSRC107	3	W	20-96135	1492306	c	Metals in water by ICP-OES (dissolved)	L039-PL	c
DSRC107	3	W	20-96135	1492306	c	Nitrate as N in water	L078-PL	c

Key: a - No sampling date b - Incorrect container  
c - Holding time d - Headspace e - Temperature

## Sample Deviation Report



DSRC107	3	W	20-96135	1492306	c	Nitrate in water	L078-PL	c
DSRC107	3	W	20-96135	1492306	c	Nitrite as N in water	L082-PL	c
DSRC107	3	W	20-96135	1492306	c	Nitrite in water	L082-PL	c
DSRC107	3	W	20-96135	1492306	c	Sulphate in water	L039-PL	c
DSRC107	3	W	20-96135	1492306	c	Total Hardness of water	L045-PL	c
DSRC107	3	W	20-96135	1492306	c	Total cyanide in water	L080-PL	c
DSRC107	3	W	20-96135	1492306	c	Total oxidised nitrogen in water	L078/82-PL	c
DSRC107	3	W	20-96135	1492306	c	Volatile organic compounds in water	L073B-PL	c
DSRC107	3	W	20-96135	1492306	c	pH at 20oC in water (automated)	L099-PL	c
DSRC108	3	W	20-96135	1492307	c	BTEX and MTBE in water (Monoaromatics)	L073B-PL	c
DSRC108	3	W	20-96135	1492307	c	Hexavalent chromium in water	L080-PL	c
DSRC108	3	W	20-96135	1492307	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC108	3	W	20-96135	1492307	c	Boron in water	L039-PL	c
DSRC108	3	W	20-96135	1492307	c	Cr (III) in water	L080-PL	c
DSRC108	3	W	20-96135	1492307	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC108	3	W	20-96135	1492307	c	Free cyanide in water	L080-PL	c
DSRC108	3	W	20-96135	1492307	c	Metals in water by ICP-MS (dissolved)	L012-PL	c
DSRC108	3	W	20-96135	1492307	c	Metals in water by ICP-OES (dissolved)	L039-PL	c
DSRC108	3	W	20-96135	1492307	c	Nitrate as N in water	L078-PL	c
DSRC108	3	W	20-96135	1492307	c	Nitrate in water	L078-PL	c
DSRC108	3	W	20-96135	1492307	c	Nitrite as N in water	L082-PL	c
DSRC108	3	W	20-96135	1492307	c	Nitrite in water	L082-PL	c
DSRC108	3	W	20-96135	1492307	c	Sulphate in water	L039-PL	c
DSRC108	3	W	20-96135	1492307	c	Total Hardness of water	L045-PL	c
DSRC108	3	W	20-96135	1492307	c	Total cyanide in water	L080-PL	c
DSRC108	3	W	20-96135	1492307	c	Total oxidised nitrogen in water	L078/82-PL	c
DSRC108	3	W	20-96135	1492307	c	Volatile organic compounds in water	L073B-PL	c
DSRC108	3	W	20-96135	1492307	c	pH at 20oC in water (automated)	L099-PL	c
DSRC224	3	W	20-96135	1492308	c	BTEX and MTBE in water (Monoaromatics)	L073B-PL	c
DSRC224	3	W	20-96135	1492308	c	Hexavalent chromium in water	L080-PL	c
DSRC224	3	W	20-96135	1492308	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC224	3	W	20-96135	1492308	c	Boron in water	L039-PL	c
DSRC224	3	W	20-96135	1492308	c	Cr (III) in water	L080-PL	c
DSRC224	3	W	20-96135	1492308	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC224	3	W	20-96135	1492308	c	Free cyanide in water	L080-PL	c
DSRC224	3	W	20-96135	1492308	c	Metals in water by ICP-MS (dissolved)	L012-PL	c
DSRC224	3	W	20-96135	1492308	c	Metals in water by ICP-OES (dissolved)	L039-PL	c
DSRC224	3	W	20-96135	1492308	c	Nitrate as N in water	L078-PL	c
DSRC224	3	W	20-96135	1492308	c	Nitrate in water	L078-PL	c
DSRC224	3	W	20-96135	1492308	c	Nitrite as N in water	L082-PL	c
DSRC224	3	W	20-96135	1492308	c	Nitrite in water	L082-PL	c
DSRC224	3	W	20-96135	1492308	c	Sulphate in water	L039-PL	c
DSRC224	3	W	20-96135	1492308	c	Total Hardness of water	L045-PL	c
DSRC224	3	W	20-96135	1492308	c	Total cyanide in water	L080-PL	c
DSRC224	3	W	20-96135	1492308	c	Total oxidised nitrogen in water	L078/82-PL	c
DSRC224	3	W	20-96135	1492308	c	Volatile organic compounds in water	L073B-PL	c
DSRC224	3	W	20-96135	1492308	c	pH at 20oC in water (automated)	L099-PL	c



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## **Analytical Report Number : 20-96136**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	09/04/2020
<b>Your job number:</b>	35560-01	<b>Samples instructed on:</b>	09/04/2020
<b>Your order number:</b>	35560	<b>Analysis completed by:</b>	20/04/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	20/04/2020
<b>Samples Analysed:</b>	2 water samples		

**Signed:** 

Karolina Marek  
PL Head of Reporting Team

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Iss No 20-96136-1 A417 Missing Link 35560-01

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The results included within the report are representative of the samples submitted for analysis.

Page 1 of 7





Analytical Report Number: 20-96136  
 Project / Site name: A417 Missing Link

Your Order No: 35560

<b>Lab Sample Number</b>				1492309	1492310			
<b>Sample Reference</b>				CP210	DSRC205			
<b>Sample Number</b>				2	2			
<b>Depth (m)</b>				16.00	10.00			
<b>Date Sampled</b>				02/04/2020	02/04/2020			
<b>Time Taken</b>				1430	1500			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.7	7.5			
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	860	760			
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	90.7	75.0			
Total Sulphur	µg/l	15	NONE	30000	25000			
Chloride	mg/l	0.15	ISO 17025	72	47			
Fluoride	µg/l	50	ISO 17025	860	860			
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	30	42			
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	5.33	2.93			
Nitrate as N	mg/l	0.01	ISO 17025	1.69	2.53			
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	7.50	11.2			
Nitrite as N	µg/l	1	ISO 17025	25	5.1			
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	82	17			
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	190	510			
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	1.7	2.5			
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	520	470			
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	277	359			

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5	< 0.5			
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5			
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5			
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5			
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5			
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16			
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Analytical Report Number: 20-96136

Project / Site name: A417 Missing Link

Your Order No: 35560

<b>Lab Sample Number</b>				1492309	1492310			
<b>Sample Reference</b>				CP210	DSRC205			
<b>Sample Number</b>				2	2			
<b>Depth (m)</b>				16.00	10.00			
<b>Date Sampled</b>				02/04/2020	02/04/2020			
<b>Time Taken</b>				1430	1500			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	0.8	< 0.4			
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.81	0.24			
Barium (dissolved)	µg/l	0.06	ISO 17025	14	12			
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1			
Boron (dissolved)	µg/l	10	ISO 17025	150	110			
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02			
Calcium (dissolved)	mg/l	0.012	ISO 17025	95	120			
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0			
Chromium (III)	µg/l	1	NONE	1.2	< 1.0			
Chromium (dissolved)	µg/l	0.2	ISO 17025	1.2	< 0.2			
Copper (dissolved)	µg/l	0.5	ISO 17025	6.9	0.7			
Iron (dissolved)	mg/l	0.004	ISO 17025	0.44	0.013			
Lead (dissolved)	µg/l	0.2	ISO 17025	0.8	< 0.2			
Magnesium (dissolved)	mg/l	0.005	ISO 17025	10	12			
Manganese (dissolved)	µg/l	0.05	ISO 17025	31	47			
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05			
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	12	0.98			
Nickel (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5			
Potassium (dissolved)	mg/l	0.025	ISO 17025	3.2	1.8			
Selenium (dissolved)	µg/l	0.6	ISO 17025	0.9	1.1			
Sodium (dissolved)	mg/l	0.01	ISO 17025	49	35			
Vanadium (dissolved)	µg/l	0.2	ISO 17025	1.4	< 0.2			
Zinc (dissolved)	µg/l	0.5	ISO 17025	1.8	1.2			

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0			

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10			

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10			



Analytical Report Number: 20-96136

Project / Site name: A417 Missing Link

Your Order No: 35560

<b>Lab Sample Number</b>	1492309	1492310			
<b>Sample Reference</b>	CP210	DSRC205			
<b>Sample Number</b>	2	2			
<b>Depth (m)</b>	16.00	10.00			
<b>Date Sampled</b>	02/04/2020	02/04/2020			
<b>Time Taken</b>	1430	1500			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>		

**VOCS**

Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status	1492309	1492310		
Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0		
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0		
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-96136**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.

