# Immingham Green Energy Terminal

TR030008

## 9.9 Environmental Statement Survey Updates for Deadline 1

Volume 9

Planning Act 2008

Regulation 5(2)(a)

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

March 2024

**Infrastructure Planning**

**Planning Act 2008**

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

# Immingham Green Energy Terminal

# Development Consent Order 2023

# Environmental Statement Survey Updates for Deadline 1

| | |
|---|---|
| **Regulation Reference** | APFP Regulation 5(2)(a) |
| **Planning Inspectorate Case Reference** | TR030008 |
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| **Author** | Associated British Ports<br>Air Products BR |

| Version | Date | Status of Version |
|---|---|---|
| Revision 1 | 13 March 2024 | Deadline1 |

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## Tables

# 1 Introduction

1.1.1 This baseline update includes additional information for three chapters within the Environmental Statement ("ES"). The additional information is as follows:

a. Survey updates to **ES Chapter 8: Nature Conservation (Terrestrial) [APP-050]** – Bat Survey Update

b. Survey updates to **ES Chapter 18: Water Use, Water Quality, Coastal Protection, Flood Risk and Drainage [APP-060]** – Surface Water Monitoring

c. Survey updates to **ES Chapter 21: Ground Conditions and Land Quality [APP-063]** – Ground Investigation and Gas Monitoring

1.1.2 These survey updates provide baseline data that was not available in time to be submitted as part of the ES or has been collected post submission of the Development Consent Order ("DCO") application.

1.1.3 None of this additional information changes any of the conclusions reached in respect of likely significant effects reached in the ES.

# 2 Survey Updates to Chapter 8: Nature Conservation (Terrestrial) (Bat Roost Survey)

## 2.1 Introduction

### Background

2.1.1 This survey update provides additional information on a survey of bats to that provided in the Environmental Statement ("ES"), as submitted, and should be read in conjunction with the following documents submitted with the application:

a. **ES Chapter 8: Nature Conservation (Terrestrial Ecology) [APP-050]**

b. **ES Appendix 8.C: Bat Survey Report [APP-182]**.

2.1.2 The Site has been surveyed for bats on previous locations as summarised in **Table 1**.

### Purpose of the Bat Survey Update

2.1.3 This bat roost survey update presents additional ecological information obtained during bat emergence/re-entry surveys of all trees with moderate to high suitability for roosts, between July and September 2023.

## 2.2 Method

### Emergence/Re-Entry Surveys

2.2.1 The requirement for bat activity surveys was identified as part of the **Preliminary Ecological Appraisal Report** for the Project in 2022 **[APP-181]**. All trees were assessed for their suitability to support roosting bats in the strip of woodland east of Laporte Road. One tree (T32), a hawthorn, contained a cavity with bat droppings inside. Nineteen trees including tree T32 had moderate-high suitability for roosting bats, all of which were subject to bat emergence and re-entry surveys completed between July and September 2023 adhering to the Bat Conservation Trust Guidelines (Ref 2-1).

2.2.2 **Table 1** summarises the date and survey type applied to those trees with moderate-high suitability for bat roosts. **Annex B** provides full details of the surveys, including timings and findings.

2.2.3 Surveys comprised of dusk emergence and dawn re-entry observations made over two visits, with use of hand-held Echo Meter Touch 2 devices and Magenta bat detectors. A third visit for high value trees involved the use of an infrared camera.

**Table 1: Bat Survey Dates (*tree with high bat roost potential)**

| Tree | Survey 1 | Dusk / Dawn | Survey 2 | Dusk / Dawn | Survey 3 | Dusk / Dawn |
|---|---|---|---|---|---|---|
| T1 | 31.07.23 | Dusk | 25.08.23 | Dusk | - | - |

| Tree | Survey 1 | Dusk / Dawn | Survey 2 | Dusk / Dawn | Survey 3 | Dusk / Dawn |
|---|---|---|---|---|---|---|
| T7 | 31.07.23 | Dusk | 29.08.23 | Dusk | - | - |
| T12 | 18.08.23 | Dawn | 09.09.23 | Dusk | - | - |
| T13* | 27.07.23 | Dusk | 26.08.23 | Dawn | 17.09.23 | Dusk |
| T14 | 09.08.23 | Dusk | 30.08.23 | Dawn | - | - |
| T17 | 10.08.23 | Dawn | 17.09.23 | Dusk | - | - |
| T20 | 17.08.23 | Dusk | 09.09.23 | Dusk | - | - |
| T22 | 17.08.23 | Dusk | 18.09.23 | Dusk | - | - |
| T23 | 18.08.23 | Dawn | 10.09.23 | Dawn | - | - |
| T26 | 18.08.23 | Dawn | 10.09.23 | Dawn | - | - |
| T27 | 08.08.23 | Dusk | 10.09.23 | Dusk | - | - |
| T29 | 09.08.23 | Dusk | 10.09.23 | Dusk | - | - |
| T31 | 02.08.23 | Dawn | 11.09.23 | Dawn | - | - |
| T32* | 28.07.23 | Dusk | 27.08.23 | Dusk | 19.09.23 | Dawn |
| T33* | 01.08.23 | Dusk | 28.08.23 | Dawn | 19.09.23 | Dawn |
| T34 | 02.08.23 | Dawn | 11.09.23 | Dawn | - | - |
| T35 | 01.08.23 | Dusk | 18.09.23 | Dawn | - | - |
| T37 | 01.08.23 | Dawn | 19.09.23 | Dusk | - | - |
| T39 | 01.08.23 | Dawn | 19.09.23 | Dusk | - | - |

