A1 Birtley to Coal House

Scheme Number: TR010031

6.3 Environmental Statement – Appendix 9.2a Ground Investigation Factual Report

APFP Regulation 5(2)(a)

Planning Act 2008

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

Volume 6

August 2019

Infrastructure Planning

Planning Act 2008

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

A1 Birtley to Coal House

Development Consent Order 20[xx]

Environmental Statement - Appendix

Regulation Reference:	APFP Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	TR010031
Application Document Reference	TR010031/APP/6.3
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Version	Date	Status of Version
Rev 0	14 August 2019	Application Issue

A1 Birtley to Coalhouse GI

GROUND INVESTIGATION FACTUAL REPORT

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1.0 INTRODUCTION

1.1 Instruction

Central Alliance Pre-Construction Services Limited (Central Alliance) was instructed by SISK Lagan Joint Venture (Principal Contractor) acting on behalf of the Client, Highways England to undertake a ground investigation. This was at a site adjacent to the route of the A1 between junctions 65 Birtley and 67 Coalhouse.

Ground Investigation and surveys for the proposed scheme were planned and delivered in two phases:

• Phase 1: An Intrusive Ground Investigation based around areas north and south of land adjacent to the A1 Alendene overbridge, which belonged to Northern Gas Networks and Gateshead Borough Council.

• Phase 2: Was an Intrusive Ground Investigation which included Pavement Investigation and Geophysical Shaft Survey works. These were predominantly in areas on the line of the A1 Infrastructure network.

At the request of the client this report presents the combined factual information obtained for Phase 1 and Phase 2 of the ground investigation scheme.

The scope of the investigation was designed by WSP with final exploratory hole locations agreed following consideration of the existing site conditions and site access restrictions, between WSP, SLJV and Central Alliance.

1.2 Objectives

The objective of this investigation was to investigate presence of below ground contamination, to obtain geological data across the site, establish geotechnical properties, and to install ground water and ground gas monitoring instrumentation.

The aim of this report is to present the findings and information obtained during the ground investigation and includes the following;

- A factual description of the work undertaken;
- Exploratory Hole Location Plans
- Exploratory Hole logs
- Core Photographs
- Down Hole Geophysical Survey Information
- CPT Logs
- Historical Shaft Investigation
- Road Core Reports
- Monitoring Results
- Laboratory testing results

1.3 Limitations

This report presents a description of the site at the time of the fieldwork, results of the fieldwork and the in-situ testing undertaken.

Any of the comments and opinions contained within this report, are based on the information obtained by Central Alliance during the investigation.

There may be other conditions prevailing at the site which have not been disclosed by this investigation and which have not been considered by this report. Responsibility cannot be accepted for conditions at the site not revealed by the investigation and confirmation of intermediate ground conditions between exploratory holes should be considered if deemed necessary.

Unless instructed by the Client Central Alliance is not obliged to and disclaims any obligation to update the report for events taking place after the date on which this investigation was undertaken. No other third parties may rely upon or reproduce the contents of this report without the written permission of Central Alliance. If any unauthorised third party comes into possession of this report they rely on it at their own risk and the authors do not owe them any Duty of Care or Skill.

This report has been commissioned on behalf of the client, Highways England and will form part of the site Health and Safety File for use by the designer and contractors and for the Client in the long-term maintenance of the scheme.

1.4 Site Constraints

The works were undertaken under the full-time supervision of an engineer. The constrains of working at night or in proximity to an active highway meant that much of the site work was not photographed in a systematic way that could be represented in the report as a photographic volume.

Boreholes were sometimes advanced within close time frames immediately after completion of service clearance. The associated hand dug pit was also therefore not photographed on every occasion. Records are presented for all of the work undertaken, however photographs can only be presented for the core samples taken and mechanically excavated trial pits.

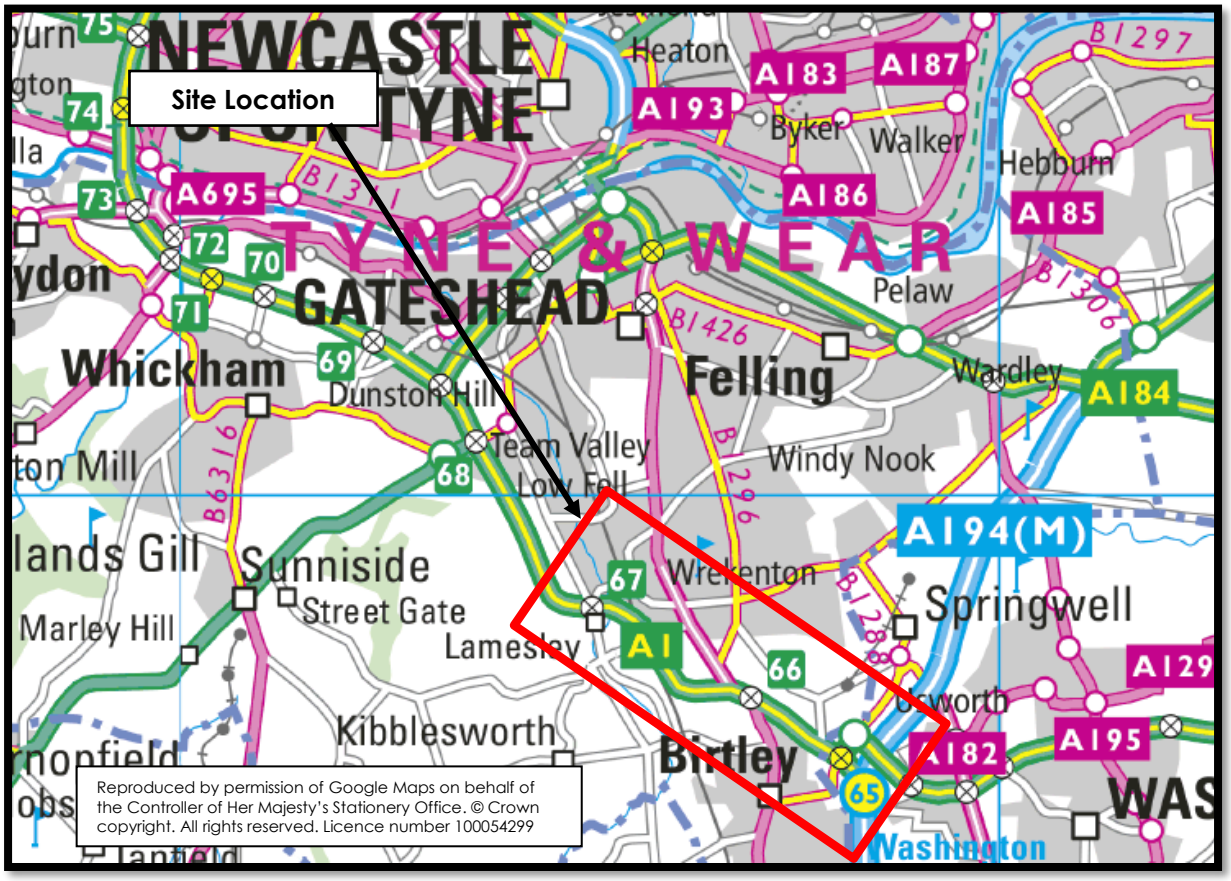
2.0 SITE DETAILS

2.1 Site Location

The site is located along a section of road approximately 6km South-east of Newcastle upon Tyne City centre which follows the length of the A1 from Birtley to Coalhouse. The site comprises approximately 4km of dual carriageway from Junction 65 to junction 67 of the A1, together with several associated slip-roads and dedicated lanes.

A Site Location Plan showing the site extents of the site is provided as Figure no. 1.

Figure 1 – Site Location Plan



2.2 Site Description

The A1 at this location gradually descends in altitude from Junctions 65 to 67. The north eastern side of the A1 generally consists of the residential areas of Birtley whereas the south western side are rural areas of Washington. To the north of the junction 66 to junction 67 section, the A1 passes through a densely vegetated area named Long Acre Woods. Beyond Long Acre Woods the A1 passes over the Newcastle to Darlington railway line. From here rural areas can be found south-west and industrial areas to the north-east. The works end at Junction 67 referred to as the Coalhouse roundabout.

West of junction 65 the road cutting opens to an embankment which follows the south west alignment of the AI and continues until just before Junction 66 (Eighton Lodge Roundabout) where both sides are elevated on embankment. Beyond junction 66 the eastern side reverts to cutting. This continues until the A1 crosses over the Darlington to Newcastle line (NER) beyond which both sides are embankment.

The surrounding land use is occupied by housing estates, industrial estates, farm land and open fields.

Unexploded Ordnance status is Low within the A1 boundary.

Coal mining, in the form of shallow and deep mining, has been recorded beneath a significant portion of the site. A coal authority permit was put into place by SLJV.

Access to the exploratory holes was via various adopted roads, Public Rights of Way and public/private tracks through fields/farmland; Several proposed access routes required the implementation of Traffic and Pedestrian Management.

The Phase 1 works took place in two distinct locations. The first was rural land owned by NGN at Junction 67, accessed from Lamesley road. The other works took place in Gateshead council land, a densely wooded area attached to Long Acre Woods. To undertake the works in Gateshead Council Land enabling works took place including the removal of trees and the construction of a stoned haul road.

2.3 Published Geology

The British Geological Survey (BGS) Website has been consulted to ascertain the local geological conditions in the survey area as well as BGS 1:50,000 Sheets 20 and 21.

2.3.1 Made Ground

The site is underlain with deposits of Made Ground associated with construction of the highway and mining activities in the area.

2.3.2 Superficial Deposits

The published geology of the area indicates that most of the site is directly underlain by Devensian Till of Quaternary age. However, some areas are underlain by alluvium deposits including clays, sands and silts that will in turn be underlain by glacial material.

2.3.3 Solid Geology

The solid geology comprises the Pennine Middle Coal Measures Formation which comprises sandstones, siltstones, mudstones, workable coal seams and worked 'fireclay' (seat earth) of Carboniferous age.

3.0 FIELDWORK

3.1 Scope of Fieldwork

The ground investigation works were completed by Central Alliance between November 13th 2017 and 29th June 2018, with works completed during weekday, weekend day shifts and night shifts.

The investigation was specified by WSP and included the following works:

- 2 no. Mine Shaft Surveys
- 4 no. Downhole Geophysical Surveys
- 19 no. Cable Percussion Boreholes with no further work
- 4 no. Cable Percussion followed by Rotary Coring
- 13 no. Cable Percussion followed by Rotary Coring and Open Hole Drilling
- 4 no. Rotary Open Holes
- 2 no. Dynamic Probes
- 44 no. Dynamic Sampling
- 10 no. Dynamic Sampling and Dynamic Probe
- 9 no. Dynamic Sampling followed by Rotary Coring
- 3 no. Dynamic Sampling followed by Rotary Coring and Open Hole Drilling
- 28 no. Trial Pits with 4 no. By using a tracked excavator
- 16 no. Cone Penetration Tests
- 85 no. Road Cores
- 18 no. 50mm Gas Groundwater standpipe Installations
- 16 no. 19mm/25mm / 33mm standpipe piezometer Installations
- 19 no. Ground Water Divers
- 1 no. Vibrating wire piezometer Installation
- Groundwater and Ground Gas Monitoring
- Geotechnical Laboratory Testing
- Environmental Laboratory Testing
- Underground Utilities Detection

The fieldworks were supervised by a Geo-Environmental engineer provided by Central Alliance who was qualified under the required terms of the specification. All fieldwork was carried out in general accordance with Eurocode 7, BS5930 'Code of Practice for Site Investigations' – (2015); BS10175 'Investigation of potentially contaminated sites – Code of Practice (2001), Association of Geotechnical and Geo-environmental Specialist Guidelines for Good Practice in Site Investigations (August 1998) and logged in accordance with BS EN ISO 14688-1:2004 and BS EN ISO 14689-2 (2004).

The final locations of exploratory holes were determined by the presence of underground service, practicalities and any site access restrictions. The locations of exploratory holes are indicated on drawing CA-3043-GI with GPS Surveyed coordinates and levels recorded on the individual exploratory hole logs presented in Appendix A.

3:1:1 Exploratory Hole Locations

Location ID	Location Type	Easting	Northing	Ground Level	Final Depth
BH17-01	CP	424481.2	558625.3	18.81	8.00
BH17-02	WLS	424628.7	558602.7	18.22	2.44
BH17-02A	WLS	424693.4	558604.1	18.10	0.90
BH17-02B	WLS	424643.4	558602.1	17.94	10.45
BH17-04	WLS	424763.9	558552.7	16.99	3.21
BH17-04A	WLS	424763.4	558552.7	16.99	3.33

BH17-04B	DP	424762.9	558552.8	16.99	4.30
BH17-05	CP	424779.0	558528.1	14.03	1.30
BH17-05A	CP	424778.1	558528.0	13.89	10.00
BH17-07	CP+RC+RO	424889.6	558531.6	11.80	80.00
BH17-08	RO	424909.8	558539.7	11.43	80.00
BH17-09	CP	424996.2	558534.6	13.08	2.62
BH17-09A	CP+RC	424996.2	558533.6	13.08	80.00
BH17-11	CP+RO+RC	425016.5	558526.4	13.67	80.00
BH17-12	WLS+DP	425051.4	558562.7	20.23	10.00
BH17-12A	WLS+DP	425051.1	558571.0	16.03	10.00
BH17-13	WLS	425052.4	558577.4	14.49	36.00
BH17-14	CP+RC+RO	425199.3	558485.1	16.43	70.00
BH17-15	CP	425272.0	558473.3	17.22	43.95
BH17-16	WLS+RC	425273.9	558524.6	22.63	8.45
BH17-16a	CP+RC+RO	425273.3	558509.0	17.02	65.00
BH17-17	CP	425403.1	558435.1	16.39	2.95
BH17-17a	CP	425404.2	558436.7	16.74	36.65
BH17-18	CP	425461.0	558471.3	20.13	28.50
BH17-18a	CP+RC+RO	425462.2	558470.3	20.07	70.00
BH17-19	CP+RC+RO	425457.6	558442.6	19.75	65.00
BH17-20	CP+RC+RO	425462.9	558418.3	19.04	65.00
BH17-21	CP+RC+RO	425536.3	558420.1	22.44	70.00
BH17-22	CP+RC+RO	425546.5	558398.6	21.94	70.00
BH17-23	CP	425560.0	558417.4	26.13	19.98
BH17-24	CP	425571.2	558363.2	23.37	19.70
BH17-25	CP+RO+RC	425605.4	558376.2	27.48	61.00
BH17-26	CP	425635.0	558346.0	28.01	20.50
BH17-27	WLS	425705.4	558289.4	29.58	7.05
BH17-27A	WLS+RC	425708.7	558290.6	30.85	23.20
BH17-27B	RO	425705.4	558289.5	30.54	40.00
BH17-28	CP	425644.2	558412.0	30.00	13.95
BH17-28A	CP+RC	425645.2	558413.1	29.99	23.70
BH17-33	WLS+RC	426003.1	558022.5	53.84	15.20
BH17-35	CP+RC	426446.0	557587.6	77.95	15.50
BH17-36	WLS+RO+RC	426449.9	557582.6	85.08	20.00
BH17-37	CP+RO+RC	426563.9	557596.7	81.43	21.00
BH17-39	WLS	426603.2	557528.2	84.26	5.45
BH17-39A	WLS+RC	426597.9	557510.6	77.94	10.60
BH17-41	WLS+RC	426654.2	557509.2	81.49	17.00
BH17-42	WLS+RO+RC	426722.8	557518.9	85.98	20.60
BH17-44	WLS+DP	426717.2	557484.6	86.03	7.70
BH17-44A	CP	426702.3	557469.2	79.64	8.94
BH17-45	WLS+RC	426749.5	557463.2	83.33	22.40
BH17-47	WLS	426824.4	557469.1	83.30	5.36

BH17-47A	WLS	426871.8	557496.7	77.72	1.53
BH17-47AA	WLS	426811.7	557474.2	83.11	1.37
BH17-47AB	WLS	426813.5	557477.8	83.12	0.80
BH17-47AC	WLS	426812.5	557476.1	83.10	0.50
BH17-47I	WLS+DP	426815.3	557474.6	83.19	3.00
BH17-47IA	DP	426813.7	557473.4	83.17	2.50
BH17-48	WLS	426961.6	557421.4	84.90	0.70
BH17-48A	WLS+RC	426960.6	557421.6	84.46	16.5
BH17-48B	WLS	426955.7	557411.3	84.89	0.70
BH17-48C	WLS	426956.9	557412.4	85.01	6.45
BH17-49	WLS+RO+RC	427188.2	557314.1	81.76	30.00
BH17-50	WLS+RC	427108.4	557308.9	80.99	30.00
BH17-51	CP	427424.4	557178.6	82.39	6.35
BH17-54	CP+RC+RO	427527.7	557066.4	89.10	23.50
BH17-55	CP+RC+RO	427547.9	557121.9	89.85	21.00
BH17-60	CP	424924.6	558540.3	11.82	51.92
BH17-61	RO	424927.0	558537.6	12.39	80.00
BH17-64	RO	424987.5	558536.9	13.22	80.00
BH17-68	CP+RC	425833.1	558236.7	37.98	12.00
BH17-69	CP+RC	425909.6	558068.3	46.07	14.10
BH17-71	WLS+DP	426415.3	557672.4	79.54	5.18
BH17-72	WLS+RC	426618.3	557570.5	81.17	16.30
BH17-73	WLS	427293.5	557250.9	80.72	4.35
BH17-75	CP	425287.0	558583.0	17.67	10.00
BH17-76	CP	424878.1	558592.5	11.29	10.00
BH17-77	CP	424898.2	558465.0	12.56	10.45
CPT17-01	TP	425211.7	558487.0	16.54	1.20
CPT17-02	TP	425248.3	558512.5	17.01	0.80
CPT17-02a	TP	425266.3	558515.3	17.01	0.80
CPT17-03	TP	425264.1	558481.4	17.19	1.20
CPT17-04	TP	425290.5	558461.6	16.09	1.20
CPT17-05	TP	425264.3	558481.2	17.23	0.90
CPT17-06	TP	425290.9	558461.9	16.09	1.20
CPT17-07	TP	425338.9	558447.3	15.98	1.20
CPT17-08	TP	425368.5	558455.4	16.5	1.20
CPT17-09	TP	425420.4	558451.5	18.27	1.20
CPT17-10	TP	425399.5	558469.0	17.89	1.20
CPT17-11	TP	425412.3	558478.2	18.28	1.20
CPT17-12	TP	425441.8	558463.7	20.26	1.20
CPT17-13	TP	425427.7	558451.7	18.83	1.20
CPT17-14	TP	425401.3	558432.0	16.42	1.20
CPT17-15	TP	425450.9	558425.9	18.91	1.20
CPT17-17	TP	425565.4	558379.0	28.16	1.20
CPT17-18	TP	425591.8	558385.6	27.15	1.20