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**Analytical Report Number : 20-96136**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

## Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
CP210		2 W	20-96136	1492309	c	BTEX and MTBE in water (Monoaromatics)	L073B-PL	c
CP210		2 W	20-96136	1492309	c	Hexavalent chromium in water	L080-PL	c
CP210		2 W	20-96136	1492309	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP210		2 W	20-96136	1492309	c	Boron in water	L039-PL	c
CP210		2 W	20-96136	1492309	c	Cr (III) in water	L080-PL	c
CP210		2 W	20-96136	1492309	c	Electrical conductivity at 20oC of water	L031-PL	c
CP210		2 W	20-96136	1492309	c	Free cyanide in water	L080-PL	c
CP210		2 W	20-96136	1492309	c	Metals in water by ICP-MS (dissolved)	L012-PL	c
CP210		2 W	20-96136	1492309	c	Metals in water by ICP-OES (dissolved)	L039-PL	c
CP210		2 W	20-96136	1492309	c	Nitrate as N in water	L078-PL	c
CP210		2 W	20-96136	1492309	c	Nitrate in water	L078-PL	c
CP210		2 W	20-96136	1492309	c	Nitrite as N in water	L082-PL	c
CP210		2 W	20-96136	1492309	c	Nitrite in water	L082-PL	c
CP210		2 W	20-96136	1492309	c	Sulphate in water	L039-PL	c
CP210		2 W	20-96136	1492309	c	Total Hardness of water	L045-PL	c
CP210		2 W	20-96136	1492309	c	Total cyanide in water	L080-PL	c
CP210		2 W	20-96136	1492309	c	Total oxidised nitrogen in water	L078/82-PL	c
CP210		2 W	20-96136	1492309	c	Volatile organic compounds in water	L073B-PL	c
CP210		2 W	20-96136	1492309	c	pH at 20oC in water (automated)	L099-PL	c
DSRC205		2 W	20-96136	1492310	c	BTEX and MTBE in water (Monoaromatics)	L073B-PL	c
DSRC205		2 W	20-96136	1492310	c	Hexavalent chromium in water	L080-PL	c
DSRC205		2 W	20-96136	1492310	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC205		2 W	20-96136	1492310	c	Boron in water	L039-PL	c
DSRC205		2 W	20-96136	1492310	c	Cr (III) in water	L080-PL	c
DSRC205		2 W	20-96136	1492310	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC205		2 W	20-96136	1492310	c	Free cyanide in water	L080-PL	c
DSRC205		2 W	20-96136	1492310	c	Metals in water by ICP-MS (dissolved)	L012-PL	c
DSRC205		2 W	20-96136	1492310	c	Metals in water by ICP-OES (dissolved)	L039-PL	c
DSRC205		2 W	20-96136	1492310	c	Nitrate as N in water	L078-PL	c
DSRC205		2 W	20-96136	1492310	c	Nitrate in water	L078-PL	c
DSRC205		2 W	20-96136	1492310	c	Nitrite as N in water	L082-PL	c
DSRC205		2 W	20-96136	1492310	c	Nitrite in water	L082-PL	c
DSRC205		2 W	20-96136	1492310	c	Sulphate in water	L039-PL	c
DSRC205		2 W	20-96136	1492310	c	Total Hardness of water	L045-PL	c
DSRC205		2 W	20-96136	1492310	c	Total cyanide in water	L080-PL	c
DSRC205		2 W	20-96136	1492310	c	Total oxidised nitrogen in water	L078/82-PL	c
DSRC205		2 W	20-96136	1492310	c	Volatile organic compounds in water	L073B-PL	c
DSRC205		2 W	20-96136	1492310	c	pH at 20oC in water (automated)	L099-PL	c



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## **Analytical Report Number : 20-96138**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	09/04/2020
<b>Your job number:</b>	35560-07	<b>Samples instructed on:</b>	09/04/2020
<b>Your order number:</b>	35560	<b>Analysis completed by:</b>	20/04/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	20/04/2020
<b>Samples Analysed:</b>	2 water samples		

**Signed:** 

Karolina Marek  
PL Head of Reporting Team

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Iss No 20-96138-1 A417 Missing Link 35560-07

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 20-96138

Project / Site name: A417 Missing Link

Your Order No: 35560

Lab Sample Number				1492315	1492316			
Sample Reference				DSRC325	DSRCOH304			
Sample Number				1	1			
Depth (m)				25.00	25.00			
Date Sampled				08/04/2020	08/04/2020			
Time Taken				0900	0930			
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					

**General Inorganics**

Parameter	Units	Limit of detection	Accreditation Status	1492315	1492316			
pH	pH Units	N/A	ISO 17025	7.8	7.8			
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	450	530			
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	30.0	121			
Total Sulphur	µg/l	15	NONE	10000	40000			
Chloride	mg/l	0.15	ISO 17025	23	8.0			
Fluoride	µg/l	50	ISO 17025	130	2100			
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	< 15	220			
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	3.32	2.04			
Nitrate as N	mg/l	0.01	ISO 17025	6.33	< 0.01			
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	28.0	< 0.05			
Nitrite as N	µg/l	1	ISO 17025	13	5.3			
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	41	17			
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	130	230			
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	6.3	< 0.3			
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	330	350			
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	195	272			

**Phenols by HPLC**

Parameter	Units	Limit of detection	Accreditation Status	1492315	1492316			
Catechol	µg/l	0.5	NONE	< 0.5	< 0.5			
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5			
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5			
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5			
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5			
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**Speciated PAHs**

Parameter	Units	Limit of detection	Accreditation Status	1492315	1492316			
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16			
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Analytical Report Number: 20-96138

Project / Site name: A417 Missing Link

Your Order No: 35560

<b>Lab Sample Number</b>				1492315	1492316			
<b>Sample Reference</b>				DSRC325	DSRCOH304			
<b>Sample Number</b>				1	1			
<b>Depth (m)</b>				25.00	25.00			
<b>Date Sampled</b>				08/04/2020	08/04/2020			
<b>Time Taken</b>				0900	0930			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	2.2	0.4			
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.32	2.35			
Barium (dissolved)	µg/l	0.06	ISO 17025	16	8.0			
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1			
Boron (dissolved)	µg/l	10	ISO 17025	< 10	150			
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	0.04			
Calcium (dissolved)	mg/l	0.012	ISO 17025	73	76			
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0			
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0			
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Copper (dissolved)	µg/l	0.5	ISO 17025	2.5	1.2			
Iron (dissolved)	mg/l	0.004	ISO 17025	0.017	< 0.004			
Lead (dissolved)	µg/l	0.2	ISO 17025	3.4	< 0.2			
Magnesium (dissolved)	mg/l	0.005	ISO 17025	3.2	20			
Manganese (dissolved)	µg/l	0.05	ISO 17025	110	14			
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05			
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.56	1.5			
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.6	< 0.5			
Potassium (dissolved)	mg/l	0.025	ISO 17025	0.64	2.4			
Selenium (dissolved)	µg/l	0.6	ISO 17025	3.3	0.6			
Sodium (dissolved)	mg/l	0.01	ISO 17025	19	12			
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.7	0.2			
Zinc (dissolved)	µg/l	0.5	ISO 17025	5.9	2.4			

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0			

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10			

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10			



Analytical Report Number: 20-96138

Project / Site name: A417 Missing Link

Your Order No: 35560

<b>Lab Sample Number</b>				1492315	1492316		
<b>Sample Reference</b>				DSRC325	DSRCOH304		
<b>Sample Number</b>				1	1		
<b>Depth (m)</b>				25.00	25.00		
<b>Date Sampled</b>				08/04/2020	08/04/2020		
<b>Time Taken</b>				0900	0930		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0		
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0		
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-96138**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.

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**Analytical Report Number : 20-96138**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



**Edward Crimp**

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## **Analytical Report Number : 20-96140**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	09/04/2020
<b>Your job number:</b>	35205	<b>Samples instructed on:</b>	09/04/2020
<b>Your order number:</b>	35560	<b>Analysis completed by:</b>	20/04/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	20/04/2020
<b>Samples Analysed:</b>	8 water samples		

**Signed:** 

Karolina Marek  
PL Head of Reporting Team

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 20-96140  
 Project / Site name: A417 Missing Link

Your Order No: 35560

Lab Sample Number	1492320	1492321	1492322	1492323	1492324
Sample Reference	DSRC108	DSRC107	CP105	CP106	CP206
Sample Number	4	4	4	4	4
Depth (m)	7.00	3.50	5.00	18.00	5.00
Date Sampled	07/04/2020	07/04/2020	08/04/2020	08/04/2020	08/04/2020
Time Taken	1400	1430	1030	1000	1100
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status		

**General Inorganics**

Parameter	Units	N/A	ISO 17025	7.7	7.6	7.5	12.3	8.1
pH	pH Units	N/A	ISO 17025	7.7	7.6	7.5	12.3	8.1
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	780	540	520	3900	310
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	3.11	36.6	8.87	16.4	6.72
Total Sulphur	µg/l	15	NONE	1000	12000	3000	5500	2200
Chloride	mg/l	0.15	ISO 17025	30	38	6.7	24	11
Fluoride	µg/l	50	ISO 17025	3900	490	370	1400	670
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	< 15	< 15	49	1600	100
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	135	14.0	3.78	5.26	23.3
Nitrate as N	mg/l	0.01	ISO 17025	0.14	2.45	0.87	0.03	0.08
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	0.63	10.9	3.85	0.15	0.34
Nitrite as N	µg/l	1	ISO 17025	18	72	14	11	230
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	60	240	47	36	750
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	560	190	370	180	190
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	< 0.3	2.5	0.9	< 0.3	0.3
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	690	350	330	930	240
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	115	224	290	852	103

**Phenols by HPLC**

Parameter	Units	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Catechol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5	< 3.5	< 3.5	< 3.5
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**Speciated PAHs**

Parameter	Units	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16
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Analytical Report Number: 20-96140  
 Project / Site name: A417 Missing Link

Your Order No: 35560

Lab Sample Number	1492320	1492321	1492322	1492323	1492324
Sample Reference	DSRC108	DSRC107	CP105	CP106	CP206
Sample Number	4	4	4	4	4
Depth (m)	7.00	3.50	5.00	18.00	5.00
Date Sampled	07/04/2020	07/04/2020	08/04/2020	08/04/2020	08/04/2020
Time Taken	1400	1430	1030	1000	1100
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status		