**Surveyors**

2.2.4 The lead surveyor, an ecologist with 22 years' consultancy experience of habitat and protected species surveying, was supported by two assistant ecologists.

**Limitations**

2.2.5 Bat emergence surveys were undertaken between 27 July and 19 September 2023. This period lies within the optimal survey period of May to October. Some surveys were limited by wind, although this can be seen as a minor limitation as surveys on trees affected by wind were surveyed again in optimal weather conditions.

## 2.3 Results

**Emergence/Re-entry Surveys**

2.3.1 No evidence of any bat emergence or re-entry was recorded during any of the surveys completed between July and September 2023. The previously confirmed

bat roost at T32 did not display any evidence of bat droppings, or evidence of staining and no bat emergence or re-entry.

2.3.2 Overall, bat activity was recorded as consistently low, with no evidence of bat foraging around any of the surveyed trees. Bat detectors identified common pipistrelle as the main species, with observation of this species foraging to the southern extents of the Long Strip woodland, (**Annex A**, **Plate 1**).

2.3.3 **Annex B** includes the full survey findings, with the data summarised in **Table 2**.

**Table 2: Summary bat survey findings July to September 2023 (C pip = common pipistrelle (*Pipistrellus pipistrellus*), S pip = soprano pipistrelle (*Pipistrellus pygmaeus*), N noc = noctule (*Nyctalus noctula*), M nat = Natterer's bat (*Myotis nattereri*))**

| Tree | Survey 1 | Summary findings | Survey 2 | Summary findings | Survey 3 | Summary findings |
|---|---|---|---|---|---|---|
| T1 | 31.07.23 | Magenta and EchoMeter detector null.<br>Analysis verified two no ID recordings. Light rain and wind. | 25.08.23 | Magenta - Null.<br>Analysis verified - No data | N/A | N/A |
| T7 | 31.07.23 | Magenta and EchoMeter detector null.<br>Analysis verified two no ID recordings.<br>Light rain and wind also prominent in exposed location. | 29.08.23 | Magenta - Null.<br>Analysis verified - No data | N/A | N/A |
| T12 | 18.08.23 | Magenta and EchoMeter detector null.<br>Analysis verified no data.<br>Wind present, located close to sea front, no bat evidence. | 09.09.23 | Magenta - 1x C pip foraging south of woodland, by road.<br>EchoMeter - Distant recordings, not heard or seen.<br>Analysis verified - 94x C pip, 21x N noc, likely distant recordings. | N/A | N/A |
| T13 | 27.07.23 | Magenta - null, EchoMeter - 3x C pip, not seen, possible distant.<br>Analysis verified 3x C pip.<br>Wind notable and may have deterred foraging bats. | 26.08.23 | Magenta - Null.<br>Analysis verified - No data | 17.09.23 | Magenta -Null.<br>Echo Meter - No ID.<br>Analysis verified - No ID.<br>Continuous breeze. |