CPT17-21	TP	425613.4	558367.8	27.55	1.20
CPT17-23	TP	425644.8	558345.5	28.26	1.20
CPT17-24	TP	425667.7	558327.0	28.46	1.20
CPT17-25	TP	425698.6	558296.6	27.38	1.20
TH01	TP	425536.2	558409.8	20.73	0.60
TH02	TP	425544.7	558408.4	22.24	0.65
TP17-01	TP	425128.1	558474.3	15.50	3.50
TP17-02	TP	425190.0	558470.0	16.10	3.50
TP17-03B	TP	425230.1	558481.0	17.10	3.50
TP17-04A	TP	425304.1	558444.3	15.71	2.00
WS17-01	WLS	425348.8	558487.0	16.91	5.45
WS17-02	WLS	425339.9	558515.1	21.29	1.43
WS17-02a	WLS	425340.2	558516.1	22.17	1.40
WS17-02b	WLS	425338.4	558514.4	20.97	1.45
WS17-03	WLS	425397.9	558502.5	23.21	1.60
WS17-03a	WLS	425397.5	558502.0	22.72	1.53
WS17-04	WLS+DP	426216.8	557809.9	65.93	2.88
WS17-06	WLS	426377.0	557718.0	79.12	0.70
WS17-07	WLS+DP	427749.7	556992.9	93.49	2.37
WS17-08	WLS	427843.5	556944.9	96.89	2.27
WS17-09	WLS+DP	427901.3	556916.6	99.52	3.28
WS17-12	WLS	427995.6	556852.9	102.67	1.00
WS17-13	WLS	425150.1	558440.0	15.16	4.45
WS17-14	WLS	425185.9	558421.0	15.24	4.45
WS17-15	WLS	425224.1	558454.0	16.16	4.45
WS17-16	WLS	425272.0	558439.0	15.64	4.45
WS17-18	WLS+DP	424839.5	558545.0	17.69	1.27
WS17-18A	WLS+DP	424838.5	558545.1	17.69	6.70
WS17-19	WLS	425046.9	558534.9	20.39	5.00
WS17-20	WLS	425111.7	558534.3	20.94	5.00
WS17-21	WLS	424911.1	558623.4	12.08	4.45
WS17-22	WLS	424920.0	558572.0	12.04	4.00
WS17-23	WLS	424917.0	558535.5	11.96	1.20
WS17-23A	WLS	424916.1	558535.9	11.96	4.00
WS17-24	WLS	424428.2	558606.5	17.82	3.00
WS17-25	WLS	424411.2	558610.9	18.16	1.70
WS17-26	WLS	424381.2	558619.1	19.04	1.80
WS17-27	WLS	424356.7	558627.0	19.80	3.00
WS17-28	WLS	424339.9	558633.3	20.28	2.00
WS17-29	WLS	424325.2	558639.5	20.56	1.46
WS17-29A	WLS	424319.9	558637.3	14.49	1.55
WS17-29B	WLS	424321.3	558639.9	21.24	5.45

3.2 PAS 128 and Ground Penetrating Radar (GPR) Survey

Throughout the siteworks ongoing underground utility detection was undertaken in accordance with British Standard PAS 128 methodology. Wherever access permitted this included a preceding survey by a Ground Penetrating Radar (GPR).

The GPR Survey results are available as an additional CAD drawing. Because of the size of this file it is issued as a second independent report.

The various stages implemented by the PAS 128 system are as follows:

PAS 128 Category Type D
Underground utility plotted from utility record data.

PAS 128 Survey Category Type C
Underground utility plotted from utility record data only, but with site reconnaissance to match utility record with physical utility street furniture as a best fit.

PAS 128 Survey Category Type B
Utility detected by geophysical methods (single or multiple) to obtain a horizontal position and/or vertical position. (Subject to access)

PAS 128 Survey Category Type A
Utility verified and positioned by physical identification. This may be by strategically positioned, hand dug trial pitting or by visual inspection within a utility chamber.

3.3 Cable Avoidance Tool (CAT) Scanning and Hand Inspection Pits

Prior to the drilling of boreholes, the GPR survey /check was completed at each of the exploratory hole locations in advance of a 1.20m hand excavated inspection pit, using insulated tools, to confirm the absence of buried services below the exact location of boring.

Where due to rough or steep terrain GPR was not suitable, a RD8000 CAT scanner was used to search for the presence of any services. Scanning was completed at surface and then at 0.30m throughout inspection pits. These were excavated with caution by a competent person, using both a CAT and signal generator tool.

Where services or obstructions were encountered the exploratory hole was repositioned inside the 5m x 5m area that had been surveyed using GPR and the process repeated.

3.4 Hand Excavated Pits

2 no. hand excavated pits TH01 and TH02 were completed using insulated tools to a depth of 0.60m and 0.65m. The purpose was to locate services below the area of intended investigation. 22 no. further hand excavated pits were completed using insulated tools to between 0.8m and 1.2m. These were all undertaken prior to the CPT test.

Other trial holes were originally scheduled but could not be completed due to being on hardstanding ground, in roads / public walkways or because the services were

situated deeper than 1.20m bgl. At these locations a GPR survey was completed to locate the depth and position of the services, the positions were then recorded using GPS survey equipment.

All of the excavations were logged and sampled by Central Alliance for the purpose of service clearance, near surface soil property evaluation and environmental risk assessment. Representative disturbed (D), bulk disturbed (B) and Environmental (ES) samples were taken and placed in sealed containers or bulk bags for transportation to the laboratory. Depths of samples recovered are shown on the exploratory hole logs presented in Appendix A.

3.5 Dynamic Probing

Probing on was completed on 8 no. locations (after a refusal from the dynamic sampling method) and 2 no. locations from the base of the pit. The probes went to depths between 2.37m bgl and 10.00m bgl. The boreholes were probed using Super Heavy Dynamic Probing Techniques (DPSH), comprising a 63.5kg weight dropping over a fixed distance of 750mm. The number of blows are counted per 100mm of penetration and a density profile is created from the resulting information.

Results of the dynamic probing are shown on the exploratory hole logs presented in Appendix A.

3.6 Dynamic Sampling

The Dynamic Sampling rigs used to complete the works were a Fraste PLG, Fraste SLG, Barreta T41, Modular rig and a specialised Massenza MIP3 slope climbing rig.

The holes were formed using conventional equipment comprising 1 metre steel cylinders with an internal plastic liner. The steel tubes were repeatedly driven into the ground at progressive depths using rods connected to a percussive hammer mounted on the rig.

Standard Penetration Tests (SPTs) were undertaken every 1m as specified by WSP in accordance with BS EN ISO 22476-3:2005 using either a split spoon sampler or solid 60° cone. The results of these tests are presented as a Standard Penetration 'N' value or as a blow count for a given penetration at the appropriate position on the borehole log. The SPT Calibration details are presented within the individual exploratory hole records.

Representative disturbed (D), bulk disturbed (B), undisturbed (U) and environmental samples (ES) were taken and placed in sealed containers for transportation to the laboratory. Depths of samples recovered are shown on the exploratory hole logs presented in Appendix A.

3.7 Cable Percussive Boreholes

36 no. Cable percussive boreholes were completed at depths between 2.62m bgl and 51.92m bgl at agreed locations. 17 no. of the 36 were drilled to rock head or refusal and then continued with rotary techniques. The Boreholes were formed using Dando 2000 and Pilcon Wayfarer 1500 Cable percussion rigs and 150, 200 and 250mm diameter casings.

Standard Penetration Tests (SPTs) were undertaken every 1m up to 5m bgl and then 1.50m onwards, with alternating U100's where possible, as specified by WSP in accordance with BS EN ISO 22476-3:2005 using either a split spoon sampler or solid 60° cone. Where required by the specification spacers were used to maintain rod stiffness for the tests. The results of these tests are presented as a Standard Penetration 'N' value or as a blow count for a given penetration at the appropriate position on the borehole log.

The SPT Calibration certificate are presented within Appendix A.

Representative disturbed (D), bulk disturbed (B), undisturbed (U) and Environmental (ES) samples were taken and placed in sealed containers or bulk bags for transportation to the laboratory. For full details of the strata encountered, groundwater strikes, samples, in-situ testing and calibration certificates please refer to the individual exploratory hole records presented in Appendix A.

3.8 **Rotary Boreholes**

36 no. exploratory holes were drilled, under the terms of a permit issued by the Coal Authority, using rotary techniques to depths between 6.70m bgl and 80.00m bgl at agreed locations. The boreholes were completed using a tracked Fraste PLG, Fraste SLG, Massenza MIP18, Beretta T41 and a specialised Massenza MIP3 Slope Climbing rig.

The boreholes were formed using rotary coring methods utilising PWF casings and a PWF 1.5m long core barrel with a Polycrystalline Diamond (PCD) core bit and air mist and water flush to produce cores of a nominal 92mm diameter. The chosen flush method was selected and operated alongside the Coal Authority, Guidance on Managing the Risk of Hazardous Gases When Drilling or Piling near Coal.

This is summarised in table 6.2.7 of the guidance which is reproduced on the next page.

6.2.7 Table of Risks for Different Drilling Scenarios

Situation	Air flush	Mist flush	Foam flush	Water flush	Mud flush	Additional controls
• Unworked coal or coal workings • High or unknown risk of hazardous gases being present / created • Occupied property within risk area.	**HIGH**	**HIGH / MED'M**	**HIGH / MED'M**	**LOW**	**LOW**	• Monitoring at rig and other open holes. • Seal boreholes as soon as possible.
• Unworked coal or coal workings • High or unknown risk of hazardous gases being created or displaced • NO occupied property within risk area.	**MEDIUM**	**MED'M/ LOW**	**MED'M/ LOW**	**LOW**	**LOW**	• Monitoring at rig and other boreholes. • Ensure materials are on site to extinguish any heating • Seal boreholes as soon as possible.
• Unworked coal or coal workings • Defined low risk of hazardous gases being present / created • Occupied property within risk area	**MEDIUM**	**LOW**	**LOW**	**LOW**	**LOW**	• Monitoring at rig and other open holes. • Seal boreholes as soon as possibl
• Unworked coal or coal workings • Defined low risk of hazardous gases being present / created • No occupied property within risk area	**LOW**	**LOW**	**LOW**	**LOW**	**LOW**	• Monitoring at rig and other open holes. • Seal boreholes as soon as possible.
• Key / Notes						
High / High Medium drilling operations should not be undertaken if there is a safer, practicable, alternative. Stringent control measures, such as monitoring inside occupied properties within the risk area, would be required to mitigate this level of risk to an acceptable level.						
Medium / Medium Low drilling operations can be undertaken but only with sufficient control measures to ensure that the work can undertaken without endangering the public or the workforce.						
Low risk drilling operations can be undertaken with standard control measures i.e. monitoring for hazardous gases at the drill rig						

Rotary open holing techniques were utilised in order to progress through any hard superficial strata, such as very dense gravel and cobbles or to reach the specified depth to show the absence or presence of mine workings .20 no. Boreholes used compressed air open holing techniques utilising a roller cone bit and/ or water with a percussion hammer.

Where necessary1.5m long steel casings were used to prevent the hole from collapsing in non-cohesive or weak material. It was considered that better sample quality would be maintained by minimising the use of casing into rock. Subsequently a number of

deeper boreholes were drilled with little or no casing as indicated on the resulting drillers logs.

For Boreholes BH17-009, BH17-011 utilised HWF casing and subsequently a T6116 Core barrel. Due to running sand encountered at great depth within the boreholes, that was described on drillers logs by the colloquial term blowing sands, it was necessary that to continue drilling a reduction in casing was required. BH17-022 also utilised HWF casing and T6116 core barrels because of collapsed mine workings within the bedrock.

For full details of the strata encountered, groundwater strikes, samples taken, in-situ testing and calibration certificates please refer to the individual exploratory hole records presented in Appendix A. Core Photographs are presented in Appendix B of this report.

3.9 Machine Excavated Trial Pits

Following a PAS 128 survey for service locations, 4 no. machine excavated trial pits, were excavated to depths between 2.00m bgl and 3.50m bgl. The trial holes were constructed using a tracked excavator and terminated at the 3.50m bgl specified by WSP. TP17-04B was terminated at 2.00m due to the presence the of diesel within the hole.

Representative disturbed (D), bulk disturbed (B) and environmental samples (ES) were taken and placed in sealed containers or bulk bags for transportation to the laboratory. Depths of samples recovered are shown on the exploratory hole logs presented in Appendix A. Associated photographs are in Appendix B.

3.10 Cone Penetration Tests

Following a PAS 128 survey for service locations, 24 no. CPTs were undertaken at locations specified by WSP to determine the geotechnical engineering properties of the soil; and assess the subsurface stratigraphy, relative density, strength and equilibrium ground pore water pressures.

The works were undertaken within the NGN land off Lamesley road and within the Gateshead Council land off Smithy Lane. 8 no. positions were undertaken in the NGN land with our tracked MIP18 CPTu rig. 16 no. positions were undertaken in the Gateshead Council Land by Socotec using their Yanmar Crawler CPT Rig.

The logs from each location can be found in Appendix C of this report.

3.11 Downhole Geophysical Logging

Boreholes BH17-19, BH17-20, BH17-21 and BH17-22, were specified to have downhole acoustic and optical imaging. This was to obtain additional geotechnical information and discontinuity data.

The surveys were completed on 14/12/2017, 02/05/2018 and the 10/05/2018 by European Geophysical Services in accordance with their method statement and risk assessments.

The report produced by European Geophysical including discontinuity data is presented in Appendix D.

3.12 Mine Shaft Surveys

2 no. Geophysical surveys were undertaken between the 4th and 12th of June by RSK. The purpose was to locate and assess the extent of the Nanny Pit and Moor Inn Pit mine entries. The Survey consisted of a Ground Penetrated Radar (GPR) survey using a GSSI SIR4000 system with 200MHz and 400MHz antennae, and a microgravity survey using a Scintrex CG6 gravimeter.

The results of these surveys are displayed in Appendix E of this report.

3.13 Road Coring (Pavement Coring)

Pavement coring was undertaken by Northumberland County Council Highways Laboratory using an XCalibre Diamond Core Drilling machine. Core locations were selected by WSP. 85 no. cores were drilled using a 150mm diamond coring bit. Photographs were taken of the core location, the core immediately after extraction and of the core hole. A roadside record form was produced, and the cores were then packaged for transport to Northumberland Country Councils' highway laboratory. All holes were reinstated using a pneumatic rammer and sealant in accordance with the specification. Core locations eastings and northings were recorded using an Arrow GPS survey device.

Pavement cores were then photographed and logged and underwent PAK marker testing at the Northumberland Highways Laboratory. Pavement core reports are shown in Appendix F.

3.14 In Situ Testing

3.14.1 Hand Vane

Hand shear vane readings were taken in the cohesive strata encountered. These were from in-situ soils of the hand dug pits and the disturbed samples recovered from dynamic sampling. Sample disturbance requires the test be undertaken by the smallest permissible vane size. A Geonor type vane was used to record peak and remoulded undrained shear strengths. The results are presented on the exploratory hole logs in Appendix A.

3.15 Installations

3.14.2 Gas and Groundwater

34 no. boreholes were installed with 50/19mm internal diameter Groundwater monitoring installation, as specified from WSP. Where data recording divers would be used 25mm/33mm internal diameter piezometer pipes were used to facilitate the presence of the instrumentation. The monitoring was completed in accordance with BS10175 and BS5930.

Monitoring of the site is still ongoing. The results will be updated in future iterations of this report. Those to date are presented in Appendix G.

3.14.3 Vibrating Wire Piezometer

BH17-023 was installed with a Vibrating Wire Piezometer. data has been collected by Central Alliance and manually interpreted.

Monitoring of the site is still ongoing. The results will be updated in future iterations of this report. Those to date are presented in Appendix G.

3.15.4 Groundwater Divers

15 no. number of boreholes were installed with a groundwater data logger as specified by WSP. These have been utilised to monitor the groundwater and groundwater pressures periodically over time.

Monitoring of the site is still ongoing. The results will be updated in future iterations of this report. Those to date are presented in Appendix G.

4.0 LABORATORY TESTING

4.1 Geotechnical Testing

Laboratory testing was scheduled by WSP on selected soil and rock samples recovered during the investigation. The samples were sent to Professional Soils Laboratory, at their testing facility near Doncaster.

The programme of laboratory testing was carried out in accordance with the laboratory's UKAS accreditation for all tests and the guidance given in the British Standard BS1377 (1990): "Methods of Test for Soils for Civil Engineering Purposes" unless stated otherwise.

The following tests have been scheduled on selected soil and rock samples. The completed laboratory test results and a table of any deviations from the schedule are presented in Appendix H.

Soil:

- Moisture Content
- Atterberg Limit (1pt)
- Atterberg Limit (4pt)
- PSD Sieve (Wet)
- PSD Sedimentation
- Compaction (4.5kg)
- Compaction (MCV)
- Total Stress Consolidation
- Consolidated Undrained Effective Stress (Single Stage 100mm)
- Consolidated Undrained Effective (Multi Stage 100mm)
- Consolidated Drained Effective Stress (Multi Stage 100mm)
- BRE SD1 Suite A (Greenfield site Pyrite Absent)
- BRE SD 1 Suite C (Brownfield site Pyrite Absent)
- Resistivity
- Rock Sample Testing.

4.2 Rock Testing

Testing for strength properties were undertaken at regular intervals in each rotary core. The quality of the rock dictated that testing was predominantly by Point Load test(PL) but where sample quality permitted some Unconfined Compressive Strength tests (UCS) were also conducted.

Rock samples were prepared by labelling the top and bottom depth of the sample. This permitted a record of the testing orientations alongside laboratory interpretation of rock weakness.

Point load tests were taken axially, diametral and irregular to the orientation of the core. These were recorded as failure load parallel, perpendicular or random to the sample laminations or bedding. The UCS tests were conducted axially through the core and the results include a sample length to height ratio and a mode of failure.