**Heavy Metals / Metalloids**

Element	Unit	Limit of detection	Accreditation Status	1492320	1492321	1492322	1492323	1492324
Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Arsenic (dissolved)	µg/l	0.15	ISO 17025	8.59	1.13	0.57	0.32	1.13
Barium (dissolved)	µg/l	0.06	ISO 17025	22	13	7.5	64	11
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Boron (dissolved)	µg/l	10	ISO 17025	580	24	21	250	29
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Calcium (dissolved)	mg/l	0.012	ISO 17025	35	76	110	340	38
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.4	< 0.2	< 0.2	< 0.2	< 0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	0.9	2.6	2.8	1.2	32
Iron (dissolved)	mg/l	0.004	ISO 17025	0.22	0.20	0.33	0.011	0.37
Lead (dissolved)	µg/l	0.2	ISO 17025	0.3	< 0.2	< 0.2	0.3	< 0.2
Magnesium (dissolved)	mg/l	0.005	ISO 17025	6.8	7.9	2.3	0.019	2.2
Manganese (dissolved)	µg/l	0.05	ISO 17025	220	91	4.0	< 0.05	9.3
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	5.9	4.4	0.67	1.6	5.7
Nickel (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5	< 0.5	2.4
Potassium (dissolved)	mg/l	0.025	ISO 17025	3.0	1.4	1.2	9.9	6.4
Selenium (dissolved)	µg/l	0.6	ISO 17025	1.2	1.2	0.8	1.1	0.8
Sodium (dissolved)	mg/l	0.01	ISO 17025	160	26	6.3	39	35
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.7	< 0.2	< 0.2	< 0.2	0.2
Zinc (dissolved)	µg/l	0.5	ISO 17025	8.7	3.7	2.1	< 0.5	6.7

**Monoaromatics & Oxygenates**

Compound	Unit	Limit of detection	Accreditation Status	1492320	1492321	1492322	1492323	1492324
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10



Analytical Report Number: 20-96140  
 Project / Site name: A417 Missing Link

Your Order No: 35560

Lab Sample Number				1492320	1492321	1492322	1492323	1492324
Sample Reference				DSRC108	DSRC107	CP105	CP106	CP206
Sample Number				4	4	4	4	4
Depth (m)				7.00	3.50	5.00	18.00	5.00
Date Sampled				07/04/2020	07/04/2020	08/04/2020	08/04/2020	08/04/2020
Time Taken				1400	1430	1030	1000	1100
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

U/S = Unsuitable Sample I/S = Insufficient Sample





Analytical Report Number: 20-96140  
Project / Site name: A417 Missing Link

Your Order No: 35560

Lab Sample Number	1492325			1492326			1492327		
Sample Reference	CP223			DSRC224			CP212		
Sample Number	4			4			4		
Depth (m)	22.00			40.00			20.00		
Date Sampled	08/04/2020			08/04/2020			08/04/2020		
Time Taken	1130			1200			1230		
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status						

**General Inorganics**

Parameter	Units	Limit of detection	Accreditation Status	1492325	1492326	1492327
pH	pH Units	N/A	ISO 17025	11.6	12.5	7.6
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	1000	5600	550
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	12.5	25.3	17.0
Total Sulphur	µg/l	15	NONE	4200	8400	5700
Chloride	mg/l	0.15	ISO 17025	12	25	9.5
Fluoride	µg/l	50	ISO 17025	530	3100	1400
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	520	16000	520
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	42.9	18.4	3.65
Nitrate as N	mg/l	0.01	ISO 17025	0.07	0.07	0.06
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	0.29	0.29	0.24
Nitrite as N	µg/l	1	ISO 17025	21	1900	19
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	68	6300	63
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	380	910	380
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	< 0.3	2.0	< 0.3
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	430	1300	360
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	60.5	460	244

**Phenols by HPLC**

Parameter	Units	Limit of detection	Accreditation Status	1492325	1492326	1492327
Catechol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5	< 0.5

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5	< 3.5
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**Speciated PAHs**

Parameter	Units	Limit of detection	Accreditation Status	1492325	1492326	1492327
Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01	< 0.01

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16	< 0.16
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Analytical Report Number: 20-96140

Project / Site name: A417 Missing Link

Your Order No: 35560

Lab Sample Number	1492325	1492326	1492327		
Sample Reference	CP223	DSRC224	CP212		
Sample Number	4	4	4		
Depth (m)	22.00	40.00	20.00		
Date Sampled	08/04/2020	08/04/2020	08/04/2020		
Time Taken	1130	1200	1230		
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status		

**Heavy Metals / Metalloids**

Element	Units	Limit of detection	Accreditation Status	1492325	1492326	1492327
Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4	0.9	< 0.4
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.89	0.73	0.65
Barium (dissolved)	µg/l	0.06	ISO 17025	47	39	11
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1
Boron (dissolved)	µg/l	10	ISO 17025	96	290	320
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02	< 0.02
Calcium (dissolved)	mg/l	0.012	ISO 17025	24	180	70
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0	< 5.0
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.3	0.6	< 0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	4.0	0.8	< 0.5
Iron (dissolved)	mg/l	0.004	ISO 17025	0.14	0.16	0.007
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2
Magnesium (dissolved)	mg/l	0.005	ISO 17025	0.17	0.013	17
Manganese (dissolved)	µg/l	0.05	ISO 17025	1.1	< 0.05	120
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	0.14	< 0.05
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	1.9	2.6	0.94
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.0	2.2	0.8
Potassium (dissolved)	mg/l	0.025	ISO 17025	71	9.2	3.2
Selenium (dissolved)	µg/l	0.6	ISO 17025	0.6	7.5	0.7
Sodium (dissolved)	mg/l	0.01	ISO 17025	68	270	33
Vanadium (dissolved)	µg/l	0.2	ISO 17025	1.6	0.5	< 0.2
Zinc (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5

**Monoaromatics & Oxygenates**

Compound	Units	Limit of detection	Accreditation Status	1492325	1492326	1492327
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10	< 10

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	200	< 10
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	200	< 10



Analytical Report Number: 20-96140  
 Project / Site name: A417 Missing Link

Your Order No: 35560

<b>Lab Sample Number</b>	1492325	1492326	1492327		
<b>Sample Reference</b>	CP223	DSRC224	CP212		
<b>Sample Number</b>	4	4	4		
<b>Depth (m)</b>	22.00	40.00	20.00		
<b>Date Sampled</b>	08/04/2020	08/04/2020	08/04/2020		
<b>Time Taken</b>	1130	1200	1230		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>		

**VOCS**

Compound	Units	Limit of detection	Accreditation Status	1492325	1492326	1492327
Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-96140**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.

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**Analytical Report Number : 20-96140**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



**Edward Crimp**

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## Analytical Report Number : 20-96141

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	09/04/2020
<b>Your job number:</b>	35560-01	<b>Samples instructed on:</b>	09/04/2020
<b>Your order number:</b>	35560	<b>Analysis completed by:</b>	20/04/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	20/04/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed:** 

Karolina Marek  
PL Head of Reporting Team

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 20-96141  
 Project / Site name: A417 Missing Link

Your Order No: 35560

<b>Lab Sample Number</b>				1492329				
<b>Sample Reference</b>				DSRC229				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				None Supplied				
<b>Date Sampled</b>				02/04/2020				
<b>Time Taken</b>				1400				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.3				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	630				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	111				
Total Sulphur	µg/l	15	NONE	37000				
Chloride	mg/l	0.15	ISO 17025	10				
Fluoride	µg/l	50	ISO 17025	1100				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	63				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	7.68				
Nitrate as N	mg/l	0.01	ISO 17025	0.35				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	1.56				
Nitrite as N	µg/l	1	ISO 17025	19				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	64				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	350				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	0.4				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	380				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	248				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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Analytical Report Number: 20-96141

Project / Site name: A417 Missing Link

Your Order No: 35560

<b>Lab Sample Number</b>				1492329				
<b>Sample Reference</b>				DSRC229				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				None Supplied				
<b>Date Sampled</b>				02/04/2020				
<b>Time Taken</b>				1400				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	0.4				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	1.22				
Barium (dissolved)	µg/l	0.06	ISO 17025	18				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	110				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	84				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Copper (dissolved)	µg/l	0.5	ISO 17025	< 0.5				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.15				
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	9.5				
Manganese (dissolved)	µg/l	0.05	ISO 17025	160				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	1.3				
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.7				
Potassium (dissolved)	mg/l	0.025	ISO 17025	4.9				
Selenium (dissolved)	µg/l	0.6	ISO 17025	0.9				
Sodium (dissolved)	mg/l	0.01	ISO 17025	83				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.2				
Zinc (dissolved)	µg/l	0.5	ISO 17025	< 0.5				

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	40				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	1600				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	1600				

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10				





Analytical Report Number: 20-96141

Project / Site name: A417 Missing Link

Your Order No: 35560

<b>Lab Sample Number</b>				1492329				
<b>Sample Reference</b>				DSRC229				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				None Supplied				
<b>Date Sampled</b>				02/04/2020				
<b>Time Taken</b>				1400				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-96141**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.