| Tree | Survey 1 | Summary findings | Survey 2 | Summary findings | Survey 3 | Summary findings |
|---|---|---|---|---|---|---|
| T14 | 09.08.23 | Magenta - null, EchoMeter - 2x C Pip. Not seen, possible distant.<br>Analysis verified 2x C Pip. | 30.08.23 | Magenta - Null.<br>Analysis verified - No data | N/A | N/A |
| T17 | 10.08.23 | Magenta - null, EchoMeter - 8x C pip. 3x N noc. Not seen, possible distant.<br>Analysis verified 8x C pip, 3x N noc. | 17.09.23 | Magenta - Null.<br>EchoMeter - No ID.<br>Analysis verified - No ID. | N/A | N/A |
| T20 | 17.08.23 | Magenta - Single bat foraging south of woodland.<br>Seen/heard at end of survey.<br>EchoMeter - recordings of foraging post emergence.<br>Analysis verified 28x C pip. | 09.09.23 | Magenta - 1x C pip foraging south of woodland, by road.<br>EchoMeter - C pip distant recordings, 8x N noc<br>Analysis verified - 35x C pip, 10 x N noc. | N/A | N/A |
| T22 | 17.08.23 | Magenta - Single bat foraging south of woodland.<br>Seen/heard at end of survey.<br>EchoMeter - 26x C pip recordings.<br>Analysis verified 28x C pip. | 18.09.23 | Magenta - 1x C pip foraging south of woodland, by road.<br>EchoMeter – 31x C pip, 10x S pip. 4x M nat.<br>Analysis verified - 12x S pip, 32x C pip. | N/A | N/A |
| T23 | 18.08.23 | Magenta and EchoMeter detector null.<br>Analysis verified two no ID recordings.<br>Wind notable and may have detracted foraging bats. | 10.09.23 | Magenta - Null.<br>EchoMeter - No ID.<br>Analysis verified - No ID. | N/A | N/A |
| T26 | 18.08.23 | Magenta and EchoMeter detector null.<br>Analysis verified two no ID recordings.<br>Wind notable and may have detracted foraging bats. | 10.09.23 | Magenta - Null.<br>EchoMeter - No ID.<br>Analysis verified - No ID. | N/A | N/A |

| Tree | Survey 1 | Summary findings | Survey 2 | Summary findings | Survey 3 | Summary findings |
|---|---|---|---|---|---|---|
| T27 | 08.08.23 | Magenta - 2x C pip foraging along the lower section of woodland edge, close to road.<br>EchoMeter - Recordings between 22.00-22.45.<br>Analysis verified - 30x C pip. | 10.09.23 | Magenta – 1x C pip foraging south of woodland.<br>EchoMeter - Frequent C pip registrations.<br>Analysis verified - 99x C pip.<br>Windy conditions. | N/A | N/A |
| T29 | 09.08.23 | Magenta - Null.<br>EchoMeter - 2x C pip not heard.<br>Analysis verified - 2x C pip.<br>Possible distant recordings, no bats seen foraging. | 10.09.23 | Magenta - Null.<br>EchoMeter - Null.<br>Analysis verified - No data.<br>Windy conditions. | N/A | N/A |
| T31 | 02.08.23 | Magenta - 2x C pip foraging along the lower section of woodland edge, close to road. Disappeared before emergence.<br>EchoMeter - 8x C pip. No bats observed around tree.<br>Analysis verified - 8x C pip.<br>On approaching survey, 2x C pip seen foraging at south extents of woodland. No observations of foraging at tree survey location. | 11.09.23 | Magenta - Null.<br>EchoMeter - No ID.<br>Analysis verified - No ID. | N/A | N/A |
| T32 | 28.07.23 | Magenta - 1x C pip foraging as continuous south of woodland.<br>EchoMeter - 4x C pip. Analysis verified - 4x C pip.<br>Data recording relate to foraging C pip, no bats seen around tree. | 27.08.23 | Magenta - 1x C pip foraging by woodland, external to survey area.<br>Analysis verified - No Data. | 19.09.23 | Magenta -Null.<br>EchoMeter - No ID.<br>Analysis verified - No ID.<br>Windy conditions. |

| Tree | Survey 1 | Summary findings | Survey 2 | Summary findings | Survey 3 | Summary findings |
|---|---|---|---|---|---|---|
| T33 | 01.08.23 | Magenta - 1x C pip foraging as continuous south of woodland.<br>EchoMeter - 4x C.pip identified as possible distant, not seen around tree location. Analysis verified - 4x C pip. | 28.08.23 | Magenta - 1x C pip foraging by woodland, external to survey area.<br>Analysis verified - No Data. | 19.09.23 | Magenta -Null.<br>EchoMeter - No ID.<br>Analysis verified - No ID.<br>Windy conditions. |
| T34 | 02.08.23 | Magenta - 2x C pip foraging as continuous south of woodland.<br>EchoMeter - 17x C pip. No bats observed around tree.<br>Analysis verified - 17x C pip.<br>On approaching survey, 2x C pip seen foraging at south extents<br>of woodland. No observations of foraging at tree survey location. | 11.09.23 | Magenta - Null.<br>EchoMeter - No ID.<br>Analysis verified - No ID. | N/A | N/A |
| T35 | 01.08.23 | Magenta - 1x C pip foraging as continuous south of woodland.<br>EchoMeter - None recorded. Analysis verified - No ID. | 18.09.23 | Magenta - Null.<br>EchoMeter - No ID.<br>Analysis verified - No ID. Windy conditions. | N/A | N/A |
| T37 | 01.08.23 | Magenta - 2x C pip foraging as continuous south of woodland.<br>EchoMeter - C pip then disappeared, not seen to enter trees. Analysis verified 28x C pip. | 19.09.23 | Magenta - Null.<br>EchoMeter - No ID.<br>Analysis verified - No ID. Windy conditions. | N/A | N/A |
| T39 | 01.08.23 | Magenta - 2x C pip foraging as continuous south of woodland, seen at end of survey.<br>EchoMeter - Null. Analysis verified - No ID | 19.09.23 | Magenta - Null.<br>EchoMeter - No ID.<br>Analysis verified - No ID. Windy conditions. | N/A | N/A |

N/A: Not applicable.