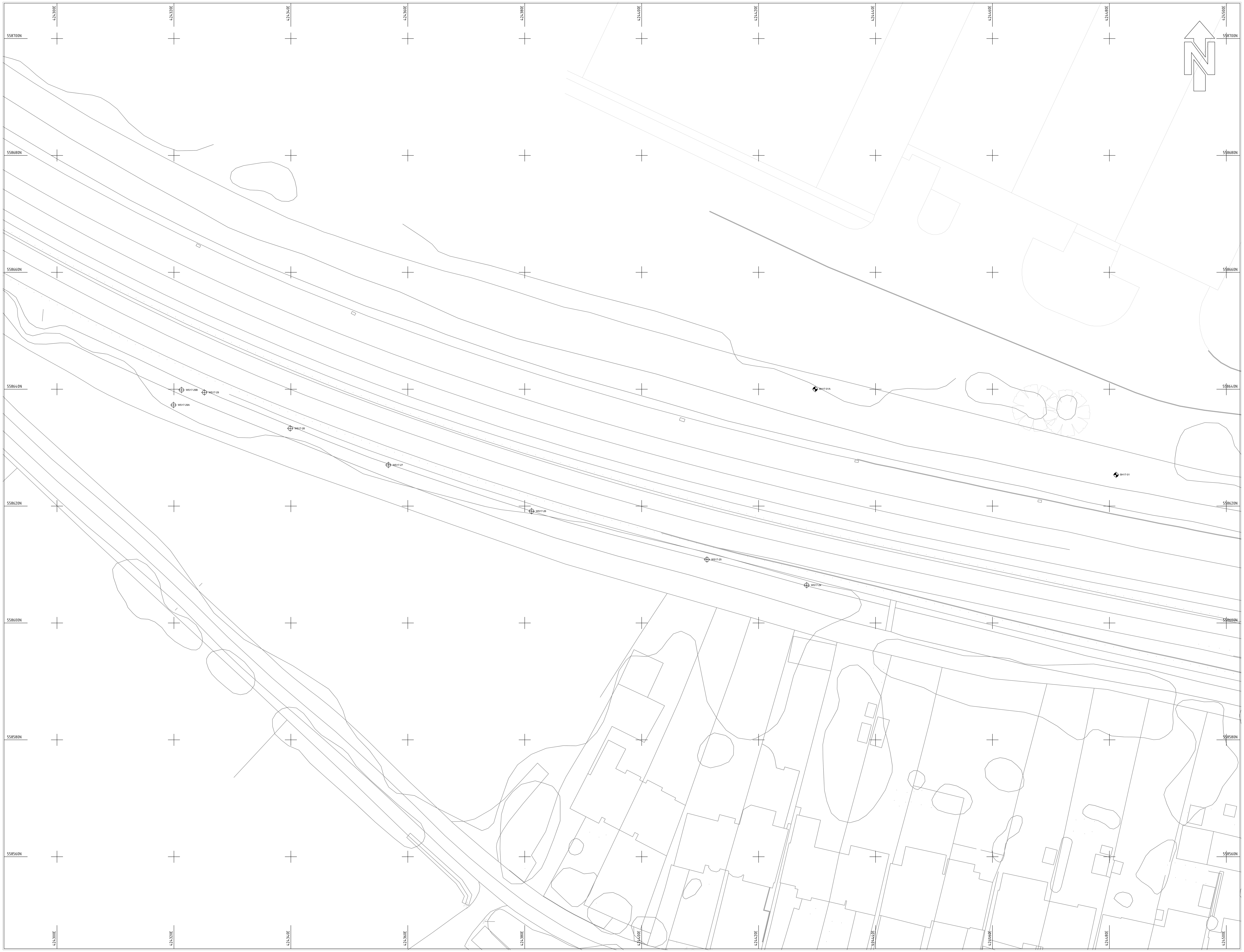
4.3 Chemical Testing

Chemical testing was scheduled by WSP on selected samples recovered during the ground investigation and from groundwater samples recovered during the monitoring. The samples were sent to Jones Environmental Laboratory at their laboratory in Deeside. Testing for all samples was carried out in accordance with the laboratory's UKAS accreditation with the following tests scheduled:

- Asbestos Identification
- Suite A Green Field site (pyrite absent)
- Contract Specific Suite E (a)
- Contract Specific Suite E (b)
- Contract Specific Suite E (c)

Full details of the chemical analyses are presented in Appendix I.

DRAWINGS



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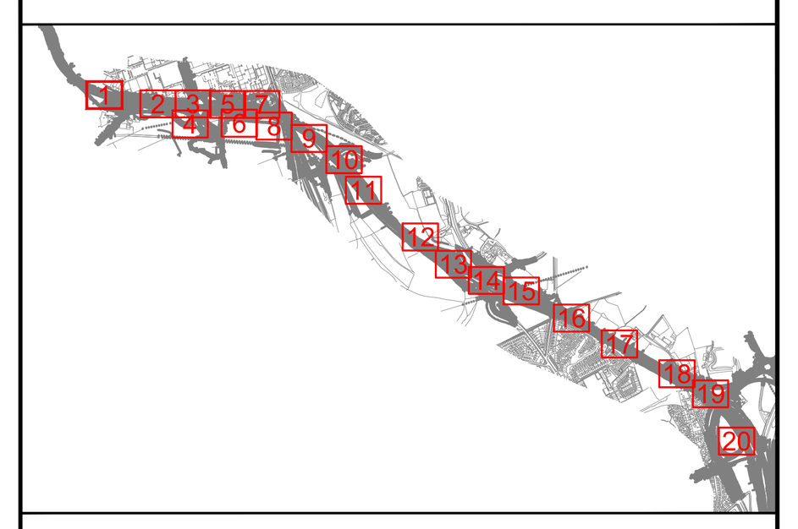

LEGEND

Geotechnical Borehole (BH)

Geotechnical Window Sample (WS)

Geotechnical CPT (Cone Penetration Test)

Geotechnical TP (Trial Pit)

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Location Coordinates

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A	CPT update from As-Built Survey	TR	Oct 2018

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ORDNANCE SURVEY Related by GNSS Ntework RTK (VRS) observations.	ORDNANCE SURVEY Related by GNSS Ntework RTK (VRS) observations.

CENTRAL ALLIANCE GEO

Tel: (0)1924 229889
Email: info@central-alliance.co.uk
Web: www.central-alliance.co.uk

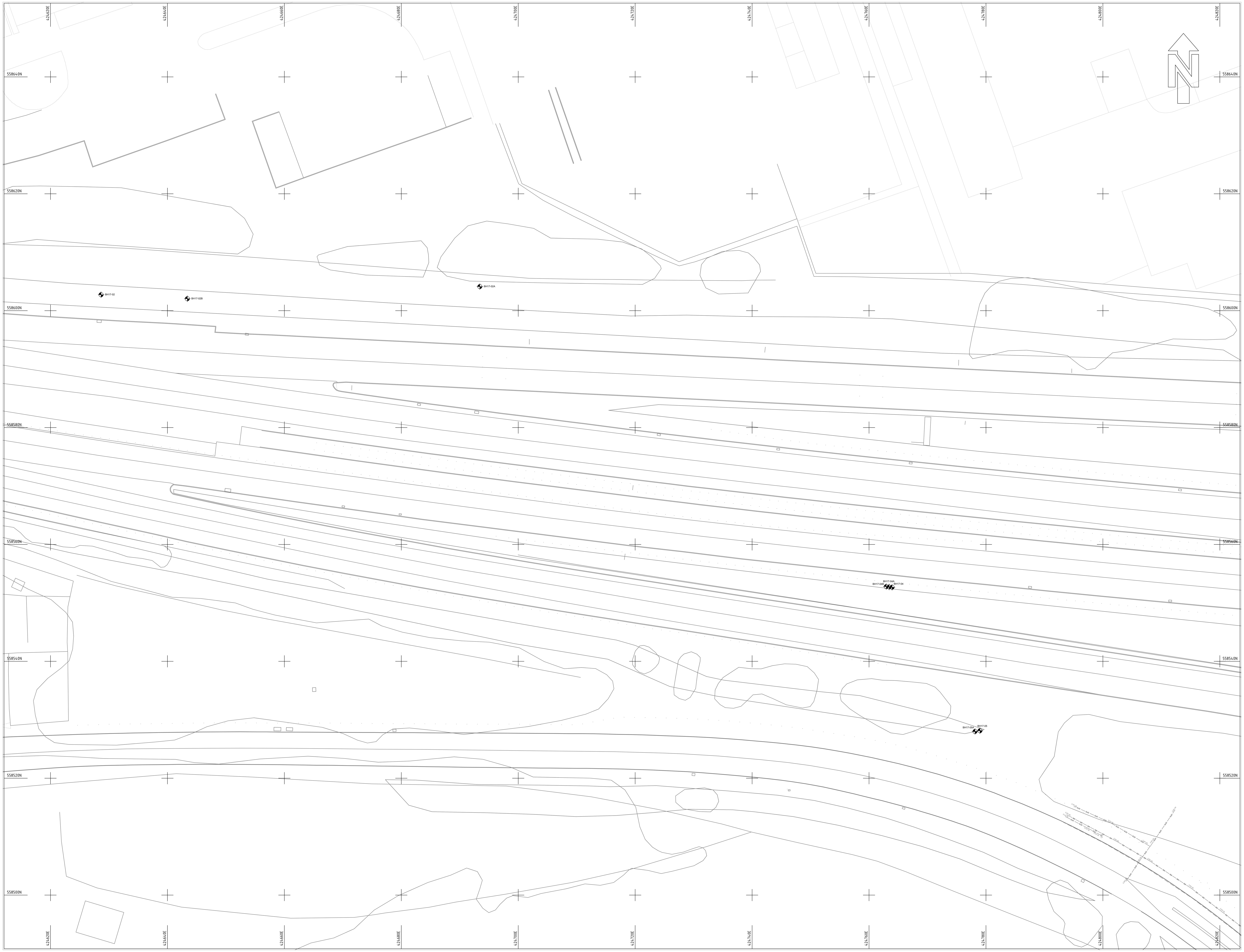
Alliance House, South Park Way,
Wakefield 41 Business Park,
Wakefield, WF2 0XJ

CLIENT:
Highways England

SITE LOCATION:
A1 Birtley to Coalhouse - A1B2CH

SURVEY TITLE:
Exploratory Hole Location Plan

SURVEYED BY:	DATE:	DRAWING NUMBER:	
DT / RJ	Apr / Jun 18	CA3043_P - A1B2CH - Rev.A	
DRAWN BY:	DATE:	SCALE:	
TR	Jun / Aug 18	1:200 @ A0	
APPROVED BY:	DATE:	SHEET NUMBER:	REV:
TR / RH	Aug 2018	1 of 20 A0	A



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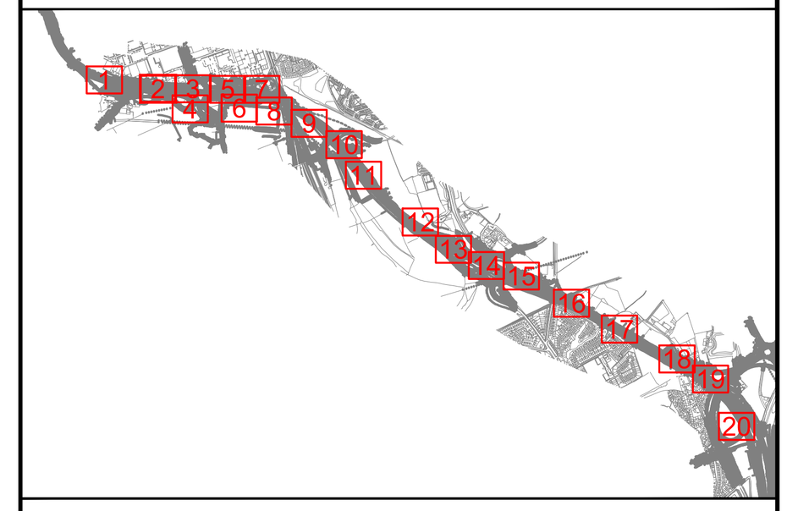

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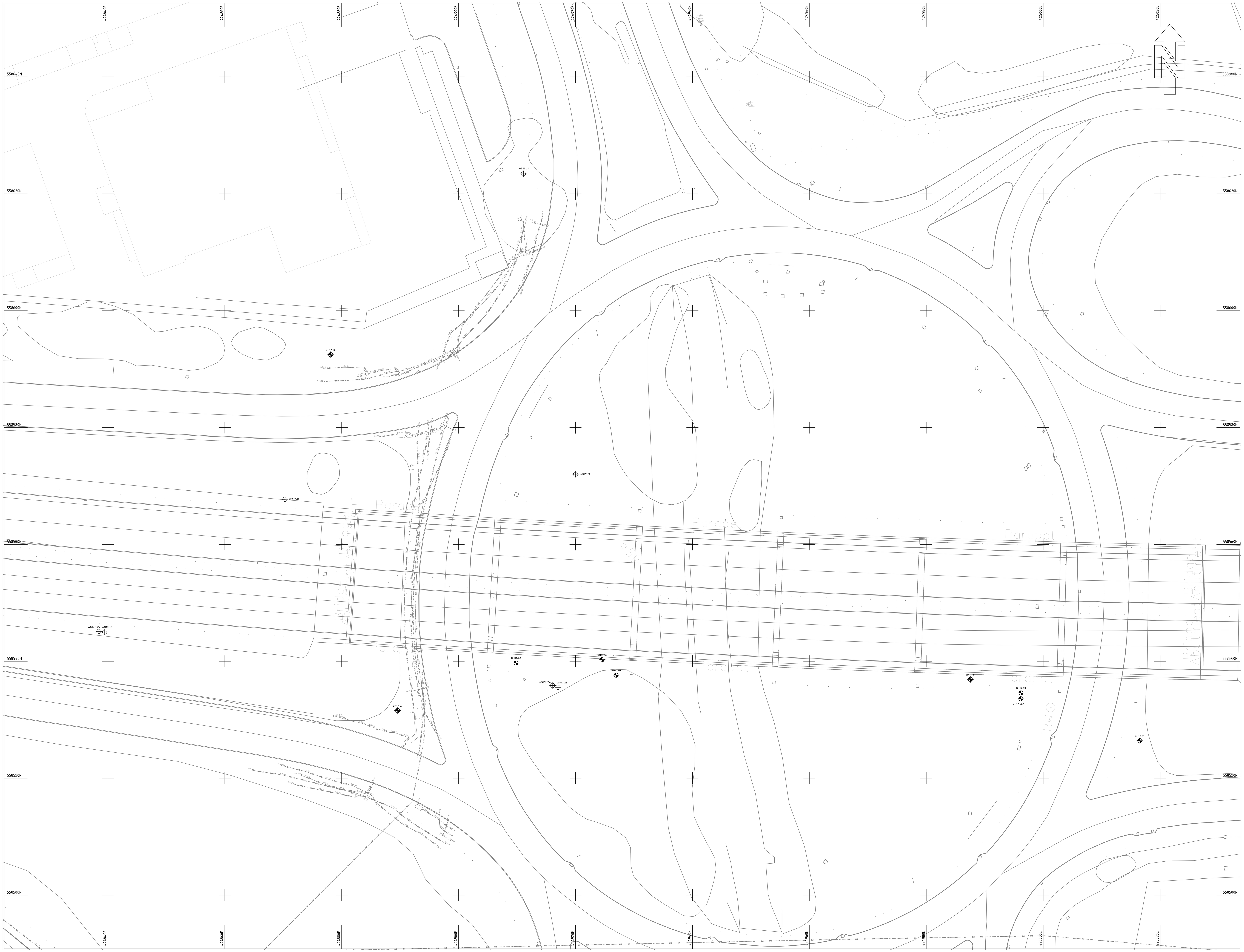

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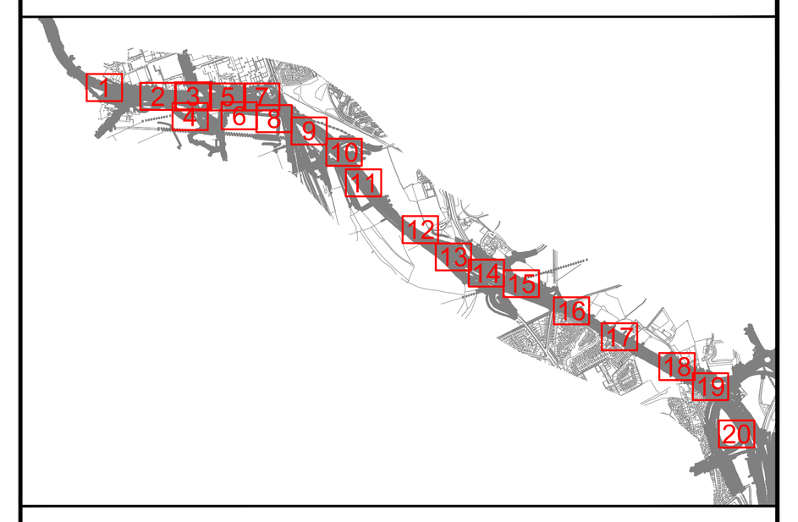