**Analytical Report Number : 20-96141**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

## Sample Deviation Report

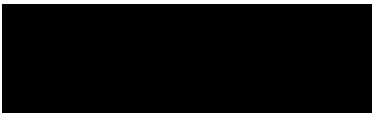


Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSRC229	1	W	20-96141	1492329	c	BTEX and MTBE in water (Monoaromatics)	L073B-PL	c
DSRC229	1	W	20-96141	1492329	c	Hexavalent chromium in water	L080-PL	c
DSRC229	1	W	20-96141	1492329	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC229	1	W	20-96141	1492329	c	Boron in water	L039-PL	c
DSRC229	1	W	20-96141	1492329	c	Cr (III) in water	L080-PL	c
DSRC229	1	W	20-96141	1492329	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC229	1	W	20-96141	1492329	c	Free cyanide in water	L080-PL	c
DSRC229	1	W	20-96141	1492329	c	Metals in water by ICP-MS (dissolved)	L012-PL	c
DSRC229	1	W	20-96141	1492329	c	Metals in water by ICP-OES (dissolved)	L039-PL	c
DSRC229	1	W	20-96141	1492329	c	Nitrate as N in water	L078-PL	c
DSRC229	1	W	20-96141	1492329	c	Nitrate in water	L078-PL	c
DSRC229	1	W	20-96141	1492329	c	Nitrite as N in water	L082-PL	c
DSRC229	1	W	20-96141	1492329	c	Nitrite in water	L082-PL	c
DSRC229	1	W	20-96141	1492329	c	Sulphate in water	L039-PL	c
DSRC229	1	W	20-96141	1492329	c	Total Hardness of water	L045-PL	c
DSRC229	1	W	20-96141	1492329	c	Total cyanide in water	L080-PL	c
DSRC229	1	W	20-96141	1492329	c	Total oxidised nitrogen in water	L078/82-PL	c
DSRC229	1	W	20-96141	1492329	c	Volatile organic compounds in water	L073B-PL	c
DSRC229	1	W	20-96141	1492329	c	pH at 20oC in water (automated)	L099-PL	c



**Edward Crimp**

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## **Analytical Report Number : 20-96142**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	09/04/2020
<b>Your job number:</b>	35560-09	<b>Samples instructed on:</b>	09/04/2020
<b>Your order number:</b>	35560-DO	<b>Analysis completed by:</b>	20/04/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	20/04/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed** 

Karolina Marek  
PL Head of Reporting Team

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Iss No 20-96142-1 A417 Missing Link 35560-09

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 20-96142

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1492328				
<b>Sample Reference</b>				DSRC229				
<b>Sample Number</b>				2				
<b>Depth (m)</b>				6.50				
<b>Date Sampled</b>				07/04/2020				
<b>Time Taken</b>				1330				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.9				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	790				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	157				
Total Sulphur	µg/l	15	NONE	52000				
Chloride	mg/l	0.15	ISO 17025	18				
Fluoride	µg/l	50	ISO 17025	1400				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	< 15				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	9.79				
Nitrate as N	mg/l	0.01	ISO 17025	0.35				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	1.56				
Nitrite as N	µg/l	1	ISO 17025	17				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	56				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	300				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	0.4				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	600				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	115				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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Analytical Report Number: 20-96142

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1492328				
<b>Sample Reference</b>				DSRC229				
<b>Sample Number</b>				2				
<b>Depth (m)</b>				6.50				
<b>Date Sampled</b>				07/04/2020				
<b>Time Taken</b>				1330				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	0.4				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.73				
Barium (dissolved)	µg/l	0.06	ISO 17025	19				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	160				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.05				
Calcium (dissolved)	mg/l	0.012	ISO 17025	36				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Copper (dissolved)	µg/l	0.5	ISO 17025	1.6				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.54				
Lead (dissolved)	µg/l	0.2	ISO 17025	0.3				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	6.0				
Manganese (dissolved)	µg/l	0.05	ISO 17025	90				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	4.3				
Nickel (dissolved)	µg/l	0.5	ISO 17025	0.9				
Potassium (dissolved)	mg/l	0.025	ISO 17025	5.4				
Selenium (dissolved)	µg/l	0.6	ISO 17025	3.6				
Sodium (dissolved)	mg/l	0.01	ISO 17025	140				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Zinc (dissolved)	µg/l	0.5	ISO 17025	2.0				

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	970				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	10000				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	11000				

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10				



Analytical Report Number: 20-96142

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1492328				
<b>Sample Reference</b>				DSRC229				
<b>Sample Number</b>				2				
<b>Depth (m)</b>				6.50				
<b>Date Sampled</b>				07/04/2020				
<b>Time Taken</b>				1330				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

U/S = Unsuitable Sample I/S = Insufficient Sample





**Analytical Report Number : 20-96142**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

Iss No 20-96142-1 A417 Missing Link 35560-09

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The results included within the report are representative of the samples submitted for analysis.



**Analytical Report Number : 20-96142**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



**Edward Crimp**

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## **Analytical Report Number : 20-96143**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	09/04/2020
<b>Your job number:</b>	35560-08	<b>Samples instructed on:</b>	09/04/2020
<b>Your order number:</b>	35560	<b>Analysis completed by:</b>	20/04/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	20/04/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed:** 

Karolina Marek  
PL Head of Reporting Team

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Iss No 20-96143-1 A417 Missing Link 35560-08

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 20-96143

Project / Site name: A417 Missing Link

Your Order No: 35560

<b>Lab Sample Number</b>				1492330				
<b>Sample Reference</b>				DSRC403				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				6.00				
<b>Date Sampled</b>				07/04/2020				
<b>Time Taken</b>				1300				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.3				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	940				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	38.4				
Total Sulphur	µg/l	15	NONE	13000				
Chloride	mg/l	0.15	ISO 17025	120				
Fluoride	µg/l	50	ISO 17025	350				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	< 15				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	4.72				
Nitrate as N	mg/l	0.01	ISO 17025	0.46				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	2.05				
Nitrite as N	µg/l	1	ISO 17025	200				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	650				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	280				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	0.7				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	600				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	259				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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Analytical Report Number: 20-96143

Project / Site name: A417 Missing Link

Your Order No: 35560

<b>Lab Sample Number</b>				1492330				
<b>Sample Reference</b>				DSRC403				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				6.00				
<b>Date Sampled</b>				07/04/2020				
<b>Time Taken</b>				1300				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	< 0.15				
Barium (dissolved)	µg/l	0.06	ISO 17025	12				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	47				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	100				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Copper (dissolved)	µg/l	0.5	ISO 17025	1.6				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.010				
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	1.7				
Manganese (dissolved)	µg/l	0.05	ISO 17025	28				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.77				
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.7				
Potassium (dissolved)	mg/l	0.025	ISO 17025	1.1				
Selenium (dissolved)	µg/l	0.6	ISO 17025	1.4				
Sodium (dissolved)	mg/l	0.01	ISO 17025	100				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Zinc (dissolved)	µg/l	0.5	ISO 17025	2.2				

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	350				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	350				

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10				



Analytical Report Number: 20-96143

Project / Site name: A417 Missing Link

Your Order No: 35560

<b>Lab Sample Number</b>				1492330				
<b>Sample Reference</b>				DSRC403				
<b>Sample Number</b>				1				
<b>Depth (m)</b>				6.00				
<b>Date Sampled</b>				07/04/2020				
<b>Time Taken</b>				1300				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-96143**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

Iss No 20-96143-1 A417 Missing Link 35560-08

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The results included within the report are representative of the samples submitted for analysis.



**Analytical Report Number : 20-96143**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**





**Edward Crimp**

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## **Analytical Report Number : 20-96144**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	09/04/2020
<b>Your job number:</b>	35560-03	<b>Samples instructed on:</b>	09/04/2020
<b>Your order number:</b>	35560-DO	<b>Analysis completed by:</b>	20/04/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	20/04/2020
<b>Samples Analysed:</b>	2 water samples		

**Signed:** 

Karolina Marek  
PL Head of Reporting Team

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Iss No 20-96144-1 A417 Missing Link 35560-03

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The results included within the report are representative of the samples submitted for analysis.

Page 1 of 6



Analytical Report Number: 20-96144

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1492331	1492332		
<b>Sample Reference</b>				DSRC218	DSRC220		
<b>Sample Number</b>				2	2		
<b>Depth (m)</b>				10.00	3.00		
<b>Date Sampled</b>				07/04/2020	07/04/2020		
<b>Time Taken</b>				1200	1230		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.3	7.2		
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	720	670		
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10		
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10		
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	30.6	39.2		
Total Sulphur	µg/l	15	NONE	10000	13000		
Chloride	mg/l	0.15	ISO 17025	49	8.0		
Fluoride	µg/l	50	ISO 17025	500	400		
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	< 15	< 15		
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	2.26	3.96		
Nitrate as N	mg/l	0.01	ISO 17025	1.72	0.10		
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	7.60	0.44		
Nitrite as N	µg/l	1	ISO 17025	30	10		
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	100	33		
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	180	530		
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	1.7	< 0.3		
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	420	500		
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	341	368		

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5	< 0.5		
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5		
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5		
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5		
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5		
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5		
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5		
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5		

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5		
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01		

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16		
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Analytical Report Number: 20-96144

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1492331	1492332			
<b>Sample Reference</b>				DSRC218	DSRC220			
<b>Sample Number</b>				2	2			
<b>Depth (m)</b>				10.00	3.00			
<b>Date Sampled</b>				07/04/2020	07/04/2020			
<b>Time Taken</b>				1200	1230			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4	< 0.4			
Arsenic (dissolved)	µg/l	0.15	ISO 17025	< 0.15	0.16			
Barium (dissolved)	µg/l	0.06	ISO 17025	21	16			
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1			
Boron (dissolved)	µg/l	10	ISO 17025	44	25			
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02			
Calcium (dissolved)	mg/l	0.012	ISO 17025	120	130			
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0			
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0			
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Copper (dissolved)	µg/l	0.5	ISO 17025	17	1.7			
Iron (dissolved)	mg/l	0.004	ISO 17025	< 0.004	0.004			
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Magnesium (dissolved)	mg/l	0.005	ISO 17025	13	9.8			
Manganese (dissolved)	µg/l	0.05	ISO 17025	21	18			
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05			
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	1.1	0.24			
Nickel (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5			
Potassium (dissolved)	mg/l	0.025	ISO 17025	2.9	1.6			
Selenium (dissolved)	µg/l	0.6	ISO 17025	0.6	< 0.6			
Sodium (dissolved)	mg/l	0.01	ISO 17025	17	5.3			
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Zinc (dissolved)	µg/l	0.5	ISO 17025	17	3.5			

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0			

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10			

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10			



Analytical Report Number: 20-96144

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1492331	1492332		
<b>Sample Reference</b>				DSRC218	DSRC220		
<b>Sample Number</b>				2	2		
<b>Depth (m)</b>				10.00	3.00		
<b>Date Sampled</b>				07/04/2020	07/04/2020		
<b>Time Taken</b>				1200	1230		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**VOCS**

Analytical Parameter	Units	Limit of detection	Accreditation Status	1492331	1492332		
Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0		
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0		
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-96144**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

Iss No 20-96144-1 A417 Missing Link 35560-03

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The results included within the report are representative of the samples submitted for analysis.