## 2.4 Conclusions

2.4.1 Bat emergence and re-entry surveys completed between July and September 2023 confirmed no evidence of bats roosting within 19 woodland trees located

within the Long Strip woodland, north of Laporte Road, which had been previously identified as having moderate-high suitability for roosting bats.

2.4.2 No evidence of bat foraging was identified within the proximity of the 19 surveyed trees. This included one tree which had previously been found to support a bat roost (T32 – likely to be common pipistrelle). This tree would be lost as a result of the Project.

2.4.3 Common pipistrelle was the only bat observed foraging in the southern section of the woodland, in an area of the Long Strip woodland which will not be impacted by the tree loss associated within the IGET proposals. The recordings were intermittent, infrequent and in very low numbers indicating a small and transient local bat population.

2.4.4 Taking a precautionary approach, the very limited bat activity recorded during the bat emergence/re-entry surveys and the negative emergence/re-entry surveys indicate that even if roosts are present, they are only likely to be used by small numbers of common bat species i.e. relatively low value roost types (Site value) that could be readily compensated through standard good practice embedded standard mitigation, i.e. the replacement of the roost with an artificial roost mimicking the conditions of the roost.

2.4.5 These surveys confirm the conclusion in the ES that the Long Strip woodland may support a small number of common species of roosting bats and is of Site value such that the impact of removing trees would be minor adverse and not significant, confirming the conclusions reached in the ES within the **Chapter 8: Nature Conservation (Terrestrial Ecology) [APP-050]** in relation to bats.

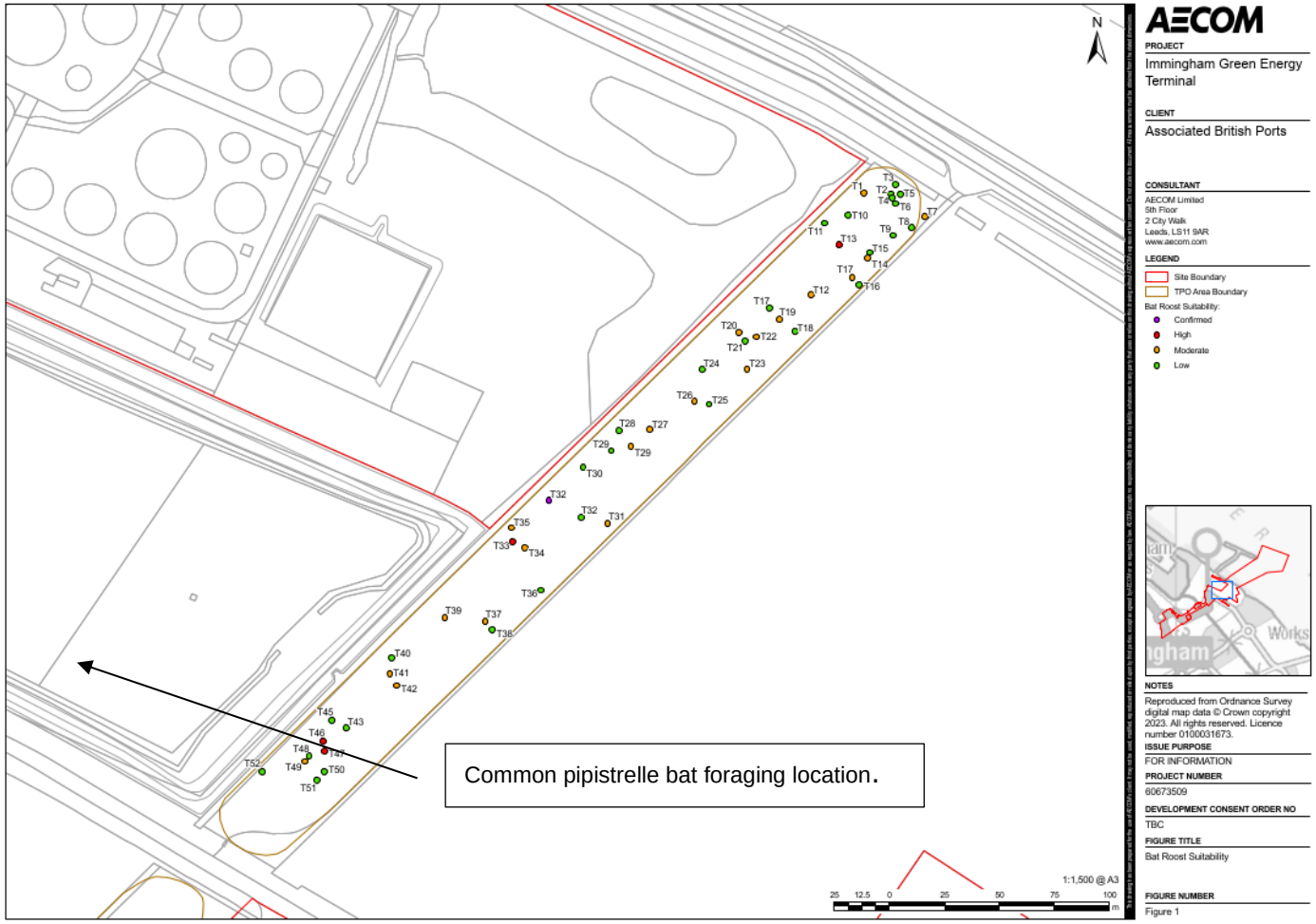
2.4.6 Any trees to be removed that support confirmed bat roosts (T32 is the only confirmed tree), will be removed under the supervision of an ecologist holding a Bat Low Impact Class Licence from Natural England. This is on the basis that only one 'low conservation status' roost (i.e. feeding, day, night and transitional roosts) has been identified during initial preliminary roost assessment ("PRA"), and later emergence/re-entry surveys. It is also based on the very low numbers of bats recorded during walked transects undertaken over spring, summer and autumn 2022 (see **ES Appendix 8.C: Bat Survey Report [APP-182]**) and during emergence/re-entry surveys in summer 2023. Therefore, tree removal would fall within the remit of a Low Impact Class Licence. Where mature trees within the Long Strip woodland with low bat roost potential would be impacted and cannot reasonably be avoided, trees will be soft-felled under Ecological Clerk of Works ("ECoW") supervision as reported in **ES Chapter 8: Nature Conservation (Terrestrial Ecology) [APP-050]**.