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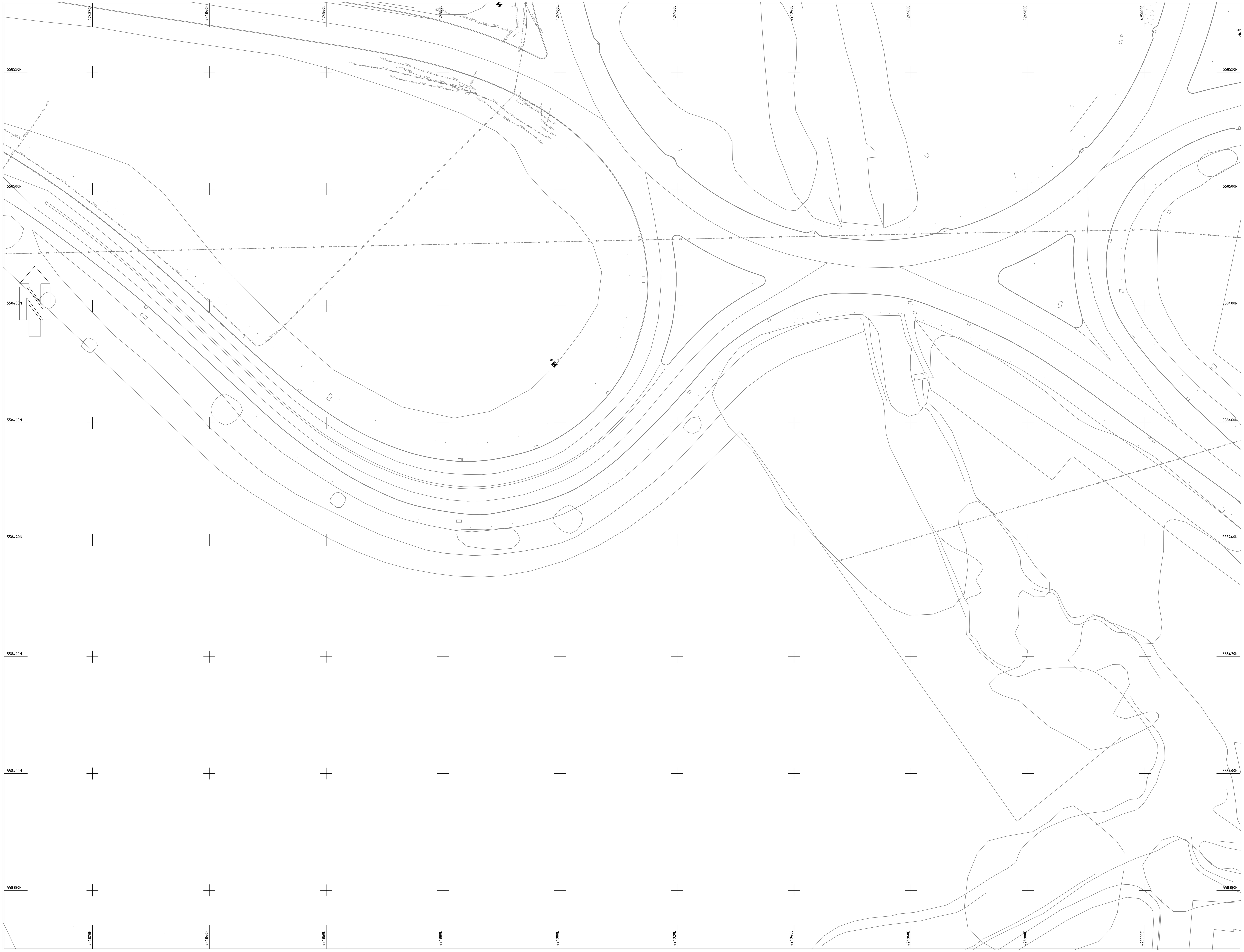

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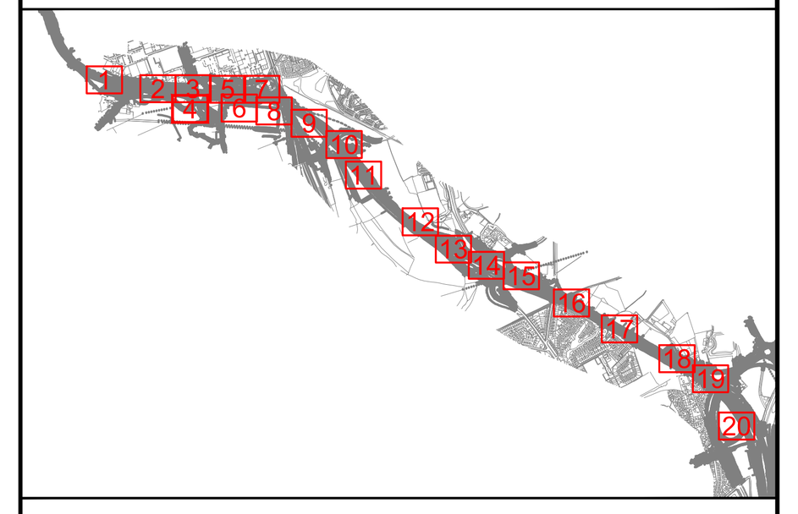

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CLIENT: Highways England

SITE LOCATION: A1 Birtley to Coalhouse - A1B2CH

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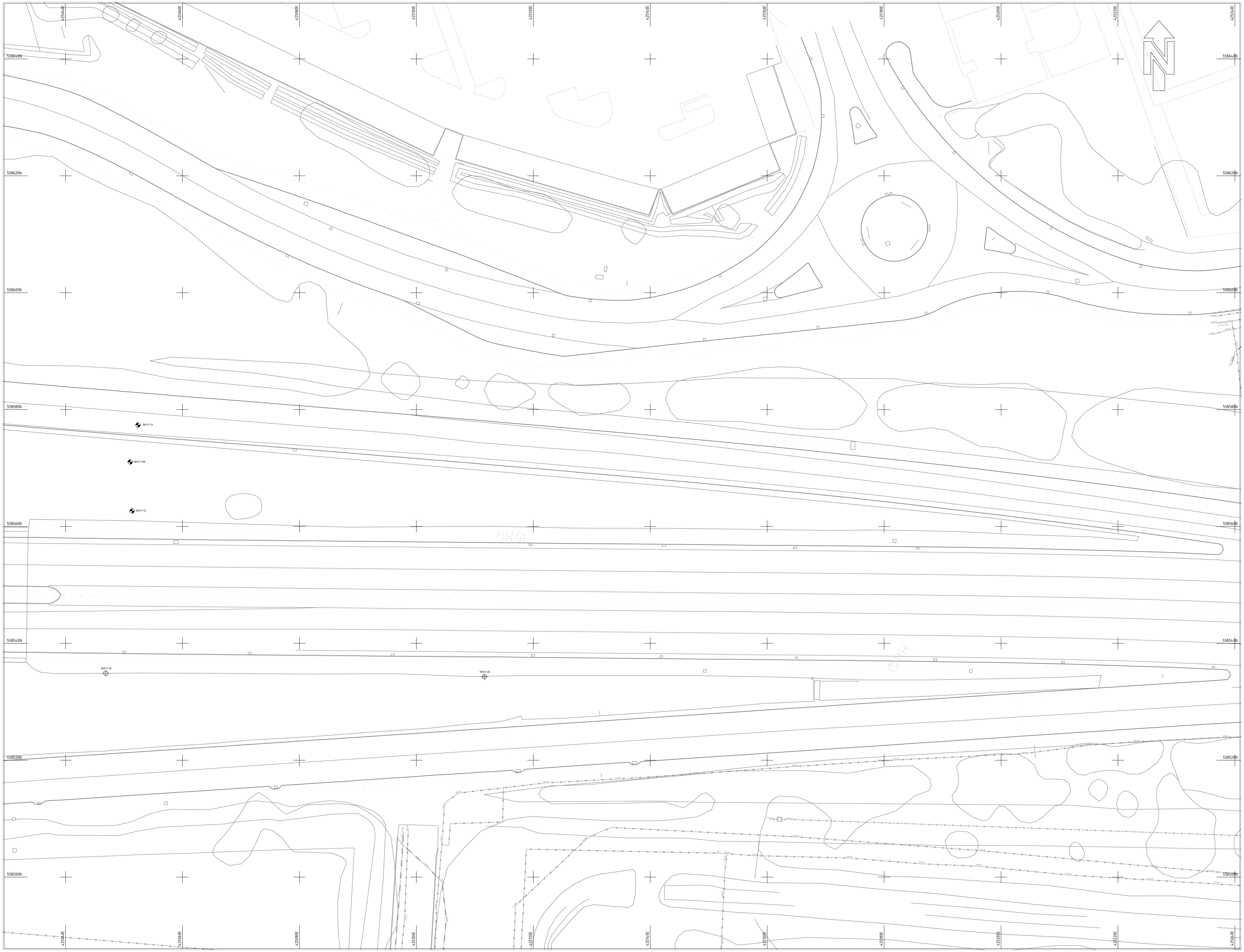

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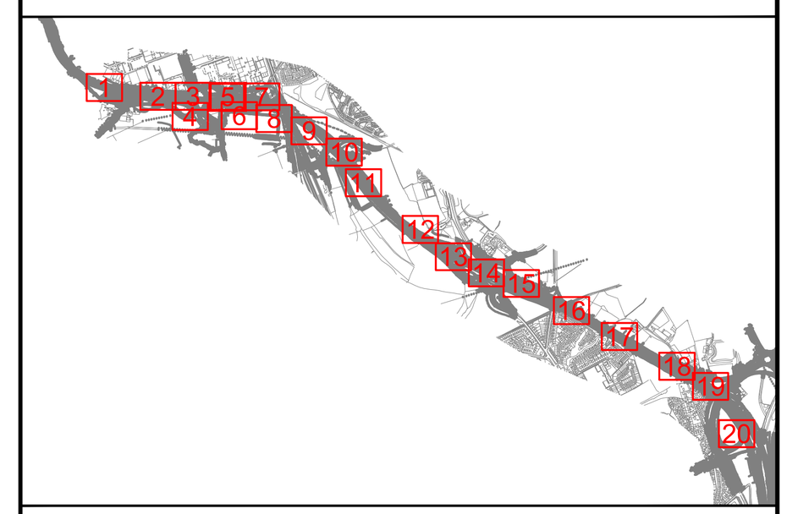

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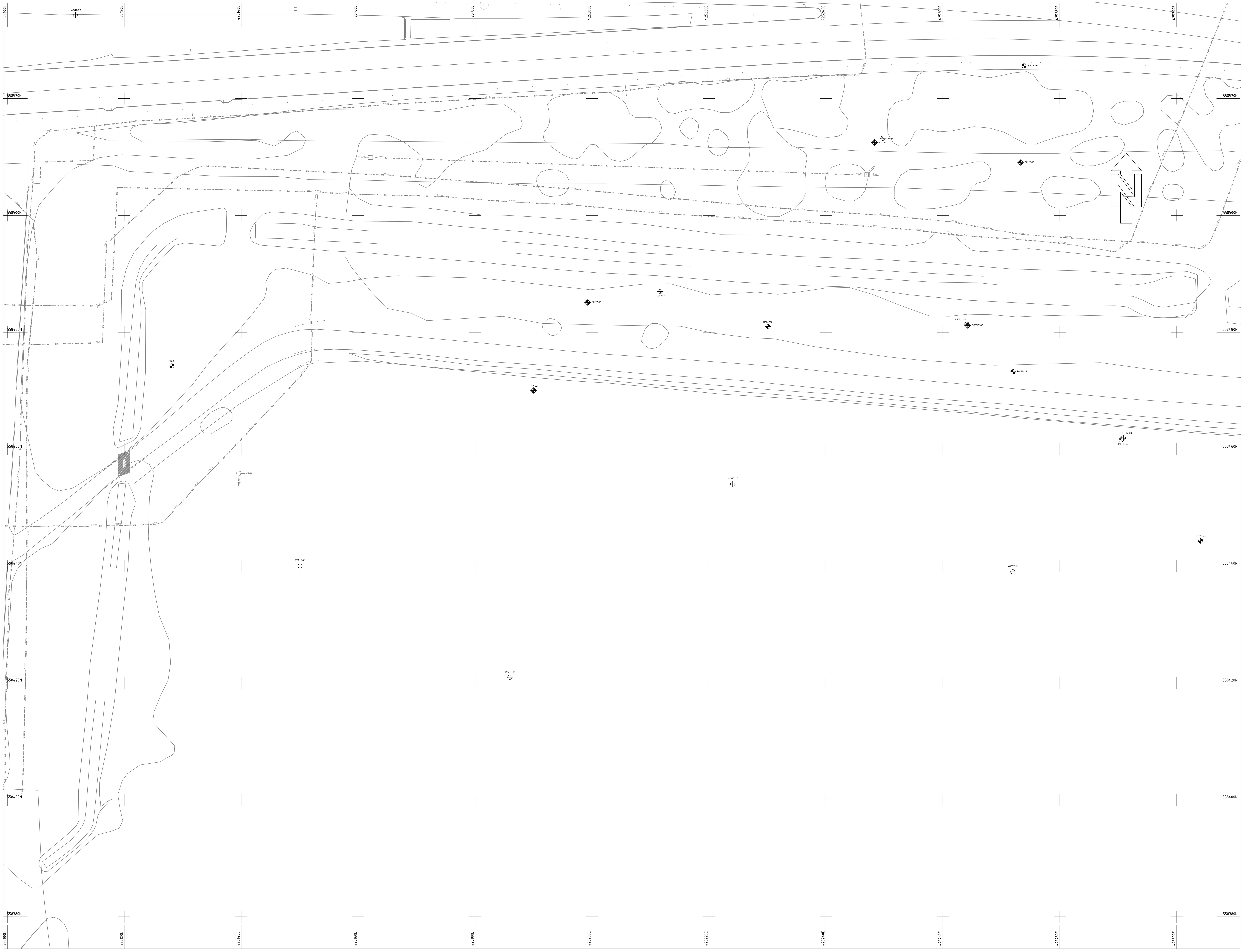

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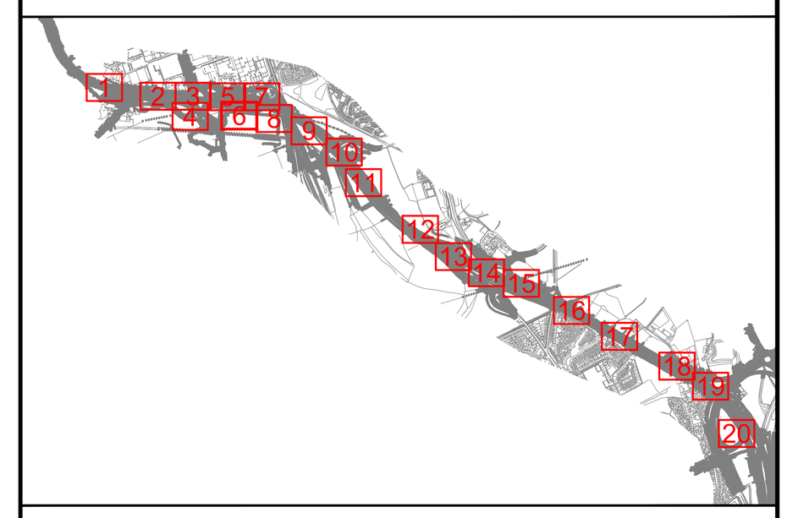

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Location Coordinates

REV.	DETAILS	BY	DATE
A	CPT update from As-Built Survey	TR	Oct 2018

GRID: ORDNANCE SURVEY Related by GNSS Ntework RTK (VRS) observations.

DATUM: ORDNANCE SURVEY Related by GNSS Ntework RTK (VRS) observations.

CENTRAL ALLIANCE GEO

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Web: www.central-alliance.co.uk

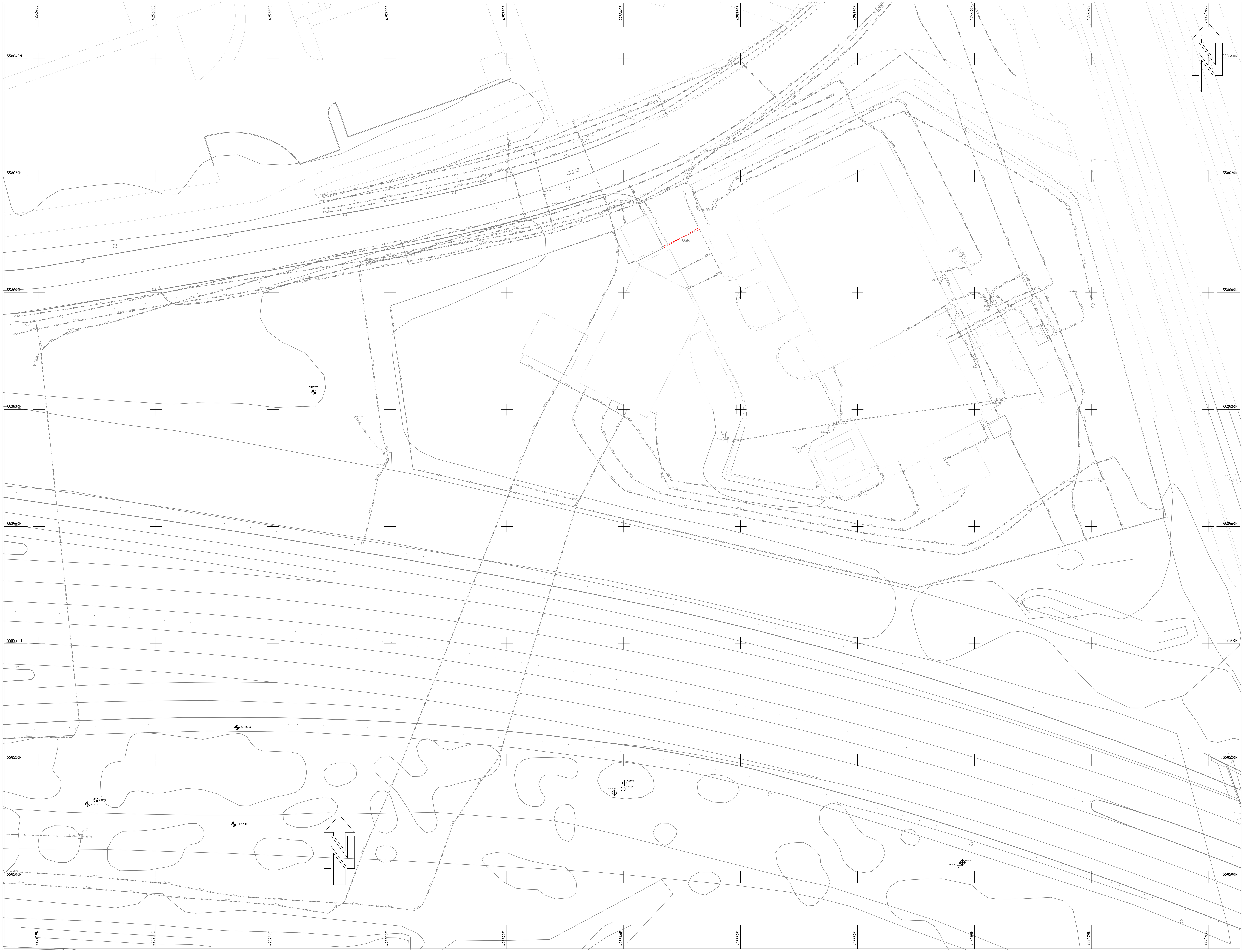
Alliance House, South Park Way,
Wakefield 41 Business Park,
Wakefield, WF2 0XJ

CLIENT: Highways England

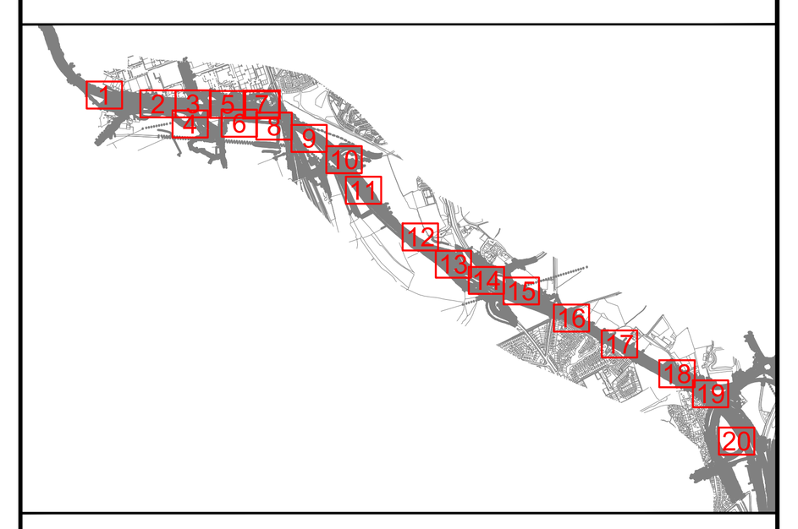
SITE LOCATION: A1 Birtley to Coalhouse - A1B2CH

SURVEY TITLE: Exploratory Hole Location Plan

SURVEYED BY:	DATE:	DRAWING NUMBER:	
DT / RJ	Apr / Jun 18	CA3043_P - A1B2CH - Rev.A	
DRAWN BY:	DATE:	SCALE:	
TR	Jun / Aug 18	1:200 @ A0	
APPROVED BY:	DATE:	SHEET NUMBER:	REV:
TR / RH	Aug 2018	6 of 20 A0	A



SHEET LAYOUT



LEGEND

- Geotechnical Borehole (BH)
- Geotechnical Window Sample (WS)
- Geotechnical CPT (Cone Penetration Test)
- Geotechnical TP (Trial Pit)

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REV.	DETAILS	BY	DATE
A	CPT update from As-Built Survey	TR	Oct 2018

GRID
ORDNANCE SURVEY
Related by GNSS Ntework RTK (VRS) observations.