**Analytical Report Number : 20-96144**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



**Edward Crimp**

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## **Analytical Report Number : 20-96978**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	17/04/2020
<b>Your job number:</b>	35560-08	<b>Samples instructed on:</b>	21/04/2020
<b>Your order number:</b>	35560-DO	<b>Analysis completed by:</b>	28/04/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	28/04/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed:** [Redacted]

Agnieszka Czerwińska

Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Iss No 20-96978-1 A417 Missing Link 35560-08

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The results included within the report are representative of the samples submitted for analysis.

Page 1 of 8



Analytical Report Number: 20-96978  
 Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1496566				
<b>Sample Reference</b>				DSRC403				
<b>Sample Number</b>				2				
<b>Depth (m)</b>				6.00				
<b>Date Sampled</b>				15/04/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.4				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	890				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	39.1				
Total Sulphur	µg/l	15	NONE	13000				
Chloride	mg/l	0.15	ISO 17025	110				
Fluoride	µg/l	50	ISO 17025	290				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	29				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	4.18				
Nitrate as N	mg/l	0.01	ISO 17025	< 0.01				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	< 0.05				
Nitrite as N	µg/l	1	ISO 17025	28				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	90				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	440				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	< 0.3				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	550				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	280				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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Analytical Report Number: 20-96978

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1496566				
<b>Sample Reference</b>				DSRC403				
<b>Sample Number</b>				2				
<b>Depth (m)</b>				6.00				
<b>Date Sampled</b>				15/04/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.31				
Barium (dissolved)	µg/l	0.06	ISO 17025	22				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	57				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	110				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Copper (dissolved)	µg/l	0.5	ISO 17025	0.7				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.013				
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	3.2				
Manganese (dissolved)	µg/l	0.05	ISO 17025	15				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.53				
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.6				
Potassium (dissolved)	mg/l	0.025	ISO 17025	1.5				
Selenium (dissolved)	µg/l	0.6	ISO 17025	1.0				
Sodium (dissolved)	mg/l	0.01	ISO 17025	98				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Zinc (dissolved)	µg/l	0.5	ISO 17025	0.9				



Analytical Report Number: 20-96978  
 Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1496566				
<b>Sample Reference</b>				DSRC403				
<b>Sample Number</b>				2				
<b>Depth (m)</b>				6.00				
<b>Date Sampled</b>				15/04/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10				

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10				

**VOCS**



Analytical Report Number: 20-96978

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

Lab Sample Number				1496566				
Sample Reference				DSRC403				
Sample Number				2				
Depth (m)				6.00				
Date Sampled				15/04/2020				
Time Taken				None Supplied				
Analytical Parameter (Water Analysis)	Units	Limit of detection	Accreditation Status					
Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-96978**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.

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**Analytical Report Number : 20-96978**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSRC403	2	W	20-96978	1496566	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC403	2	W	20-96978	1496566	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC403	2	W	20-96978	1496566	c	Nitrate as N in water	L078-PL	c
DSRC403	2	W	20-96978	1496566	c	Nitrate in water	L078-PL	c
DSRC403	2	W	20-96978	1496566	c	Nitrite as N in water	L082-PL	c
DSRC403	2	W	20-96978	1496566	c	Nitrite in water	L082-PL	c
DSRC403	2	W	20-96978	1496566	c	Total oxidised nitrogen in water	L078/82-PL	c
DSRC403	2	W	20-96978	1496566	c	pH at 20oC in water (automated)	L099-PL	c



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## **Analytical Report Number : 20-96980**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	17/04/2020
<b>Your job number:</b>	35205	<b>Samples instructed on:</b>	21/04/2020
<b>Your order number:</b>	35560-DO	<b>Analysis completed by:</b>	28/04/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	28/04/2020
<b>Samples Analysed:</b>	2 water samples		

**Signed:** [Redacted]

Agnieszka Czerwińska

Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 20-96980

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1496577	1496578			
<b>Sample Reference</b>				CP105	CP106			
<b>Sample Number</b>				5	5			
<b>Depth (m)</b>				9.50	16.00			
<b>Date Sampled</b>				15/04/2020	15/04/2020			
<b>Time Taken</b>				None Supplied	None Supplied			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.2	12.3			
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	630	3800			
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	24.2	15.1			
Total Sulphur	µg/l	15	NONE	8100	5000			
Chloride	mg/l	0.15	ISO 17025	13	24			
Fluoride	µg/l	50	ISO 17025	380	1000			
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	< 15	1500			
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	4.58	5.51			
Nitrate as N	mg/l	0.01	ISO 17025	0.99	0.01			
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	4.38	< 0.05			
Nitrite as N	µg/l	1	ISO 17025	36	32			
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	120	100			
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	470	170			
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	1.0	< 0.3			
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	440	1000			
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	340	682			

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5	< 0.5			
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5			
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5			
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5			
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5			
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16			
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Analytical Report Number: 20-96980

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1496577	1496578			
<b>Sample Reference</b>				CP105	CP106			
<b>Sample Number</b>				5	5			
<b>Depth (m)</b>				9.50	16.00			
<b>Date Sampled</b>				15/04/2020	15/04/2020			
<b>Time Taken</b>				None Supplied	None Supplied			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4	< 0.4			
Arsenic (dissolved)	µg/l	0.15	ISO 17025	< 0.15	< 0.15			
Barium (dissolved)	µg/l	0.06	ISO 17025	27	69			
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1			
Boron (dissolved)	µg/l	10	ISO 17025	42	250			
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02			
Calcium (dissolved)	mg/l	0.012	ISO 17025	120	270			
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0			
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0			
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Copper (dissolved)	µg/l	0.5	ISO 17025	1.1	0.9			
Iron (dissolved)	mg/l	0.004	ISO 17025	0.015	0.014			
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.2			
Magnesium (dissolved)	mg/l	0.005	ISO 17025	11	0.035			
Manganese (dissolved)	µg/l	0.05	ISO 17025	39	0.14			
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05			
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.59	1.3			
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.1	< 0.5			
Potassium (dissolved)	mg/l	0.025	ISO 17025	1.8	9.6			
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6	1.2			
Sodium (dissolved)	mg/l	0.01	ISO 17025	7.4	42			
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Zinc (dissolved)	µg/l	0.5	ISO 17025	1.6	< 0.5			

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0			

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10			

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10			



Analytical Report Number: 20-96980

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1496577	1496578		
<b>Sample Reference</b>				CP105	CP106		
<b>Sample Number</b>				5	5		
<b>Depth (m)</b>				9.50	16.00		
<b>Date Sampled</b>				15/04/2020	15/04/2020		
<b>Time Taken</b>				None Supplied	None Supplied		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0		
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0		
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-96980**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.

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**Analytical Report Number : 20-96980**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

## Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
CP105		5 W	20-96980	1496577	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP105		5 W	20-96980	1496577	c	Electrical conductivity at 20oC of water	L031-PL	c
CP105		5 W	20-96980	1496577	c	Nitrate as N in water	L078-PL	c
CP105		5 W	20-96980	1496577	c	Nitrate in water	L078-PL	c
CP105		5 W	20-96980	1496577	c	Nitrite as N in water	L082-PL	c
CP105		5 W	20-96980	1496577	c	Nitrite in water	L082-PL	c
CP105		5 W	20-96980	1496577	c	Total oxidised nitrogen in water	L078/82-PL	c
CP105		5 W	20-96980	1496577	c	pH at 20oC in water (automated)	L099-PL	c
CP106		5 W	20-96980	1496578	c	Ammoniacal Nitrogen as N in water	L082-PL	c
CP106		5 W	20-96980	1496578	c	Electrical conductivity at 20oC of water	L031-PL	c
CP106		5 W	20-96980	1496578	c	Nitrate as N in water	L078-PL	c
CP106		5 W	20-96980	1496578	c	Nitrate in water	L078-PL	c
CP106		5 W	20-96980	1496578	c	Nitrite as N in water	L082-PL	c
CP106		5 W	20-96980	1496578	c	Nitrite in water	L082-PL	c
CP106		5 W	20-96980	1496578	c	Total oxidised nitrogen in water	L078/82-PL	c
CP106		5 W	20-96980	1496578	c	pH at 20oC in water (automated)	L099-PL	c



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## **Analytical Report Number : 20-96981**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	17/04/2020
<b>Your job number:</b>	35560-09	<b>Samples instructed on:</b>	21/04/2020
<b>Your order number:</b>	35560-DO	<b>Analysis completed by:</b>	28/04/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	28/04/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed:** [Redacted]