## 2.5 References

Ref 2-1 Collins, J. (ed.) (2023). Bat Surveys for Professional Ecologists: Good Practice Guidelines (4th Edition). Bat Conservation Trust, London.

# Annex A: Plates

**Plate 1: Location of trees surveyed in northern section of Long Strip woodland and Common pipistrelle foraging location.**



# Annex B: Bat Survey Data

| Immingham Green Energy Terminal: Bat Survey Visit 1 for all trees with Moderate and High Bat Roost Potential | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ref** | **Date** | **Surveyor** | **Species** | **Survey** | **Sunset** | **Sunrise** | **Start** | **End** | **Temp** | **Rain** | **Wind** | **Magenta** | **Echo Meter** | **Analysis Verified** | **Comments** |
| T1 | 31.07.23 | MCh/JW | *Fraxinus excelsior* | Dusk | 21:00 | - | 20:40 | 22:20 | 15 | 2 | 3 | Null. | Null. | 2 No ID recordings. | Light rain at 21:50, more continuous from 22:10. Bat survey ended 22:20. Windy. |
| T7 | 31.07.23 | MC/LA | *Fraxinus excelsior* | Dusk | 21:00 | - | 20:40 | 22:20 | 15 | 2 | 3 | Null. | Null. | 2 No ID recordings. | Light rain at 21:50 and then more continuous from 22:10. Bat survey ended 22:20. Wind also prominent in exposed location. |
| T12 | 18.08.23 | MC/JW | *Quercus robur* | Dawn | - | 05:53 | 03:30 | 06:00 | 16 | 0 | 3 | Null. | Null. | No Data. | Wind present, located close to sea front, no bat evidence. |
| T13 | 27.07.23 | MC/MCh | *Fraxinus excelsior* | Dusk | 21:07 | - | 20:45 | 22:50 | 18 | 0 | 1 | Null. | 3x C pip, 22:07, 22:20, 22:22. | 3x C pip. | Dark conditions within woodland due to canopy cover, visibility low. Recordings were faint on detector, possible distant. |