DATUM
ORDNANCE SURVEY
Related by GNSS Ntework RTK (VRS) observations.

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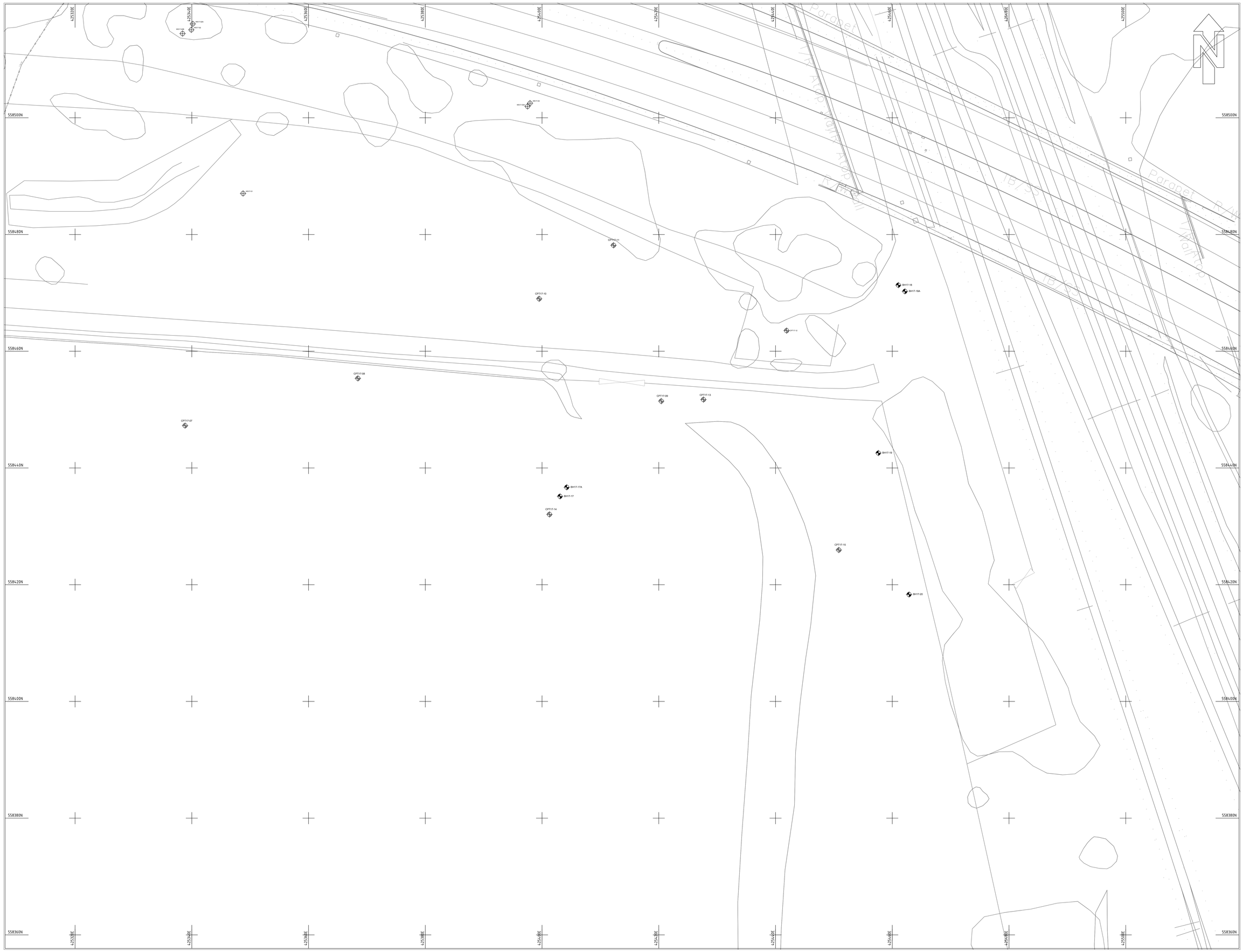
CLIENT: Highways England

SITE LOCATION: A1 Birtley to Coalhouse - A1B2CH

SURVEY TITLE: Exploratory Hole Location Plan

SURVEYED BY: DT / RJ	DATE: Apr / Jun 18	DRAWING NUMBER: CA3043_P - A1B2CH - Rev.A
DRAWN BY: TR	DATE: Jun / Aug 18	SCALE: 1:200 @ A0
APPROVED BY: TR / RH	DATE: Aug 2018	SHEET NUMBER: 7 of 20 A0 — REV: A



SHEET LAYOUT

LEGEND

◕	Geotechnical Borehole (BH)
⊕	Geotechnical Window Sample (WS)
⊗	Geotechnical CPT (Cone Penetration Test)
◑	Geotechnical TP (Trial Pit)

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A	CPT update from As-Built Survey	TR	Oct 2018

GRID
ORDNANCE SURVEY
Related by GNSS
Ntework RTK (VRS)
observations.

DATUM
ORDNANCE SURVEY
Related by GNSS Ntework RTK (VRS) observations.

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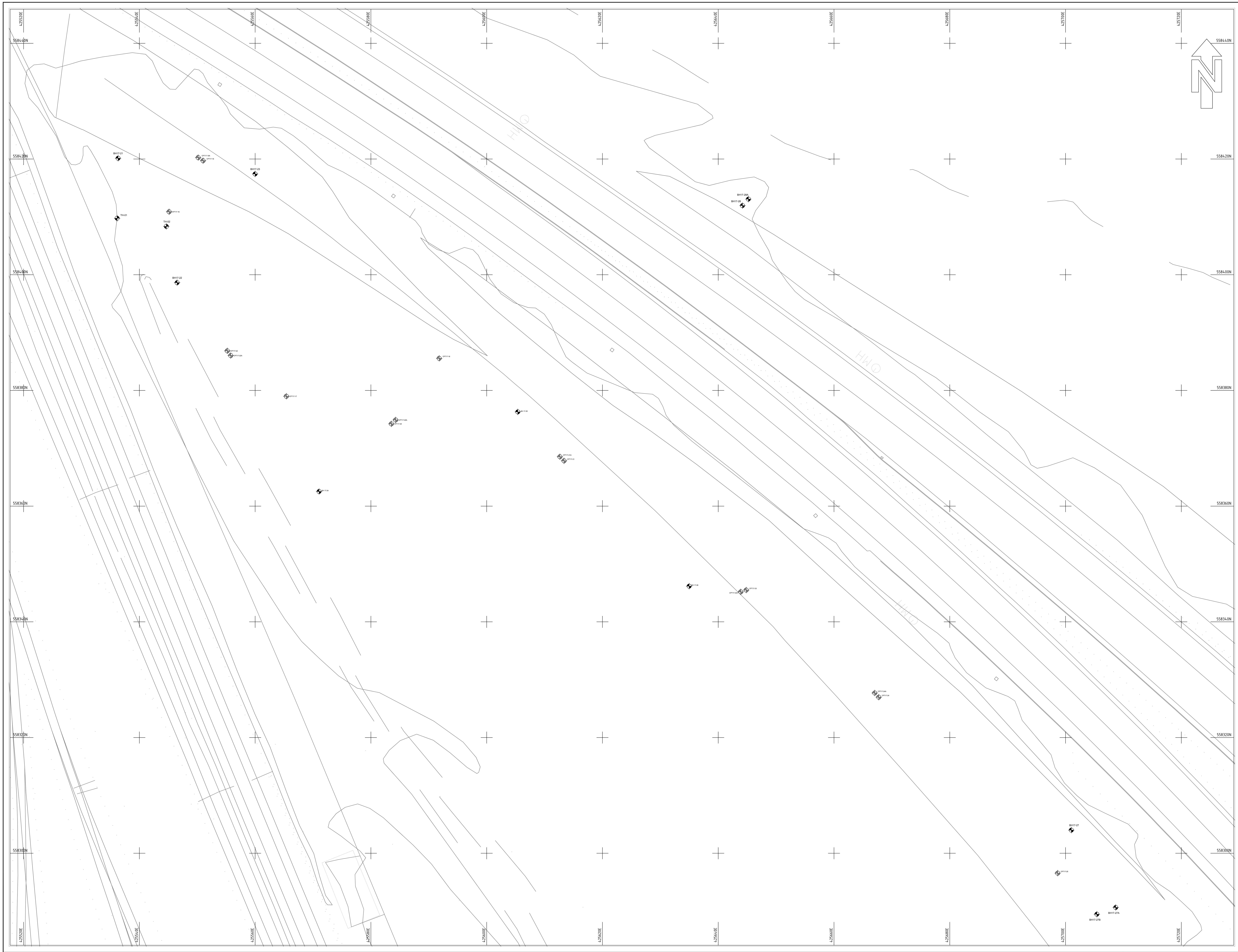
CLIENT:
Highways England

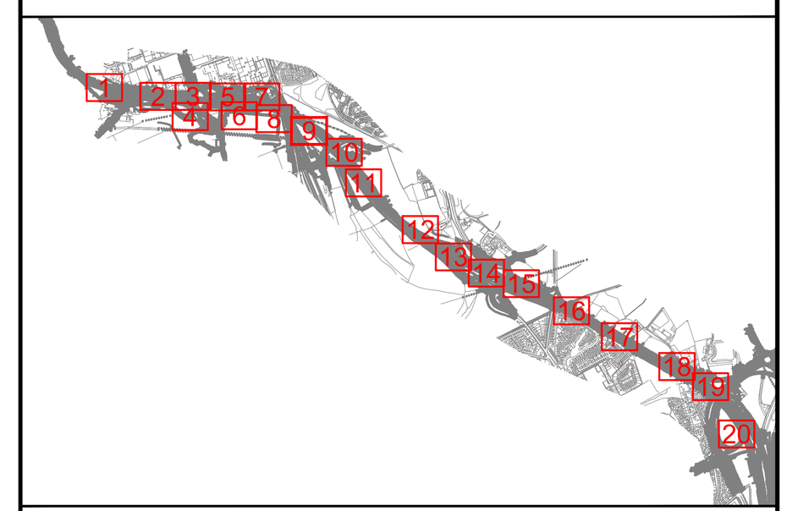
SITE LOCATION:
A1 Birtley to Coalhouse - A1B2CH

SURVEY TITLE:
Exploratory Hole Location Plan

SURVEYED BY: DT / RJ	DATE: Apr / Jun 18	DRAWING NUMBER: CA3043_P - A1B2CH - Rev.A
DRAWN BY: TR	DATE: Jun / Aug 18	SCALE: 1:200 @ A0
APPROVED BY: TR / RH	DATE: Aug 2018	SHEET NUMBER: 8 of 20 A0 — REV: A



SHEET LAYOUT



LEGEND

- Geotechnical Borehole (BH)
- Geotechnical Window Sample (WS)
- Geotechnical CPT (Cone Penetration Test)
- Geotechnical TP (Trial Pit)

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Location Coordinates

REV.	DETAILS	BY	DATE
A	CPT update from As-Built Survey	TR	Oct 2018

GRID
ORDNANCE SURVEY
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DATUM
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CLIENT:
Highways England

SITE LOCATION:
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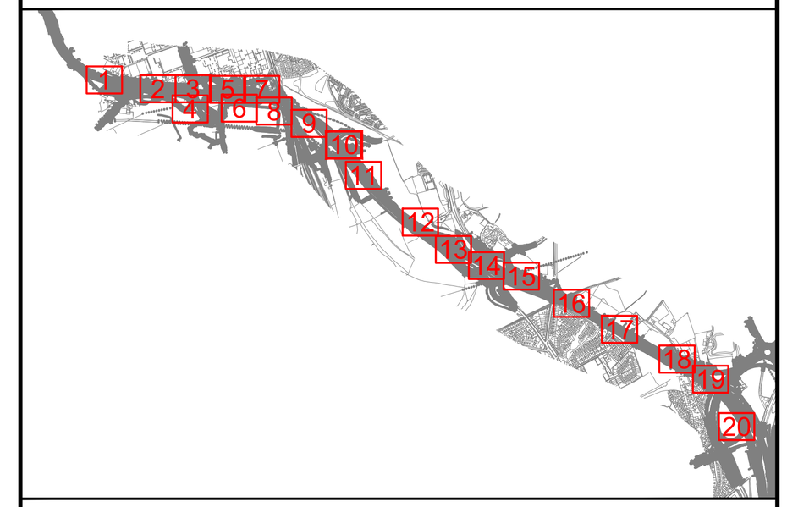
SURVEY TITLE:
Exploratory Hole Location Plan

SURVEYED BY: DT / RJ	DATE: Apr / Jun 18	DRAWING NUMBER: CA3043_P - A1B2CH - Rev.A
DRAWN BY: TR	DATE: Jun / Aug 18	SCALE: 1:200 @ A0
APPROVED BY: TR / RH	DATE: Aug 2018	SHEET NUMBER: 9 of 20 A0 — REV: A

SHEET LAYOUT



LEGEND

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GRID
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DATUM
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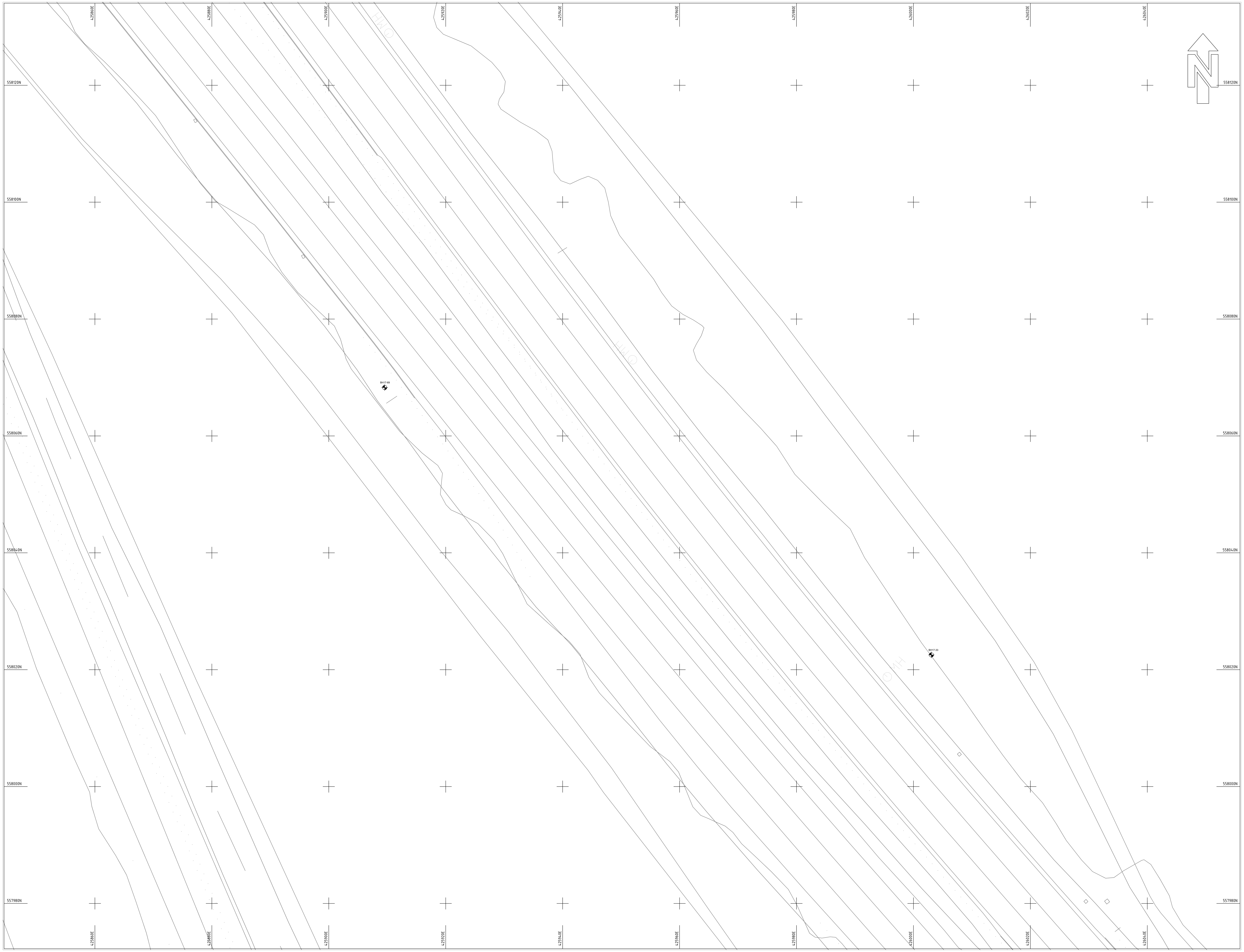
CLIENT: Highways England

SITE LOCATION: A1 Birtley to Coalhouse - A1B2CH

SURVEY TITLE: Exploratory Hole Location Plan

SURVEYED BY: DT / RJ	DATE: Apr / Jun 18	DRAWING NUMBER: CA3043_P - A1B2CH - Rev.A
DRAWN BY: TR	DATE: Jun / Aug 18	SCALE: 1:200 @ A0
APPROVED BY: TR / RH	DATE: Aug 2018	SHEET NUMBER: 10 of 20 A0 — REV: A