Agnieszka Czerwińska

Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 20-96981  
 Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1496579				
<b>Sample Reference</b>				DSRC229				
<b>Sample Number</b>				3				
<b>Depth (m)</b>				6.00				
<b>Date Sampled</b>				15/04/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.3				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	600				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	62.5				
Total Sulphur	µg/l	15	NONE	21000				
Chloride	mg/l	0.15	ISO 17025	11				
Fluoride	µg/l	50	ISO 17025	890				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	73				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	6.17				
Nitrate as N	mg/l	0.01	ISO 17025	0.03				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	0.15				
Nitrite as N	µg/l	1	ISO 17025	43				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	140				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	410				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	< 0.3				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	410				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	252				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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Analytical Report Number: 20-96981

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1496579				
<b>Sample Reference</b>				DSRC229				
<b>Sample Number</b>				3				
<b>Depth (m)</b>				6.00				
<b>Date Sampled</b>				15/04/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.75				
Barium (dissolved)	µg/l	0.06	ISO 17025	21				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	85				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	87				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Copper (dissolved)	µg/l	0.5	ISO 17025	< 0.5				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.020				
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	8.4				
Manganese (dissolved)	µg/l	0.05	ISO 17025	210				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.91				
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.5				
Potassium (dissolved)	mg/l	0.025	ISO 17025	4.4				
Selenium (dissolved)	µg/l	0.6	ISO 17025	0.7				
Sodium (dissolved)	mg/l	0.01	ISO 17025	47				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Zinc (dissolved)	µg/l	0.5	ISO 17025	< 0.5				

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	250				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	7700				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	8000				

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10				





Analytical Report Number: 20-96981

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

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<b>Sample Number</b>				3				
<b>Depth (m)</b>				6.00				
<b>Date Sampled</b>				15/04/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-96981**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.

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**Analytical Report Number : 20-96981**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSRC229	3	W	20-96981	1496579	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC229	3	W	20-96981	1496579	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC229	3	W	20-96981	1496579	c	Nitrate as N in water	L078-PL	c
DSRC229	3	W	20-96981	1496579	c	Nitrate in water	L078-PL	c
DSRC229	3	W	20-96981	1496579	c	Nitrite as N in water	L082-PL	c
DSRC229	3	W	20-96981	1496579	c	Nitrite in water	L082-PL	c
DSRC229	3	W	20-96981	1496579	c	Total oxidised nitrogen in water	L078/82-PL	c
DSRC229	3	W	20-96981	1496579	c	pH at 20oC in water (automated)	L099-PL	c



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## **Analytical Report Number : 20-96984**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	17/04/2020
<b>Your job number:</b>	35560-07	<b>Samples instructed on:</b>	21/04/2020
<b>Your order number:</b>	35560-DO	<b>Analysis completed by:</b>	28/04/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	28/04/2020
<b>Samples Analysed:</b>	2 water samples		

**Signed:** 

Karolina Marek  
PL Head of Reporting Team

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 20-96984

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1496596	1496597			
<b>Sample Reference</b>				DSRC325	DSRCOH304			
<b>Sample Number</b>				2	2			
<b>Depth (m)</b>				25.00	25.00			
<b>Date Sampled</b>				15/04/2020	15/04/2020			
<b>Time Taken</b>				None Supplied	None Supplied			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	8.1	7.5			
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	570	520			
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	75.5	98.9			
Total Sulphur	µg/l	15	NONE	25000	33000			
Chloride	mg/l	0.15	ISO 17025	25	9.0			
Fluoride	µg/l	50	ISO 17025	210	1800			
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	63	250			
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	3.85	2.77			
Nitrate as N	mg/l	0.01	ISO 17025	1.89	0.28			
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	8.38	1.22			
Nitrite as N	µg/l	1	ISO 17025	120	22			
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	400	73			
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	220	240			
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	2.0	< 0.3			
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	340	360			
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	157	262			

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5	< 0.5			
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5			
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5			
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5			
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5			
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16			
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Analytical Report Number: 20-96984

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1496596	1496597			
<b>Sample Reference</b>				DSRC325	DSRCOH304			
<b>Sample Number</b>				2	2			
<b>Depth (m)</b>				25.00	25.00			
<b>Date Sampled</b>				15/04/2020	15/04/2020			
<b>Time Taken</b>				None Supplied	None Supplied			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	0.5	< 0.4			
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.44	2.21			
Barium (dissolved)	µg/l	0.06	ISO 17025	32	8.6			
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1			
Boron (dissolved)	µg/l	10	ISO 17025	12	160			
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02			
Calcium (dissolved)	mg/l	0.012	ISO 17025	56	71			
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0			
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0			
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.5	< 0.2			
Copper (dissolved)	µg/l	0.5	ISO 17025	1.5	0.5			
Iron (dissolved)	mg/l	0.004	ISO 17025	0.13	0.007			
Lead (dissolved)	µg/l	0.2	ISO 17025	0.3	< 0.2			
Magnesium (dissolved)	mg/l	0.005	ISO 17025	4.2	21			
Manganese (dissolved)	µg/l	0.05	ISO 17025	10	24			
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05			
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	1.2	1.5			
Nickel (dissolved)	µg/l	0.5	ISO 17025	0.7	1.7			
Potassium (dissolved)	mg/l	0.025	ISO 17025	2.2	2.8			
Selenium (dissolved)	µg/l	0.6	ISO 17025	12	0.8			
Sodium (dissolved)	mg/l	0.01	ISO 17025	75	14			
Vanadium (dissolved)	µg/l	0.2	ISO 17025	2.3	< 0.2			
Zinc (dissolved)	µg/l	0.5	ISO 17025	2.7	1.1			

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0			

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10			

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10			



Analytical Report Number: 20-96984

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1496596	1496597		
<b>Sample Reference</b>				DSRC325	DSRCOH304		
<b>Sample Number</b>				2	2		
<b>Depth (m)</b>				25.00	25.00		
<b>Date Sampled</b>				15/04/2020	15/04/2020		
<b>Time Taken</b>				None Supplied	None Supplied		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0		
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0		
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		

U/S = Unsuitable Sample I/S = Insufficient Sample





**Analytical Report Number : 20-96984**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.



**Analytical Report Number : 20-96984**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

## Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSRC325	2	W	20-96984	1496596	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC325	2	W	20-96984	1496596	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC325	2	W	20-96984	1496596	c	Nitrate as N in water	L078-PL	c
DSRC325	2	W	20-96984	1496596	c	Nitrate in water	L078-PL	c
DSRC325	2	W	20-96984	1496596	c	Nitrite as N in water	L082-PL	c
DSRC325	2	W	20-96984	1496596	c	Nitrite in water	L082-PL	c
DSRC325	2	W	20-96984	1496596	c	Total oxidised nitrogen in water	L078/82-PL	c
DSRC325	2	W	20-96984	1496596	c	pH at 20oC in water (automated)	L099-PL	c
DSRCOH304	2	W	20-96984	1496597	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRCOH304	2	W	20-96984	1496597	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRCOH304	2	W	20-96984	1496597	c	Nitrate as N in water	L078-PL	c
DSRCOH304	2	W	20-96984	1496597	c	Nitrate in water	L078-PL	c
DSRCOH304	2	W	20-96984	1496597	c	Nitrite as N in water	L082-PL	c
DSRCOH304	2	W	20-96984	1496597	c	Nitrite in water	L082-PL	c
DSRCOH304	2	W	20-96984	1496597	c	Total oxidised nitrogen in water	L078/82-PL	c
DSRCOH304	2	W	20-96984	1496597	c	pH at 20oC in water (automated)	L099-PL	c



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## Analytical Report Number : 20-96986

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	17/04/2020
<b>Your job number:</b>	35560-03	<b>Samples instructed on:</b>	21/04/2020
<b>Your order number:</b>	35560-DO	<b>Analysis completed by:</b>	28/04/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	28/04/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed:** [Redacted]

Agnieszka Czerwińska

Technical Reviewer (Reporting Team)  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 20-96986

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1496599				
<b>Sample Reference</b>				DSRC218				
<b>Sample Number</b>				3				
<b>Depth (m)</b>				16.00				
<b>Date Sampled</b>				15/04/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.2				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	670				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	25.9				
Total Sulphur	µg/l	15	NONE	8600				
Chloride	mg/l	0.15	ISO 17025	29				
Fluoride	µg/l	50	ISO 17025	330				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	< 15				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	2.44				
Nitrate as N	mg/l	0.01	ISO 17025	4.27				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	18.9				
Nitrite as N	µg/l	1	ISO 17025	36				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	120				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	420				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	4.3				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	410				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	317				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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Analytical Report Number: 20-96986

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1496599				
<b>Sample Reference</b>				DSRC218				
<b>Sample Number</b>				3				
<b>Depth (m)</b>				16.00				
<b>Date Sampled</b>				15/04/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	< 0.15				
Barium (dissolved)	µg/l	0.06	ISO 17025	20				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	30				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	110				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Copper (dissolved)	µg/l	0.5	ISO 17025	1.5				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.007				
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	8.9				
Manganese (dissolved)	µg/l	0.05	ISO 17025	19				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.47				
Nickel (dissolved)	µg/l	0.5	ISO 17025	1.3				
Potassium (dissolved)	mg/l	0.025	ISO 17025	1.6				
Selenium (dissolved)	µg/l	0.6	ISO 17025	0.7				
Sodium (dissolved)	mg/l	0.01	ISO 17025	22				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Zinc (dissolved)	µg/l	0.5	ISO 17025	1.8				

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10				

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10				



Analytical Report Number: 20-96986

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

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<b>Sample Number</b>				3				
<b>Depth (m)</b>				16.00				
<b>Date Sampled</b>				15/04/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-96986**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.