| Immingham Green Energy Terminal: Bat Survey Visit 1 for all trees with Moderate and High Bat Roost Potential | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ref** | **Date** | **Surveyor** | **Species** | **Survey** | **Sunset** | **Sunrise** | **Start** | **End** | **Temp** | **Rain** | **Wind** | **Magenta** | **Echo Meter** | **Analysis Verified** | **Comments** |
| T14 | 09.08.23 | MC/MCh | *Fraxinus excelsior* | Dusk | 20:45 | - | 20:30 | 22:50 | 19 | 0 | 1 | Null. | 2x C pip, 22.00, 22.10. | 2x C pip. | Good visibility, possible distant recordings. Not seen but heard. |
| T17 | 10.08.23 | LA/JW | *Fraxinus excelsior* | Dawn | - | 04:15 | 03:45 | 06:15 | 19 | 0 | 1 | Null. | 8x C pip, 3x N noc. | 8x C pip, 3x N noc. | No bats seen, detector recordings only. |
| T20 | 17.08.23 | LA/MCh | *Quercus robur* | Dusk | 20:31 | - | 20:10 | 22:15 | 18 | 0 | 1 | Single bat foraging south of woodland. Seen/heard at end of survey: 22:00-22:15. | Recordings of foraging post emergence, from 21.15 for 1 hr. | 28x C pip. | Data likely to reflect a single C pip foraging south of woodland, not at the tree location T20. |
| T22 | 17.08.23 | MC/JW | *Fraxinus excelsior* | Dusk | 20:31 | - | 20:10 | 22:15 | 18 | 0 | 1 | Single bat foraging south of woodland, Seen/heard end of survey: 22:00-22:15. | 26x C pip recordings. | 28x C pip. | Data likely to reflect a single C pip foraging south of woodland, not at the tree location. |
| T23 | 18.08.23 | LA/JW | *Fraxinus excelsior* | Dawn | - | 05:53 | 03:30 | 06:30 | 16 | 0 | 3 | Null. | Null. | No ID. | Wind notable and may have detracted foraging bats. |

| Immingham Green Energy Terminal: Bat Survey Visit 1 for all trees with Moderate and High Bat Roost Potential | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ref** | **Date** | **Surveyor** | **Species** | **Survey** | **Sunset** | **Sunrise** | **Start** | **End** | **Temp** | **Rain** | **Wind** | **Magenta** | **Echo Meter** | **Analysis Verified** | **Comments** |
| T26 | 18.08.23 | MC/MCh | *Fraxinus excelsior* | Dawn | - | 05:53 | 03:30 | 06:30 | 16 | 0 | 3 | Null. | Null. | No ID. | Wind notable and may have detracted foraging bats. |
| T27 | 08.08.23 | LA/JW | *Fraxinus excelsior* | Dusk | 20:45 | - | 20:20 | 22:45 | 19 | 0 | 1 | 2x C pip foraging along the lower section of woodland edge, close to road. 22:45. | Recordings between 22.00-22.45. | 30x C pip. | Recordings likely to pick up foraging south of woodland. No bats observed at tree survey location. |
| T29 | 09.08.23 | MC/MCh | *Fraxinus excelsior* | Dusk | 20:45 | - | 20:30 | 22:50 | 19 | 0 | 1 | Null. | 2x C pip not heard. | 2x C pip. | Possible distant recordings, no bats seen foraging. |
| T31 | 02.08.23 | MCh/JW | *Fraxinus excelsior* | Dawn | - | 05:17 | 03:07 | 05:30 | 15 | 0-3 | 1 | 2 x C pip foraging along the lower section of woodland edge, close to road. Disappeared before | 8x C pip 3.08-4.00. No bats observed around tree. | 8x C pip. | On approaching survey, 2x C pip seen foraging at south extents of woodland. No observations of foraging at tree survey location. |

| Immingham Green Energy Terminal: Bat Survey Visit 1 for all trees with Moderate and High Bat Roost Potential | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ref** | **Date** | **Surveyor** | **Species** | **Survey** | **Sunset** | **Sunrise** | **Start** | **End** | **Temp** | **Rain** | **Wind** | **Magenta** | **Echo Meter** | **Analysis Verified** | **Comments** |
| | | | | | | | | | | | | emergence . | | | |
| T32 | 28.07.23 | MC/MCh | *Crataegus monogyna* | Dusk | 21:07 | - | 20:45 | 22:57 | 17 | 0 | 1 | 1x C pip foraging as continuous south of woodland. 22.00-22.04. | 4x C pip 21:53-22.04. | 4x C pip. | Data recording relate to foraging C pip, no bats seen around tree. |
| T33 | 01.08.23 | JW/MCh | *Fraxinus excelsior* | Dusk | 20:58 | - | 20:30 | 22:45 | 18 | 0 | 0 | 1x C pip foraging as continuous south of woodland. | 4x C pip identified as possible distant, not seen around tree location . | 4 x C pip. | |