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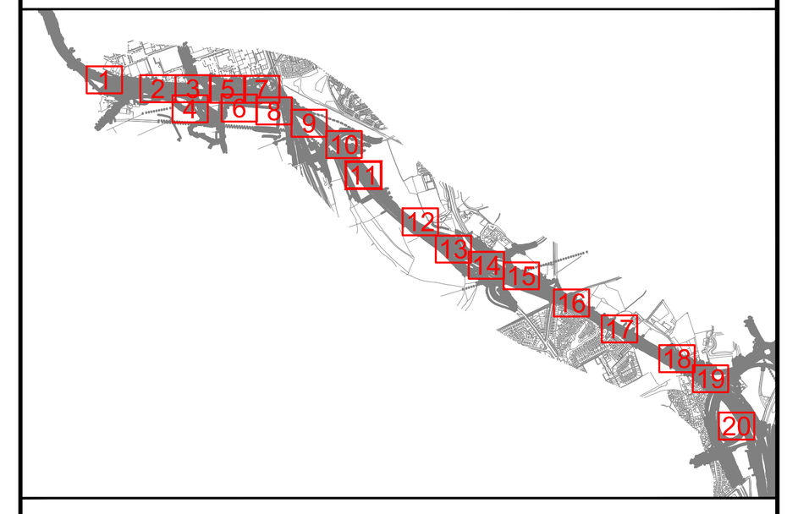

LEGEND

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GRID
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DATUM
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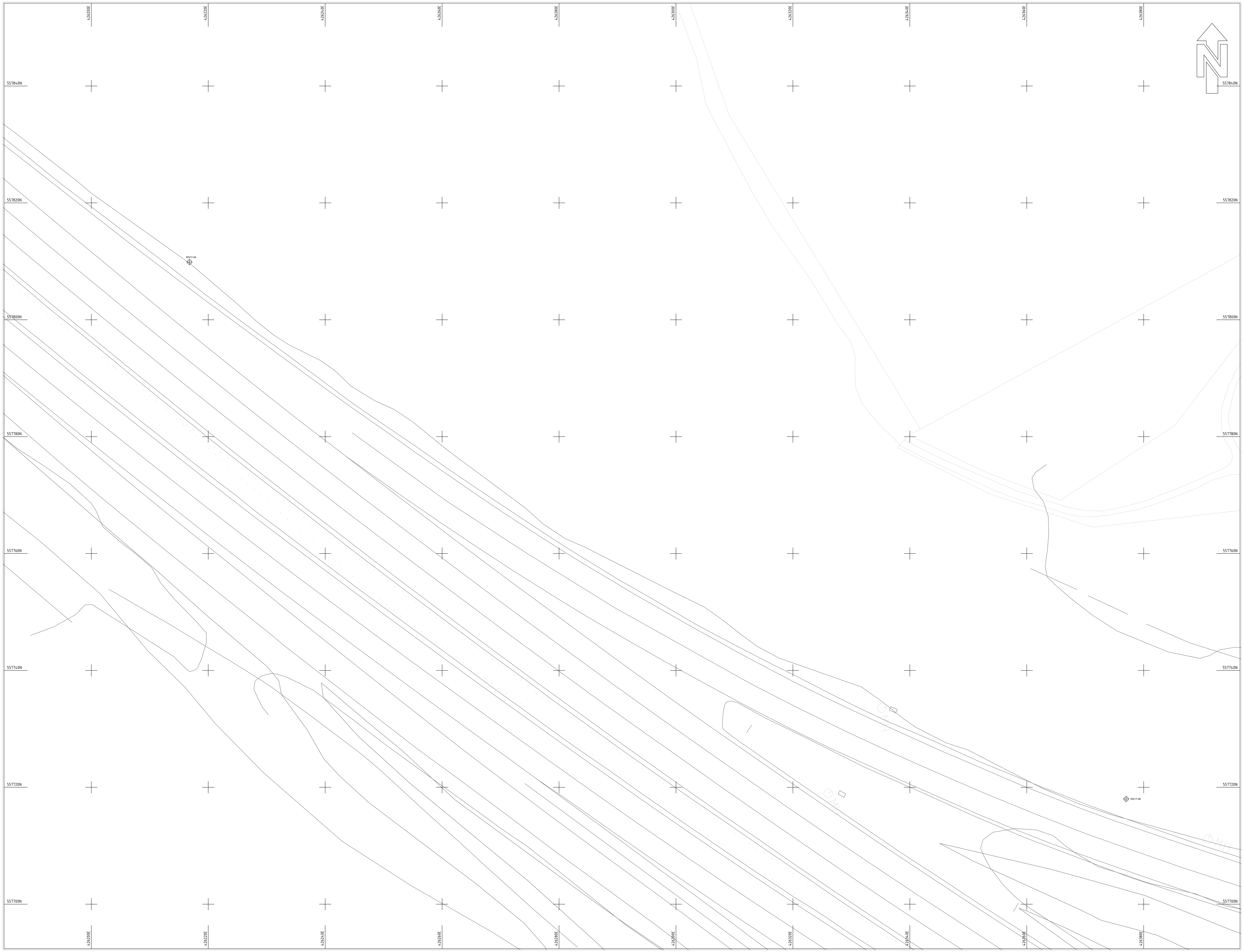
CLIENT: Highways England

SITE LOCATION: A1 Birtley to Coalhouse - A1B2CH

SURVEY TITLE: Exploratory Hole Location Plan

SURVEYED BY: DT / RJ	DATE: Apr / Jun 18	DRAWING NUMBER: CA3043_P - A1B2CH - Rev.A	
DRAWN BY: TR	DATE: Jun / Aug 18	SCALE: 1:200 @ A0	
APPROVED BY: TR / RH	DATE: Aug 2018	SHEET NUMBER: 11 of 20 A0	REV: A



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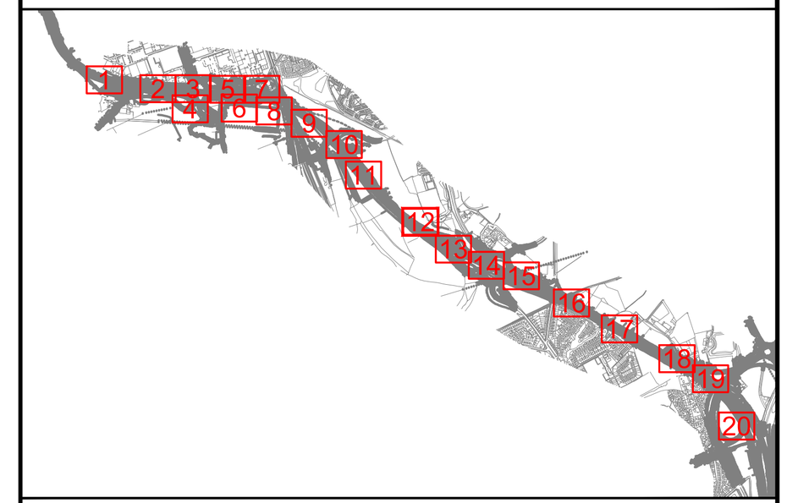

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GRID: ORDNANCE SURVEY Related by GNSS Ntework RTK (VRS) observations.

DATUM: ORDNANCE SURVEY Related by GNSS Ntework RTK (VRS) observations.

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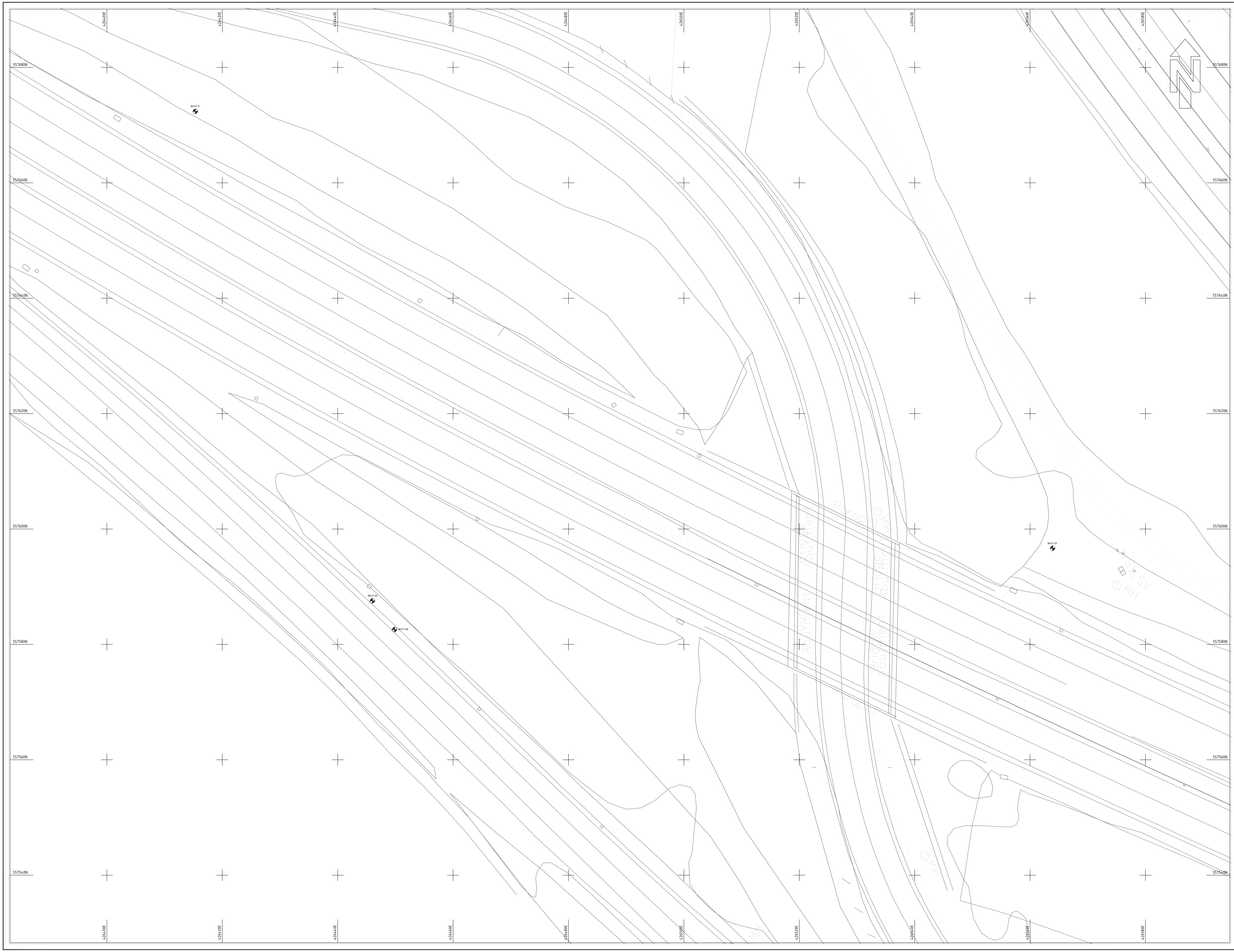
SURVEY TITLE: Exploratory Hole Location Plan

SURVEYED BY:	DATE:	DRAWING NUMBER:	
DT / RJ	Apr / Jun 18	CA3043_P - A1B2CH - Rev.A	
DRAWN BY:	DATE:	SCALE:	
TR	Jun / Aug 18	1:200 @ A0	
APPROVED BY:	DATE:	SHEET NUMBER:	REV:
TR / RH	Aug 2018	12 of 20 A0	A



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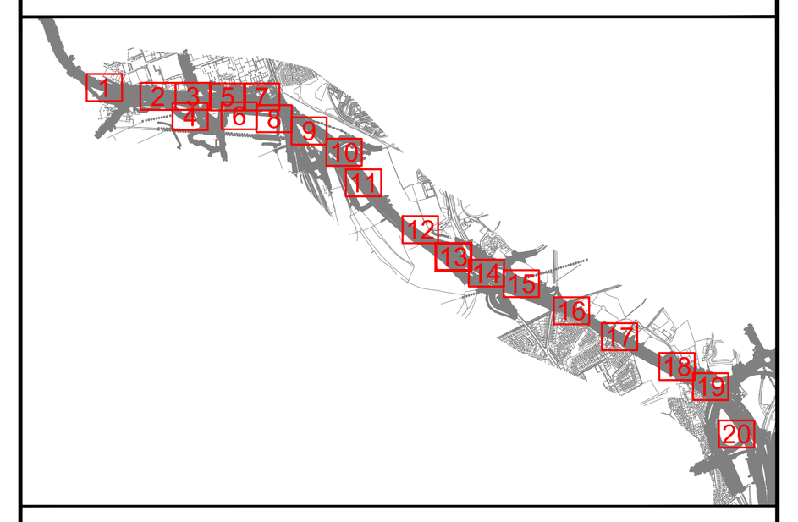

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GRID	DATUM
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CLIENT: Highways England

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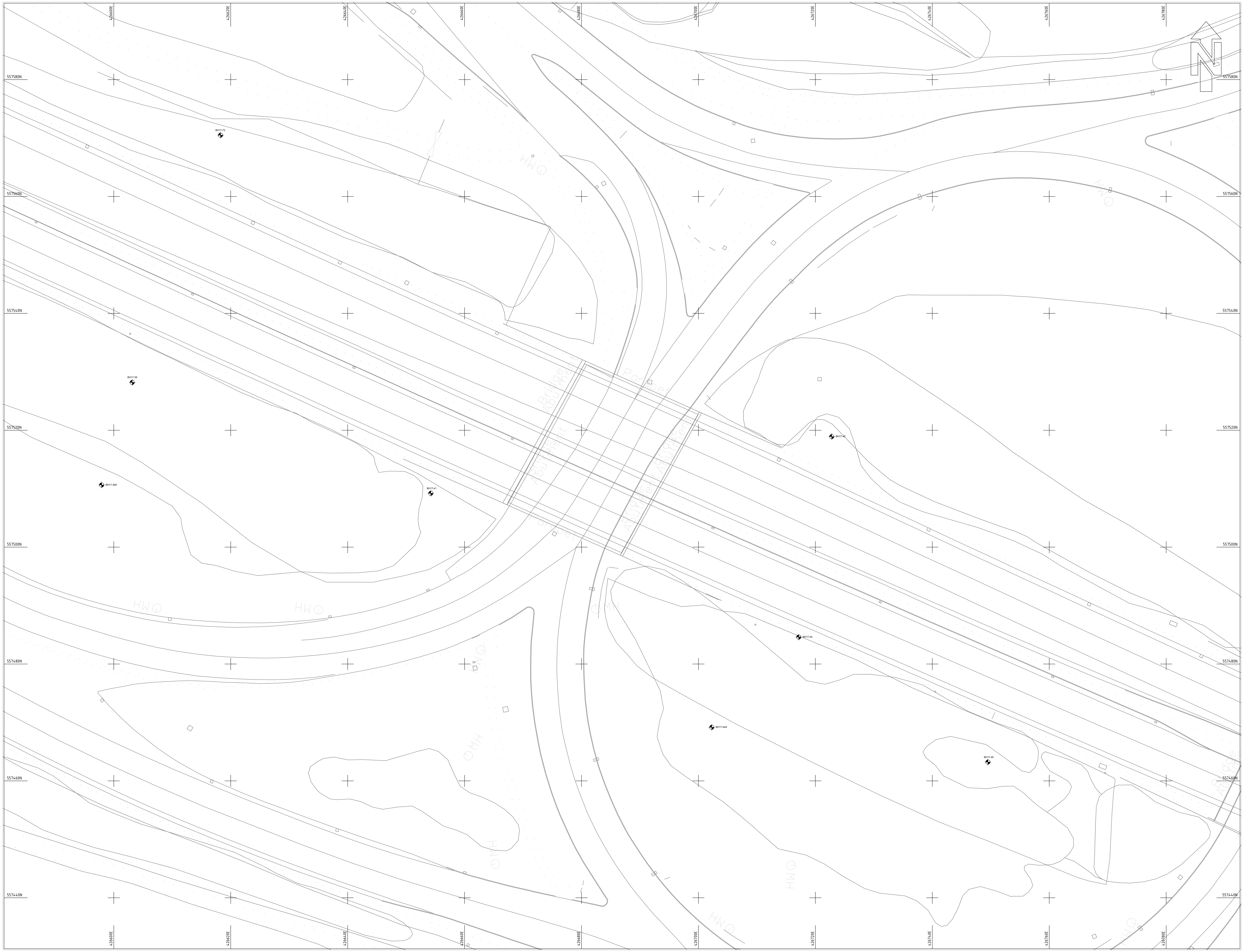
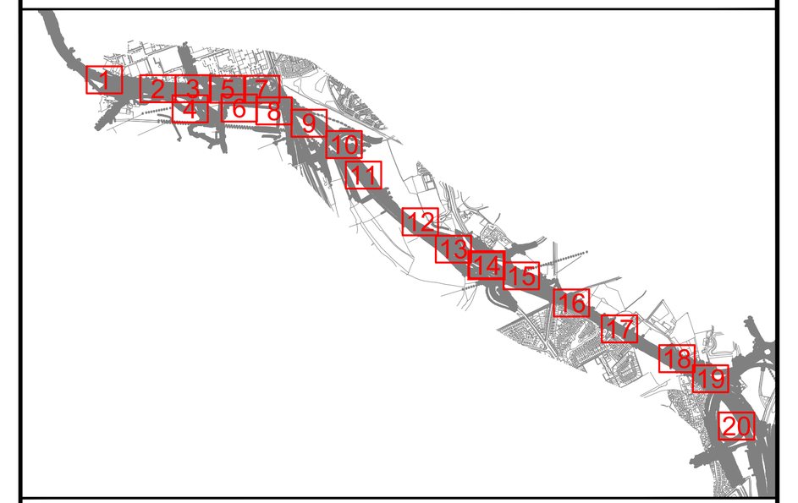
SURVEY TITLE: Exploratory Hole Location Plan

SURVEYED BY:	DATE:	DRAWING NUMBER:	
DT / RJ	Apr / Jun 18	CA3043_P - A1B2CH - Rev.A	
DRAWN BY:	DATE:	SCALE:	
TR	Jun / Aug 18	1:200 @ A0	
APPROVED BY:	DATE:	SHEET NUMBER:	REV:
TR / RH	Aug 2018	13 of 20 A0	A



SHEET LAYOUT



LEGEND

Geotechnical Borehole (BH)

Geotechnical Window Sample (WS)

Geotechnical CPT
(Cone Penetration Test)

Geotechnical TP
(Trial Pit)

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Location Coordinates

REV.	DETAILS	BY	DATE
A	CPT update from As-Built Survey	TR	Oct 2018

GRID	DATUM
ORDNANCE SURVEY Related by GNSS Ntework RTK (VRS) observations.	ORDNANCE SURVEY Related by GNSS Ntework RTK (VRS) observations.