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**Analytical Report Number : 20-96986**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

## Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSRC218	3	W	20-96986	1496599	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC218	3	W	20-96986	1496599	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC218	3	W	20-96986	1496599	c	Nitrate as N in water	L078-PL	c
DSRC218	3	W	20-96986	1496599	c	Nitrate in water	L078-PL	c
DSRC218	3	W	20-96986	1496599	c	Nitrite as N in water	L082-PL	c
DSRC218	3	W	20-96986	1496599	c	Nitrite in water	L082-PL	c
DSRC218	3	W	20-96986	1496599	c	Total oxidised nitrogen in water	L078/82-PL	c
DSRC218	3	W	20-96986	1496599	c	pH at 20oC in water (automated)	L099-PL	c



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## **Analytical Report Number : 20-98559**

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	30/04/2020
<b>Your job number:</b>	35560-07	<b>Samples instructed on:</b>	01/05/2020
<b>Your order number:</b>	35560-DO	<b>Analysis completed by:</b>	11/05/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	11/05/2020
<b>Samples Analysed:</b>	2 water samples		

**Signed:** 

Karolina Marek  
Head of Reporting Section

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Iss No 20-98559-1 A417 Missing Link 35560-07

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 20-98559

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1505049	1505050			
<b>Sample Reference</b>				DSRC325	DSRCOH304			
<b>Sample Number</b>				3	3			
<b>Depth (m)</b>				25.00	25.00			
<b>Date Sampled</b>				29/04/2020	29/04/2020			
<b>Time Taken</b>				None Supplied	None Supplied			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.7	7.5			
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	430	530			
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10			
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	28.8	107			
Total Sulphur	µg/l	15	NONE	9600	36000			
Chloride	mg/l	0.15	ISO 17025	20	7.6			
Fluoride	µg/l	50	ISO 17025	180	3600			
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	21	170			
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	2.51	1.85			
Nitrate as N	mg/l	0.01	ISO 17025	5.94	0.12			
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	26.3	0.54			
Nitrite as N	µg/l	1	ISO 17025	34	19			
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	110	61			
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	160	190			
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	6.0	< 0.3			
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	290	390			
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	183	270			

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5	< 0.5			
Resorcinol	µg/l	0.5	NONE	< 0.5	< 0.5			
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Cresols	µg/l	0.5	NONE	< 0.5	< 0.5			
Naphthols	µg/l	0.5	NONE	< 0.5	< 0.5			
Isopropylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Phenol	µg/l	0.5	NONE	< 0.5	< 0.5			
Trimethylphenol	µg/l	0.5	NONE	< 0.5	< 0.5			

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5	< 3.5			
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01			

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16	< 0.16			
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Analytical Report Number: 20-98559

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1505049	1505050			
<b>Sample Reference</b>				DSRC325	DSRCOH304			
<b>Sample Number</b>				3	3			
<b>Depth (m)</b>				25.00	25.00			
<b>Date Sampled</b>				29/04/2020	29/04/2020			
<b>Time Taken</b>				None Supplied	None Supplied			
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4	< 0.4			
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.33	3.67			
Barium (dissolved)	µg/l	0.06	ISO 17025	22	7.9			
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1			
Boron (dissolved)	µg/l	10	ISO 17025	< 10	91			
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02	< 0.02			
Calcium (dissolved)	mg/l	0.012	ISO 17025	68	80			
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0			
Chromium (III)	µg/l	1	NONE	< 1.0	< 1.0			
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2			
Copper (dissolved)	µg/l	0.5	ISO 17025	1.3	0.8			
Iron (dissolved)	mg/l	0.004	ISO 17025	0.008	0.010			
Lead (dissolved)	µg/l	0.2	ISO 17025	0.5	< 0.2			
Magnesium (dissolved)	mg/l	0.005	ISO 17025	3.2	17			
Manganese (dissolved)	µg/l	0.05	ISO 17025	14	24			
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05			
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.22	2.8			
Nickel (dissolved)	µg/l	0.5	ISO 17025	< 0.5	5.1			
Potassium (dissolved)	mg/l	0.025	ISO 17025	0.74	2.1			
Selenium (dissolved)	µg/l	0.6	ISO 17025	2.1	< 0.6			
Sodium (dissolved)	mg/l	0.01	ISO 17025	19	9.8			
Vanadium (dissolved)	µg/l	0.2	ISO 17025	0.8	0.4			
Zinc (dissolved)	µg/l	0.5	ISO 17025	7.4	4.2			

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0			
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0			
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0			
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0			

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10			

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0			
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10			
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10			
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10	< 10			



Analytical Report Number: 20-98559

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1505049	1505050		
<b>Sample Reference</b>				DSRC325	DSRCOH304		
<b>Sample Number</b>				3	3		
<b>Depth (m)</b>				25.00	25.00		
<b>Date Sampled</b>				29/04/2020	29/04/2020		
<b>Time Taken</b>				None Supplied	None Supplied		
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>				

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Vinyl Chloride	µg/l	1	NONE	< 1.0	< 1.0		
Trichlorofluoromethane	µg/l	1	NONE	< 1.0	< 1.0		
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trichloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Chlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p & m-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Styrene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Tribromomethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
o-Xylene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0	< 1.0		
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Bromobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Butylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0	< 1.0		
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0	< 1.0		

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-98559**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discrete analyser)	Determination of Alkalinity by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

Iss No 20-98559-1 A417 Missing Link 35560-07

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The results included within the report are representative of the samples submitted for analysis.



**Analytical Report Number : 20-98559**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**



## Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSRC325	3	W	20-98559	1505049	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC325	3	W	20-98559	1505049	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC325	3	W	20-98559	1505049	c	Nitrate as N in water	L078-PL	c
DSRC325	3	W	20-98559	1505049	c	Nitrate in water	L078-PL	c
DSRC325	3	W	20-98559	1505049	c	Nitrite as N in water	L082-PL	c
DSRC325	3	W	20-98559	1505049	c	Nitrite in water	L082-PL	c
DSRC325	3	W	20-98559	1505049	c	Total oxidised nitrogen in water	L078/82-PL	c
DSRC325	3	W	20-98559	1505049	c	pH at 20oC in water (automated)	L099-PL	c
DSRCOH304	3	W	20-98559	1505050	cd	BTEX and MTBE in water (Monoaromatics)	L073B-PL	d
DSRCOH304	3	W	20-98559	1505050	cd	Ammoniacal Nitrogen as N in water	L082-PL	dc
DSRCOH304	3	W	20-98559	1505050	cd	Electrical conductivity at 20oC of water	L031-PL	c
DSRCOH304	3	W	20-98559	1505050	cd	Nitrate as N in water	L078-PL	c
DSRCOH304	3	W	20-98559	1505050	cd	Nitrate in water	L078-PL	c
DSRCOH304	3	W	20-98559	1505050	cd	Nitrite as N in water	L082-PL	c
DSRCOH304	3	W	20-98559	1505050	cd	Nitrite in water	L082-PL	c
DSRCOH304	3	W	20-98559	1505050	cd	TPHCWG (Waters)	L070-PL	d
DSRCOH304	3	W	20-98559	1505050	cd	Total oxidised nitrogen in water	L078/82-PL	c
DSRCOH304	3	W	20-98559	1505050	cd	Volatile organic compounds in water	L073B-PL	d
DSRCOH304	3	W	20-98559	1505050	cd	pH at 20oC in water (automated)	L099-PL	c



**Edward Crimp**

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## Analytical Report Number : 20-98566

<b>Project / Site name:</b>	A417 Missing Link	<b>Samples received on:</b>	30/04/2020
<b>Your job number:</b>	35560-03	<b>Samples instructed on:</b>	01/05/2020
<b>Your order number:</b>	35560-DO	<b>Analysis completed by:</b>	11/05/2020
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	11/05/2020
<b>Samples Analysed:</b>	1 water sample		

**Signed:** 

Karolina Marek  
Head of Reporting Section

**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Iss No 20-98566-1 A417 Missing Link 35560-03

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The results included within the report are representative of the samples submitted for analysis.

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Analytical Report Number: 20-98566

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1505136				
<b>Sample Reference</b>				DSRC218				
<b>Sample Number</b>				4				
<b>Depth (m)</b>				16.00				
<b>Date Sampled</b>				29/04/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**General Inorganics**

pH	pH Units	N/A	ISO 17025	7.2				
Electrical Conductivity at 20 °C	µS/cm	10	ISO 17025	650				
Total Cyanide	µg/l	10	ISO 17025	< 10				
Free Cyanide	µg/l	10	ISO 17025	< 10				
Sulphate as SO <sub>4</sub>	mg/l	0.045	ISO 17025	23.8				
Total Sulphur	µg/l	15	NONE	7900				
Chloride	mg/l	0.15	ISO 17025	12				
Fluoride	µg/l	50	ISO 17025	450				
Ammoniacal Nitrogen as N	µg/l	15	ISO 17025	< 15				
Dissolved Organic Carbon (DOC)	mg/l	0.1	NONE	1.87				
Nitrate as N	mg/l	0.01	ISO 17025	2.85				
Nitrate as NO <sub>3</sub>	mg/l	0.05	ISO 17025	12.6				
Nitrite as N	µg/l	1	ISO 17025	39				
Nitrite as NO <sub>2</sub>	µg/l	5	ISO 17025	130				
Alkalinity	mgCaCO <sub>3</sub> /l	3	ISO 17025	300				
Total Oxidised Nitrogen (TON)	mg/l	0.3	NONE	2.9				
Total Dissolved Solids (Gravimetric)	mg/l	4	ISO 17025	430				
Hardness - Total	mgCaCO <sub>3</sub> /l	1	ISO 17025	349				