| Immingham Green Energy Terminal: Bat Survey Visit 1 for all trees with Moderate and High Bat Roost Potential | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ref** | **Date** | **Surveyor** | **Species** | **Survey** | **Sunset** | **Sunrise** | **Start** | **End** | **Temp** | **Rain** | **Wind** | **Magenta** | **Echo Meter** | **Analysis Verified** | **Comments** |
| T34 | 02.08.23 | LA/MC | *Quercus robur* | Dawn | - | 05:17 | 03:07 | 05:30 | 15 | 0-3 | 1 | 2x C pip foraging as continuous south of woodland. | 17x C pip 3.08-4.00. No bats observed around tree. | 17x C pip. | On approaching survey, 2x C pip seen foraging at south extents of woodland. No observations of foraging at tree survey location. |
| T35 | 01.08.23 | LA/MC | *Quercus robur* | Dusk | 20:58 | - | 20:30 | 22:45 | 18 | 0 | 0 | 1x C pip foraging as continuous south of woodland. | None recorded. | No ID. | |
| T37 | 01.08.23 | LA/MC | *Fraxinus excelsior* | Dawn | - | 05:15 | 03:10 | 05:30 | 14 | 0-2 | 1 | 2x C pip foraging as continuous south of woodland. | Recordings from 03.26 to 04.38, bat then disappeared, not seen to enter trees. | 28x C pip. | Mostly dry, light rain at 05:00. |
| T39 | 01.08.23 | JW/MCh | *Quercus robur* | Dawn | - | 05:15 | 03:10 | 05:30 | 14 | 0-2 | 1 | 2x C pip foraging as continuous | Null. | No ID. | Mostly dry, light rain at 05:00. Phone kept |

| Immingham Green Energy Terminal: Bat Survey Visit 1 for all trees with Moderate and High Bat Roost Potential | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Ref** | **Date** | **Surveyor** | **Species** | **Survey** | **Sunset** | **Sunrise** | **Start** | **End** | **Temp** | **Rain** | **Wind** | **Magenta** | **Echo Meter** | **Analysis Verified** | **Comments** |
| | | | | | | | | | | | | south of woodland. | | | closing off app, although non-recordings noted. |

# 3 Survey Updates to Chapter 18: Water Use, Water Quality, Coastal Protection, Flood Risk and Drainage (Surface Water Monitoring)

## 3.1 Introduction

3.1.1 This survey update provides an update to the Water Quality Sampling 2023 assessment included within the submitted Environmental Statement (ES) and should be read in conjunction with the following documents submitted with the Development Consent Order ("DCO"):

a. **ES Chapter 18: Water Use, Water Quality, Coastal Protection, Flood Risk and Drainage [APP-060]**

b. **ES Appendix 18.C: Water Quality Sampling 2023 [APP-211]**

3.1.2 This assessment considers the water quality effects arising from the relevant additional information, as summarised in the sections below.

3.1.3 This survey update considers changes in legislation, baseline conditions or potential effects since the submitted ES was prepared; if no change is listed then conditions are the same as those presented in the submitted ES.

## 3.2 Updated Baseline Conditions

**Existing Baseline**

*Introduction*

3.2.1 Two previous rounds of water quality monitoring were undertaken on 31 March 2023 and 18 May 2023. Further water quality monitoring was completed on 23 November 2023 and 4 December 2023. The additional water quality monitoring was undertaken to supplement the previous monitoring rounds, and to gain an understanding on how the change in river flow during the Winter might impact upon water quality. The previous monitoring rounds were undertaken in the Summer and so therefore it would improve the understanding of the annual background concentrations of specific water contaminants.

3.2.2 There is a need to understand the annual baseline conditions since water quality can alter during seasonal changes in freshwater environments. The Project has the potential to impact watercourses during each phase (construction, maintenance and operation). There is limited historical baseline water quality information available from the Environment Agency for both the Habrough Marsh Drain and North Beck Drain.

3.2.3 Both of these watercourses have been previously affected by historical pollution incidents and so due to the surrounding land-use being dominated by heavy industry, concentrations of contaminants may fluctuate seasonally.

3.2.4 Since the Project Site is within the tidal limit of the Humber Estuary, two samples were required to be obtained from the two drains due to the tidal influence of the River Humber. Tidal changes alter between seasons and so can have the potential to effect water quality.

*Results*

3.2.5 Two rounds of sampling were obtained from Habrough Marsh Drain and North Beck Drain. The first round of sampling was collected between 09:00 and 12:00 on 23 November 2023 on the incoming low tide (2m – 4m above chart datum ("ACD")) (**Annex C: Plate 2**) and the second round of sampling was also collected between 09:00 and 12:00PM on 4 December 2023 on the outgoing high tide (5m – 5.5m above chart datum ("ACD")) (**Annex C: Plate 3**). **Annex D** shows the site conditions at which sampling was undertaken.