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GEO

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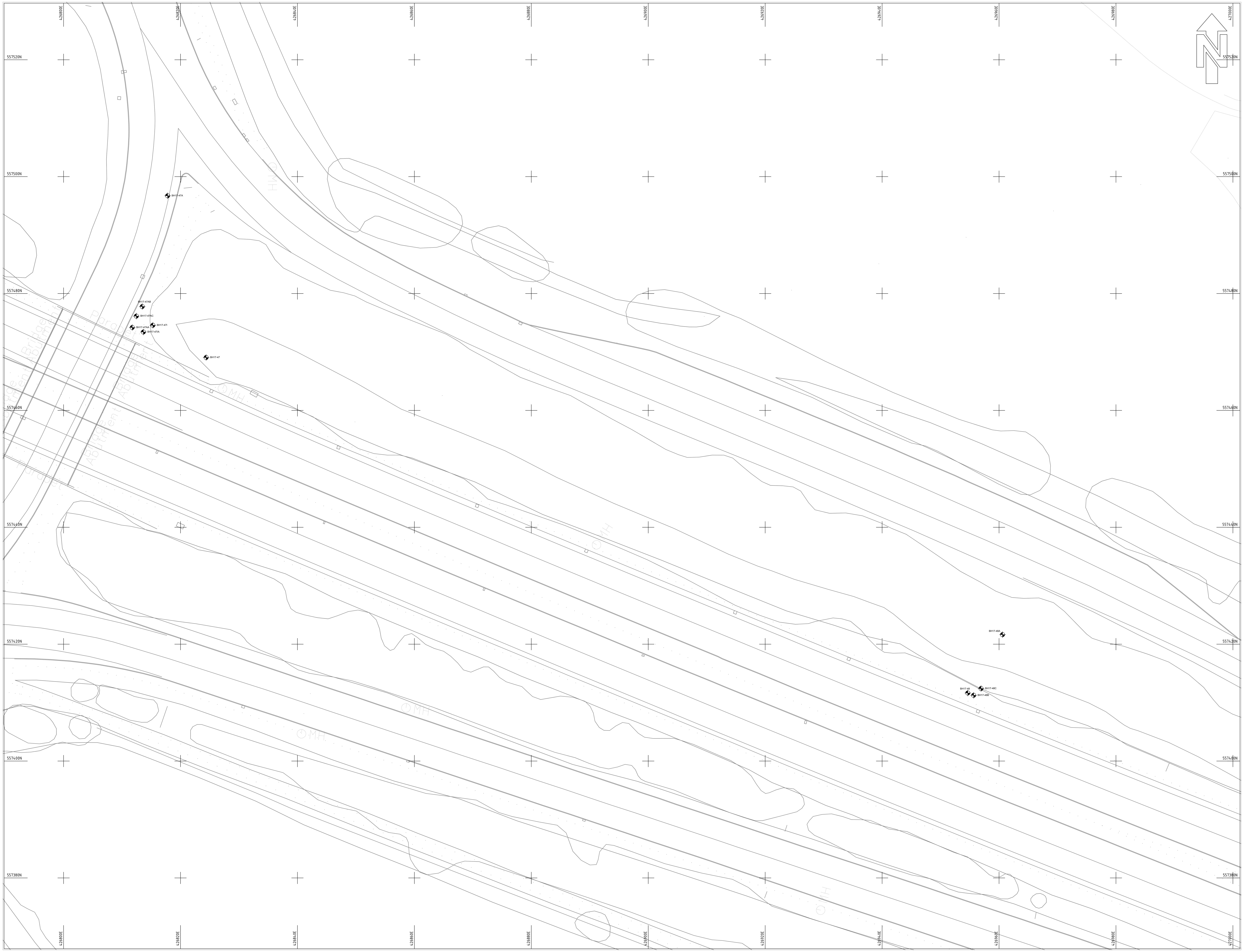
CLIENT:
Highways England

SITE LOCATION:
A1 Birtley to Coalhouse - A1B2CH

SURVEY TITLE:
Exploratory Hole Location Plan

SURVEYED BY:	DATE:	DRAWING NUMBER:	
DT / RJ	Apr / Jun 18	CA3043_P - A1B2CH - Rev.A	
DRAWN BY:	DATE:	SCALE:	
TR	Jun / Aug 18	1:200 @ A0	
APPROVED BY:	DATE:	SHEET NUMBER:	REV:
TR / RH	Aug 2018	14 of 20 A0	A



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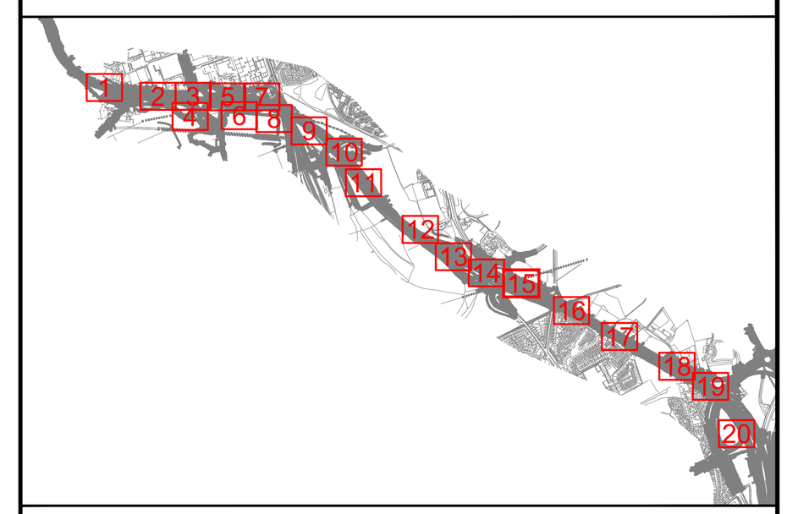

LEGEND

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Geotechnical Window Sample (WS)

Geotechnical CPT
(Cone Penetration Test)

Geotechnical TP
(Trial Pit)

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Location Coordinates

REV.	DETAILS	BY	DATE
A	CPT update from As-Built Survey	TR	Oct 2018

GRID
ORDNANCE SURVEY
Related by GNSS Ntework RTK (VRS) observations.

DATUM
ORDNANCE SURVEY
Related by GNSS Ntework RTK (VRS) observations.

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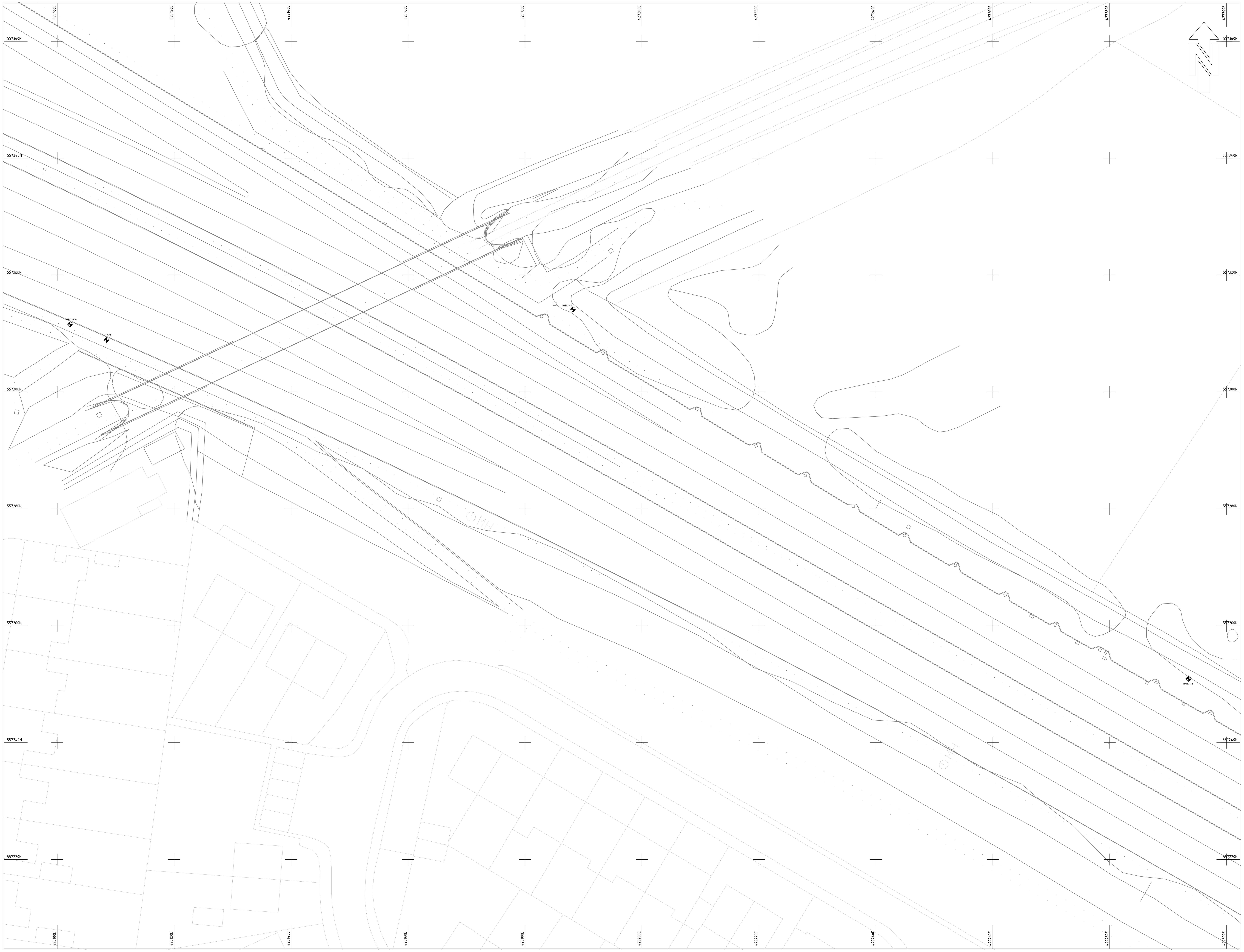
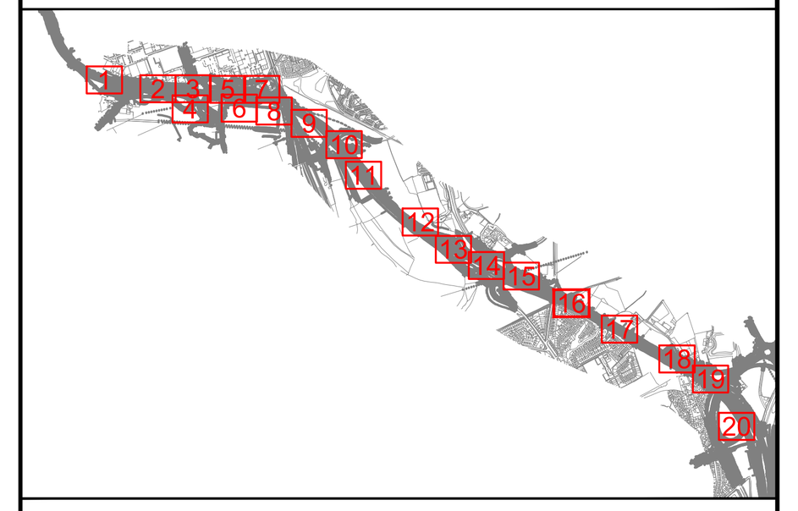
SURVEYED BY:	DATE:	DRAWING NUMBER:	
DT / RJ	Apr / Jun 18	CA3043_P - A1B2CH - Rev.A	
DRAWN BY:	DATE:	SCALE:	
TR	Jun / Aug 18	1:200 @ A0	
APPROVED BY:	DATE:	SHEET NUMBER:	REV:
TR / RH	Aug 2018	15 of 20 A0	A



SHEET LAYOUT



LEGEND

- Geotechnical Borehole (BH)
- Geotechnical Window Sample (WS)
- Geotechnical CPT (Cone Penetration Test)
- Geotechnical TP (Trial Pit)

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Location Coordinates

REV.	DETAILS	BY	DATE
A	CPT update from As-Built Survey	TR	Oct 2018

GRID	DATUM
ORDNANCE SURVEY Related by GNSS Ntework RTK (VRS) observations.	ORDNANCE SURVEY Related by GNSS Ntework RTK (VRS) observations.

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CLIENT:
Highways England

SITE LOCATION:
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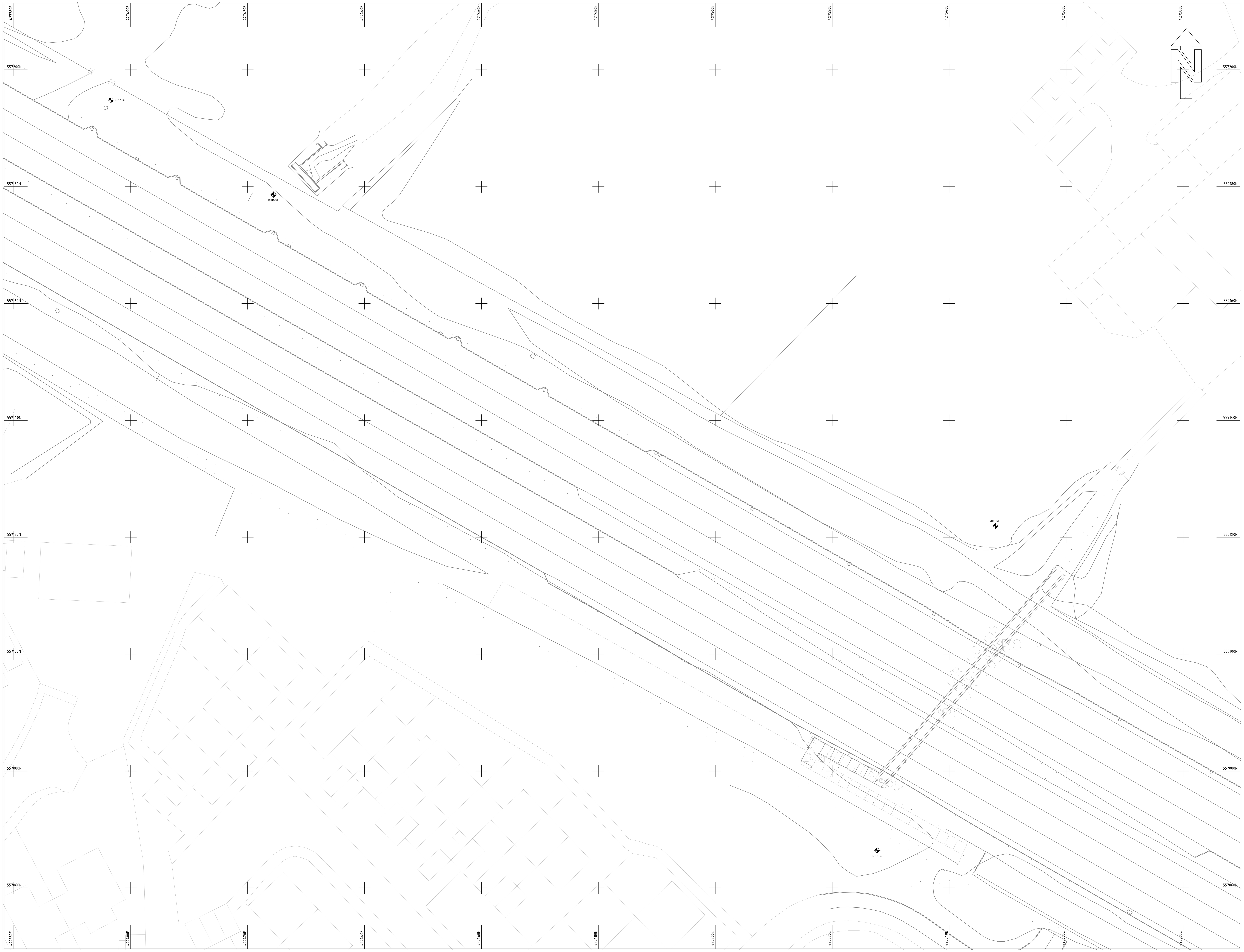
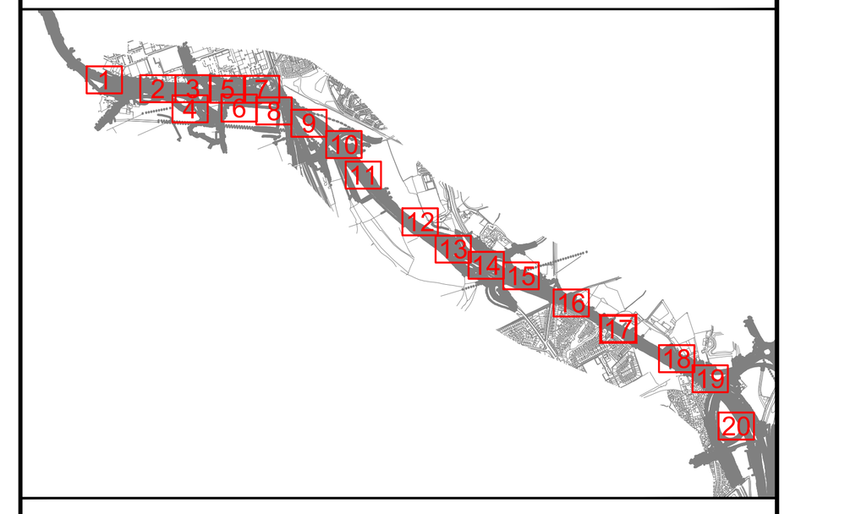
SURVEY TITLE:
Exploratory Hole Location Plan

SURVEYED BY:	DATE:	DRAWING NUMBER:	
DT / RJ	Apr / Jun 18	CA3043_P - A1B2CH - Rev.A	
DRAWN BY: TR	DATE: Jun / Aug 18	SCALE: 1:200 @ A0	
APPROVED BY: TR / RH	DATE: Aug 2018	SHEET NUMBER: 16 of 20 A0	REV: A



SHEET LAYOUT



LEGEND

Geotechnical Borehole (BH)

Geotechnical Window Sample (WS)

Geotechnical CPT (Cone Penetration Test)

Geotechnical TP (Trial Pit)

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Location Coordinates

REV.	DETAILS	BY	DATE
A	CPT update from As-Built Survey	TR	Oct 2018

GRID
ORDNANCE SURVEY
Related by GNSS Ntework RTK (VRS) observations.