**Phenols by HPLC**

Catechol	µg/l	0.5	NONE	< 0.5				
Resorcinol	µg/l	0.5	NONE	< 0.5				
Ethylphenol & Dimethylphenol	µg/l	0.5	NONE	< 0.5				
Cresols	µg/l	0.5	NONE	< 0.5				
Naphthols	µg/l	0.5	NONE	< 0.5				
Isopropylphenol	µg/l	0.5	NONE	< 0.5				
Phenol	µg/l	0.5	NONE	< 0.5				
Trimethylphenol	µg/l	0.5	NONE	< 0.5				

**Total Phenols**

Total Phenols (HPLC)	µg/l	3.5	NONE	< 3.5				
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**Speciated PAHs**

Naphthalene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01				
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01				
Fluorene	µg/l	0.01	ISO 17025	< 0.01				
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01				
Anthracene	µg/l	0.01	ISO 17025	< 0.01				
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Pyrene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Chrysene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Indeno(1,2,3-cd)pyrene	µg/l	0.01	ISO 17025	< 0.01				
Dibenz(a,h)anthracene	µg/l	0.01	ISO 17025	< 0.01				
Benzo(ghi)perylene	µg/l	0.01	ISO 17025	< 0.01				

**Total PAH**

Total EPA-16 PAHs	µg/l	0.16	ISO 17025	< 0.16				
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Analytical Report Number: 20-98566

Project / Site name: A417 Missing Link

Your Order No: 35560-DO

<b>Lab Sample Number</b>				1505136				
<b>Sample Reference</b>				DSRC218				
<b>Sample Number</b>				4				
<b>Depth (m)</b>				16.00				
<b>Date Sampled</b>				29/04/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**Heavy Metals / Metalloids**

Antimony (dissolved)	µg/l	0.4	ISO 17025	< 0.4				
Arsenic (dissolved)	µg/l	0.15	ISO 17025	0.41				
Barium (dissolved)	µg/l	0.06	ISO 17025	9.9				
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1				
Boron (dissolved)	µg/l	10	ISO 17025	27				
Cadmium (dissolved)	µg/l	0.02	ISO 17025	< 0.02				
Calcium (dissolved)	mg/l	0.012	ISO 17025	120				
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0				
Chromium (III)	µg/l	1	NONE	< 1.0				
Chromium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Copper (dissolved)	µg/l	0.5	ISO 17025	0.8				
Iron (dissolved)	mg/l	0.004	ISO 17025	0.005				
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Magnesium (dissolved)	mg/l	0.005	ISO 17025	12				
Manganese (dissolved)	µg/l	0.05	ISO 17025	4.8				
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05				
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	0.28				
Nickel (dissolved)	µg/l	0.5	ISO 17025	< 0.5				
Potassium (dissolved)	mg/l	0.025	ISO 17025	1.5				
Selenium (dissolved)	µg/l	0.6	ISO 17025	< 0.6				
Sodium (dissolved)	mg/l	0.01	ISO 17025	6.8				
Vanadium (dissolved)	µg/l	0.2	ISO 17025	< 0.2				
Zinc (dissolved)	µg/l	0.5	ISO 17025	3.7				

**Monoaromatics & Oxygenates**

Benzene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-xylene	µg/l	1	ISO 17025	< 1.0				
o-xylene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aliphatic (C5 - C35)</b>	µg/l	10	NONE	< 10				

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0				
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10				
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10				
<b>TPH-CWG - Aromatic (C5 - C35)</b>	µg/l	10	NONE	< 10				



Analytical Report Number: 20-98566  
 Project / Site name: A417 Missing Link

Your Order No: 35560-DO

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<b>Sample Number</b>				4				
<b>Depth (m)</b>				16.00				
<b>Date Sampled</b>				29/04/2020				
<b>Time Taken</b>				None Supplied				
<b>Analytical Parameter (Water Analysis)</b>	<b>Units</b>	<b>Limit of detection</b>	<b>Accreditation Status</b>					

**VOCS**

Chloromethane	µg/l	1	ISO 17025	< 1.0				
Chloroethane	µg/l	1	ISO 17025	< 1.0				
Bromomethane	µg/l	1	ISO 17025	< 1.0				
Vinyl Chloride	µg/l	1	NONE	< 1.0				
Trichlorofluoromethane	µg/l	1	NONE	< 1.0				
1,1-Dichloroethene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
MTBE (Methyl Tertiary Butyl Ether)	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
2,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloromethane	µg/l	1	ISO 17025	< 1.0				
1,1,1-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloroethane	µg/l	1	ISO 17025	< 1.0				
1,1-Dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,2-dichloroethene	µg/l	1	ISO 17025	< 1.0				
Benzene	µg/l	1	ISO 17025	< 1.0				
Tetrachloromethane	µg/l	1	ISO 17025	< 1.0				
1,2-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Trichloroethene	µg/l	1	ISO 17025	< 1.0				
Dibromomethane	µg/l	1	ISO 17025	< 1.0				
Bromodichloromethane	µg/l	1	ISO 17025	< 1.0				
Cis-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Trans-1,3-dichloropropene	µg/l	1	ISO 17025	< 1.0				
Toluene	µg/l	1	ISO 17025	< 1.0				
1,1,2-Trichloroethane	µg/l	1	ISO 17025	< 1.0				
1,3-Dichloropropane	µg/l	1	ISO 17025	< 1.0				
Dibromochloromethane	µg/l	1	ISO 17025	< 1.0				
Tetrachloroethene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromoethane	µg/l	1	ISO 17025	< 1.0				
Chlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,1,1,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Ethylbenzene	µg/l	1	ISO 17025	< 1.0				
p & m-Xylene	µg/l	1	ISO 17025	< 1.0				
Styrene	µg/l	1	ISO 17025	< 1.0				
Tribromomethane	µg/l	1	ISO 17025	< 1.0				
o-Xylene	µg/l	1	ISO 17025	< 1.0				
1,1,2,2-Tetrachloroethane	µg/l	1	ISO 17025	< 1.0				
Isopropylbenzene	µg/l	1	ISO 17025	< 1.0				
Bromobenzene	µg/l	1	ISO 17025	< 1.0				
n-Propylbenzene	µg/l	1	ISO 17025	< 1.0				
2-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
4-Chlorotoluene	µg/l	1	ISO 17025	< 1.0				
1,3,5-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
tert-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trimethylbenzene	µg/l	1	ISO 17025	< 1.0				
sec-Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,3-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
p-Isopropyltoluene	µg/l	1	ISO 17025	< 1.0				
1,2-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
1,4-Dichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Butylbenzene	µg/l	1	ISO 17025	< 1.0				
1,2-Dibromo-3-chloropropane	µg/l	1	ISO 17025	< 1.0				
1,2,4-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				
Hexachlorobutadiene	µg/l	1	ISO 17025	< 1.0				
1,2,3-Trichlorobenzene	µg/l	1	ISO 17025	< 1.0				

U/S = Unsuitable Sample I/S = Insufficient Sample



**Analytical Report Number : 20-98566**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025
Ammoniacal Nitrogen as N in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the discrete analyser (colorimetric) salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in water (Monoaromatics)	Determination of BTEX and MTBE in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
Chloride in water	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Cr (III) in water	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Dissolved Organic Carbon in water	Determination of dissolved inorganic carbon in water by TOC/DOC NDIR Analyser.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	NONE
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Free cyanide in water	Determination of free cyanide by distillation followed by colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Hexavalent chromium in water	Determination of hexavalent chromium in water by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method by continuous flow analyser. Accredited Matrices SW, GW, PW.	L080-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrate in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025

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The results included within the report are representative of the samples submitted for analysis.



**Analytical Report Number : 20-98566**

**Project / Site name: A417 Missing Link**

**Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)**

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Phenols, speciated, in water, by HPLC	Determination of speciated phenols by HPLC.	In house method based on Blue Book Method.	L030-PL	W	NONE
Speciated EPA-16 PAHs in water	Determination of PAH compounds in water by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards. Accredited matrices: SW PW GW	In-house method based on USEPA 8270	L102B-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Total cyanide in water	Determination of total cyanide by distillation followed by colorimetry. Accredited matrices: SW PW GW	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total oxidised nitrogen in water	Calculation from nitrate and nitrite.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L078/82-PL	W	NONE
Total Sulphur in water	Determination of total sulphur in water by acidification followed by ICP-OES.	In-house method based on MEWAM 1986 Methods for the Determination of Metals in Soil""	L039-PL	W	NONE
TPHCWG (Waters)	Determination of dichloromethane extractable hydrocarbons in water by GC-MS, speciation by interpretation.	In-house method	L070-PL	W	NONE
Volatile organic compounds in water	Determination of volatile organic compounds in water by headspace GC-MS. Accredited matrices: SW PW GW	In-house method based on USEPA8260	L073B-PL	W	ISO 17025

**For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.**

**For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.**

**Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.**

Sample Deviation Report



Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
DSRC218	4	W	20-98566	1505136	c	Ammoniacal Nitrogen as N in water	L082-PL	c
DSRC218	4	W	20-98566	1505136	c	Electrical conductivity at 20oC of water	L031-PL	c
DSRC218	4	W	20-98566	1505136	c	Nitrate as N in water	L078-PL	c
DSRC218	4	W	20-98566	1505136	c	Nitrate in water	L078-PL	c
DSRC218	4	W	20-98566	1505136	c	Nitrite as N in water	L082-PL	c
DSRC218	4	W	20-98566	1505136	c	Nitrite in water	L082-PL	c
DSRC218	4	W	20-98566	1505136	c	Total oxidised nitrogen in water	L078/82-PL	c
DSRC218	4	W	20-98566	1505136	c	pH at 20oC in water (automated)	L099-PL	c