DATUM
ORDNANCE SURVEY
Related by GNSS Ntework RTK (VRS) observations.

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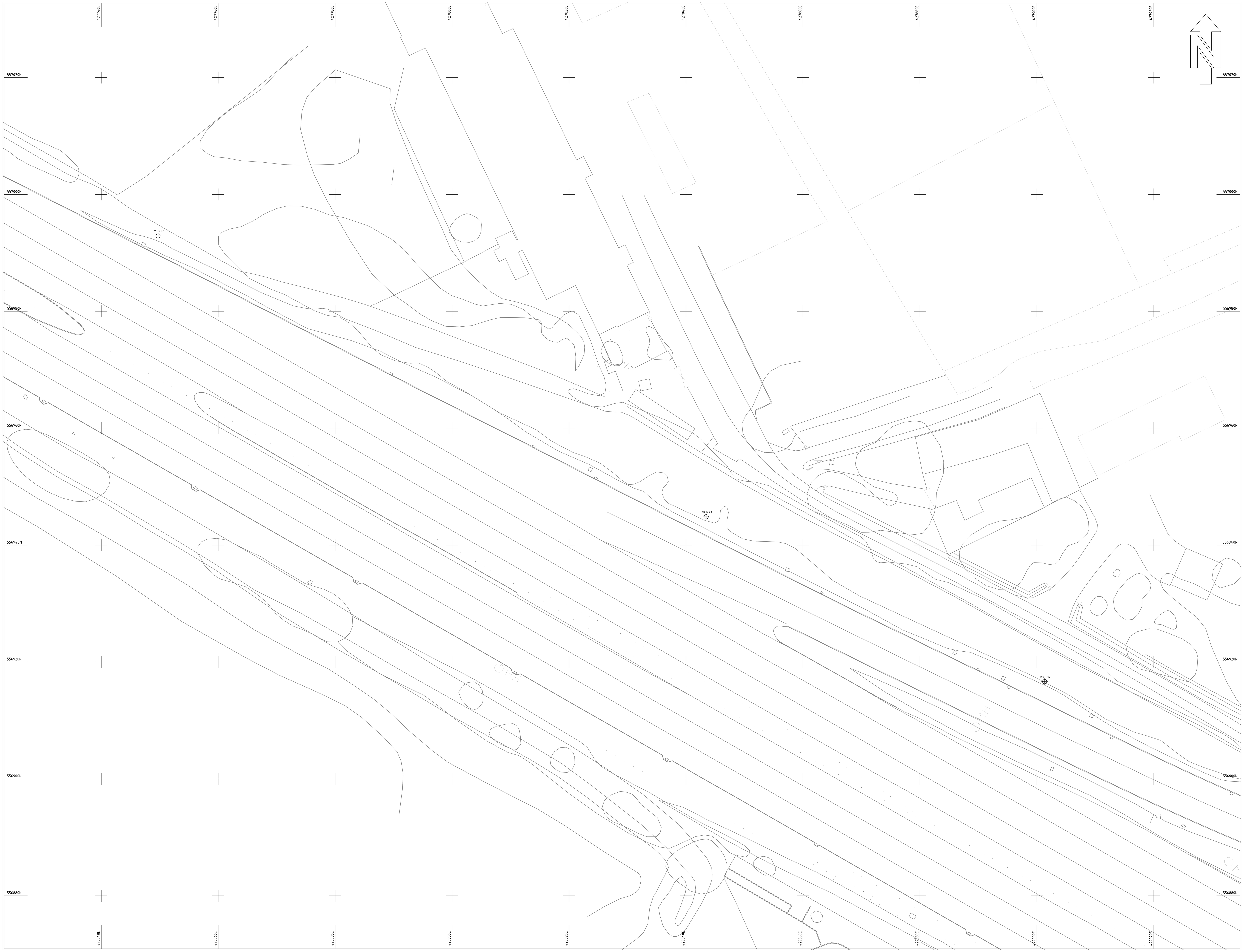
CLIENT:
Highways England

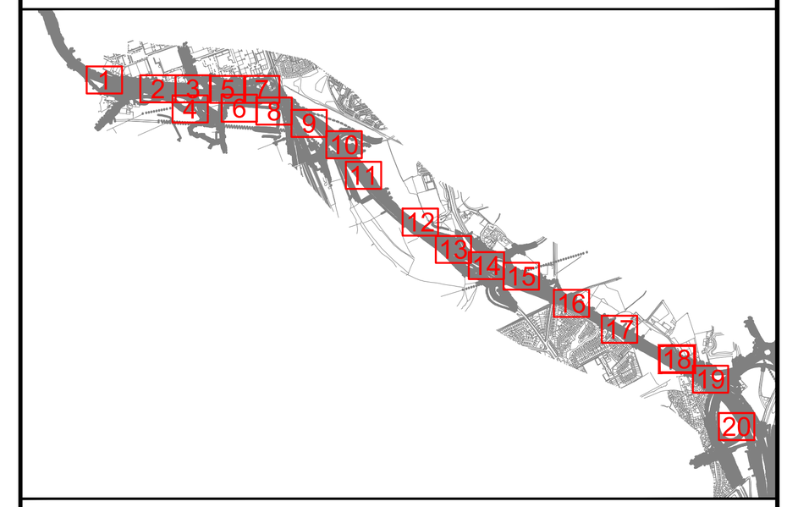
SITE LOCATION:
A1 Birtley to Coalhouse - A1B2CH

SURVEY TITLE:
Exploratory Hole Location Plan

SURVEYED BY:	DATE:	DRAWING NUMBER:	
DT / RJ	Apr / Jun 18	CA3043_P - A1B2CH - Rev.A	
DRAWN BY:	DATE:	SCALE:	
TR	Jun / Aug 18	1:200 @ A0	
APPROVED BY:	DATE:	SHEET NUMBER:	REV:
TR / RH	Aug 2018	17 of 20 A0	A



SHEET LAYOUT



LEGEND

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REV.	DETAILS	BY	DATE
A	CPT update from As-Built Survey	TR	Oct 2018

GRID
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DATUM
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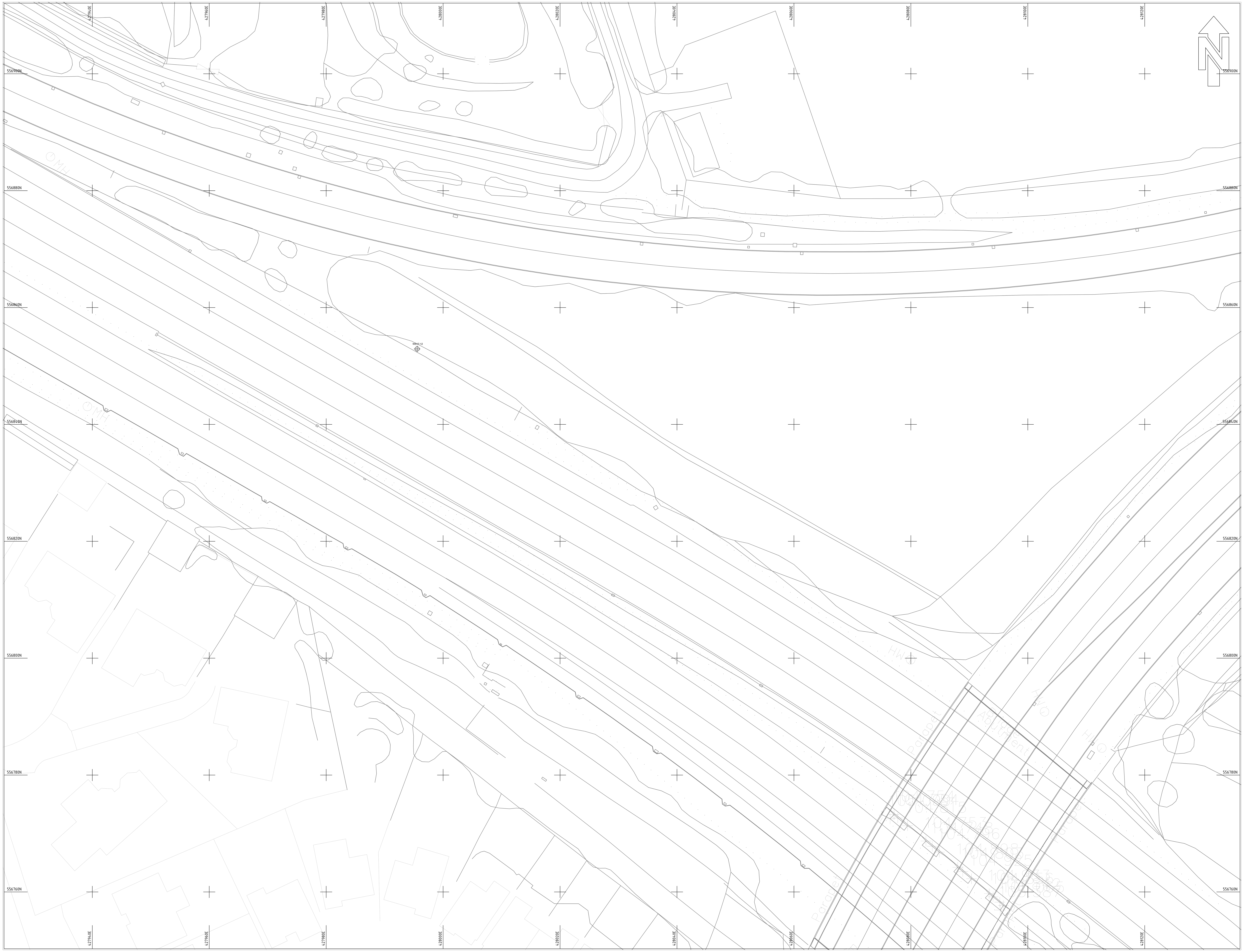
CLIENT: Highways England

SITE LOCATION: A1 Birtley to Coalhouse - A1B2CH

SURVEY TITLE: Exploratory Hole Location Plan

SURVEYED BY: DT / RJ	DATE: Apr / Jun 18	DRAWING NUMBER: CA3043_P - A1B2CH - Rev.A
DRAWN BY: TR	DATE: Jun / Aug 18	SCALE: 1:200 @ A0
APPROVED BY: TR / RH	DATE: Aug 2018	SHEET NUMBER: 18 of 20 A0 — REV: A



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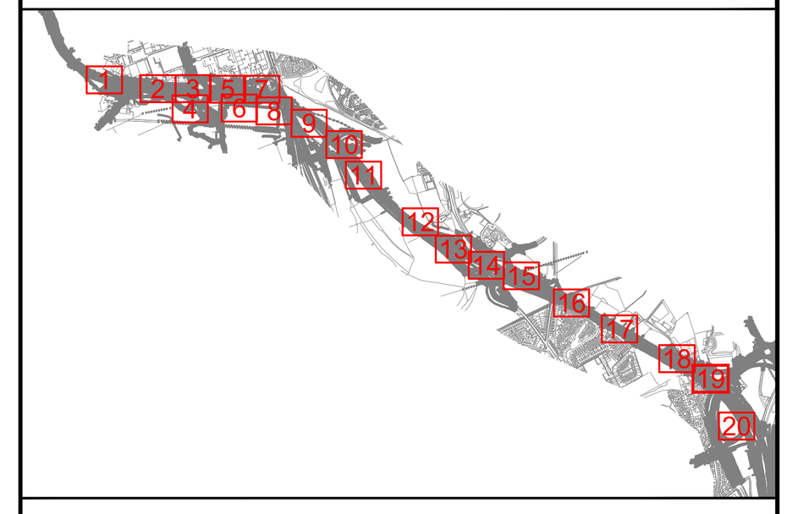

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A	CPT update from As-Built Survey	TR	Oct 2018

GRID
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DATUM
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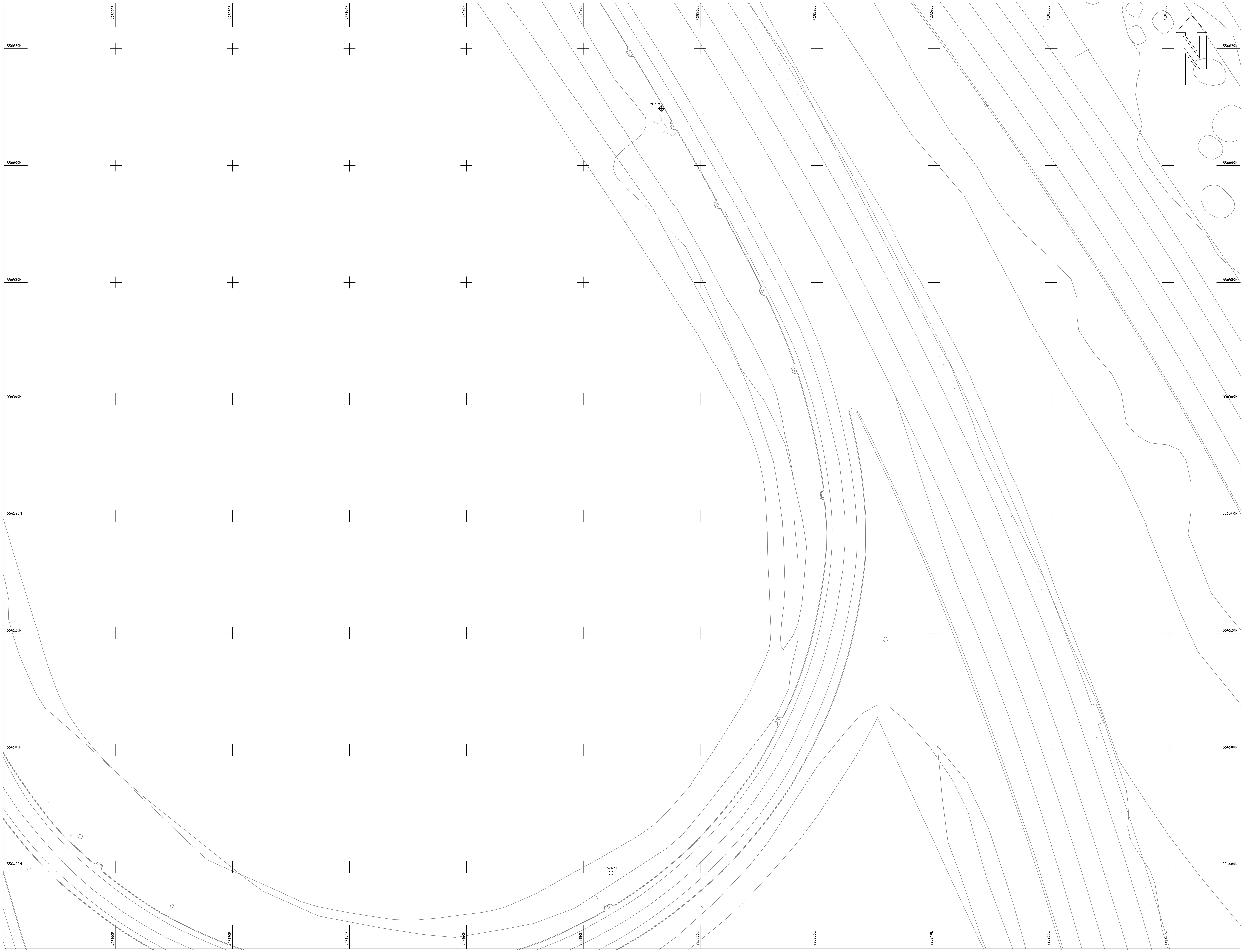
SURVEY TITLE: Exploratory Hole Location Plan

SURVEYED BY:	DATE:	DRAWING NUMBER:	
DT / RJ	Apr / Jun 18	CA3043_P - A1B2CH - Rev.A	
DRAWN BY:	DATE:	SCALE:	
TR	Jun / Aug 18	1:200 @ A0	
APPROVED BY:	DATE:	SHEET NUMBER:	REV:
TR / RH	Aug 2018	19 of 20 A0	A



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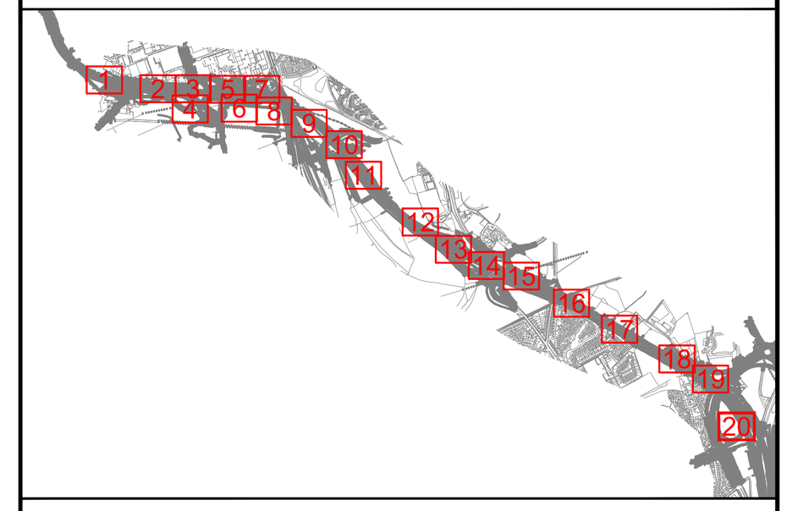

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REV.	DETAILS	BY	DATE
A	CPT update from As-Built Survey	TR	Oct 2018

GRID: ORDNANCE SURVEY Related by GNSS Ntework RTK (VRS) observations.

DATUM: ORDNANCE SURVEY Related by GNSS Ntework RTK (VRS) observations.

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CLIENT: Highways England

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SURVEY TITLE: Exploratory Hole Location Plan

SURVEYED BY:	DATE:	DRAWING NUMBER:	
DT / RJ	Apr / Jun 18	CA3043_P - A1B2CH - Rev.A	
DRAWN BY:	DATE:	SCALE:	
TR	Jun / Aug 18	1:200 @ A0	
APPROVED BY:	DATE:	SHEET NUMBER:	REV:
TR / RH	Aug 2018	20 of 20 A0	A

If you need help accessing this or any other Highways England information, please call **0300 470 4580** and we will help you.

This document is also available on our website at **www.gov.uk /highways**

If you have any enquiries about this document A1BirtleytoCoalhouse@highwaysengland.co.uk or call **0300 470 4580***.

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These rules apply to calls from any type of line including mobile, BT, other fixed line or payphone. Calls may be recorded or monitored.

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