3.2.6 Similar to the previous monitoring rounds, the two samples were collected under two different flow regimes of the two drains. The water in the two drains is heavily influenced by the Humber Estuary, which is tidal. The samples were compared to both the freshwater and saline Environmental Quality Standards ("EQS") based on the Water Framework Directive (Standards and Classification Directions (England and Wales) 2015 guidelines (where available) (Ref 3-1). The results are summarised in **Annex E**.

*Summary of Results*

3.2.7 Results from the on-site multi-parameter sonde indicated that all sites monitored were weakly alkaline (pH ranging from 6.98 to 8.37) with electrical conductivity typical of freshwater bodies. Laboratory results reflected this where pH values ranged from 7.73 to 8.32. The results from site SW2 on 31 March 2023 had the highest values for specific conductivity, actual conductivity, salinity, total dissolved solids and lowest for rugged dissolved oxygen and pH indicating that the water may be more brackish than the other samples taken.

3.2.8 Both the Habrough Marsh Drain and North Beck Drain are currently failing to meet good Environmental Quality Standards ("EQS") based on the Water Framework Directive (Standards and Classification Directions (England and Wales) 2015 (Ref 3-1). In terms of inorganics, Ammoniacal Nitrogen was exceeded twice, at sampling site SW2 (18 May 2023) and sampling site SW1 (23 November 2023). Both Chloride and Sulphate exceeded the WFD Freshwater standards by an order of magnitude at SW2 (18 May 2023). Orthophosphate levels at all locations (other than sampling site SW2 on 18 May 2023) exceeded the WFD freshwater standards.

3.2.9 For filtered (dissolved) metals, Cadmium was only exceeded at sampling site SW2 on 18 May 2023 for freshwater standards. Chromium VI was exceeded twice for saltwater standards at sampling site SW3 (18 May 2023) and sampling site SW1 (4 December 2023). Copper was exceeded at all locations and at most times, with the exception of sampling site SW3 on the 23 November 2023. Nickel was only exceeded at one location, sampling site SW3 on the 18 May 2023. Zinc was also exceeded at sampling sites SW1, SW2 and SW3 on separate occasions.

3.2.10 For unfiltered (total) metals, both Arsenic and Cadmium did not exceed the EQS. Chromium concentrations were a lot higher and exceed the EQS at all three locations, where the monitoring on 18 May 2023 had the highest concentrations. Both Copper and Lead exceeded the EQS at all locations and on every visit, other than Lead at sampling site SW1 on 18 May 2023. Nickel exceeded the EQS on three occasions. Phosphorus was exceeded only at sampling sites SW2 and SW3. Zinc exceeded both the saltwater and freshwater EQS at all locations.

3.2.11 Several exceedances of PAHs were recorded at all locations, with the majority of exceedances recorded within sampling sites SW2 and SW3 during the first and second monitoring round. In comparison to the previous two monitoring rounds, less PAHs were exceeded. At all three sampling locations on 23 November 2023, Benzo (a)pyrene and Fluoranthene exceeded the EQS. On the last monitoring round, Benzo(b)pyrene and Fluoranthene exceeded the EQS. The exceedances of Benzo(a)pyrene and Fluoranthene are at least one order of magnitude above the freshwater EQS.

3.2.12 Overall, the Summer flows tended to have lower exceedances than the Winter flows. There are several determinands that are exceeded all year and at all locations, comprising of; Ortho-phosphate, Copper, Lead, Zinc and Fluoranthene. The exceedances of PAHs, metals and inorganics are very similar between the Summer and Winter flow regimes. The exceedances of PAHs throughout the year are likely to be associated with an off-site source due to the lack of high PAH concentrations within the soil and groundwater samples from the Ground Investigation (**ES Appendix 21.B: Phase II Ground Investigation Interpretative Report [APP-216]**). The elevated metal concentrations within the surface water in correlation with the groundwater and soil samples from the Ground Investigation indicate that these are due to natural conditions. Concentrations of measured parameters tended to be similar across all riverine conditions.

**Future Baseline**

3.2.13 The future baseline conditions have not changed as a result of the additional information.

## 3.3 Summary of Updated Likely Significant Residual Effects

3.3.1 There are **no changes** to the likely significant effects identified in **Chapter 18** of the submitted ES, as a result of the above surveys. This is because the winter samples (Nov/Dec) were no worse than the summer samples Mar/May). The residual effects would remain as reported within **Section 18.8** of **ES Chapter 18 [APP-060]**.

## 3.4 References

Ref 3-1 The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015. [Date accessed: 13/12/2023].

Ref 3-2 National Tidal and Sea Level Facility (2023) UK National Tide Gauge Network: Immingham. [Date accessed: 11/12/2023]

# Annex C: Tides at Immingham with Sample Times

**Plate 2: Sampling time for first round of monitoring with a low tide between 08:00 – 12:00 on the 23 November 2023 (Ref 3-2)**

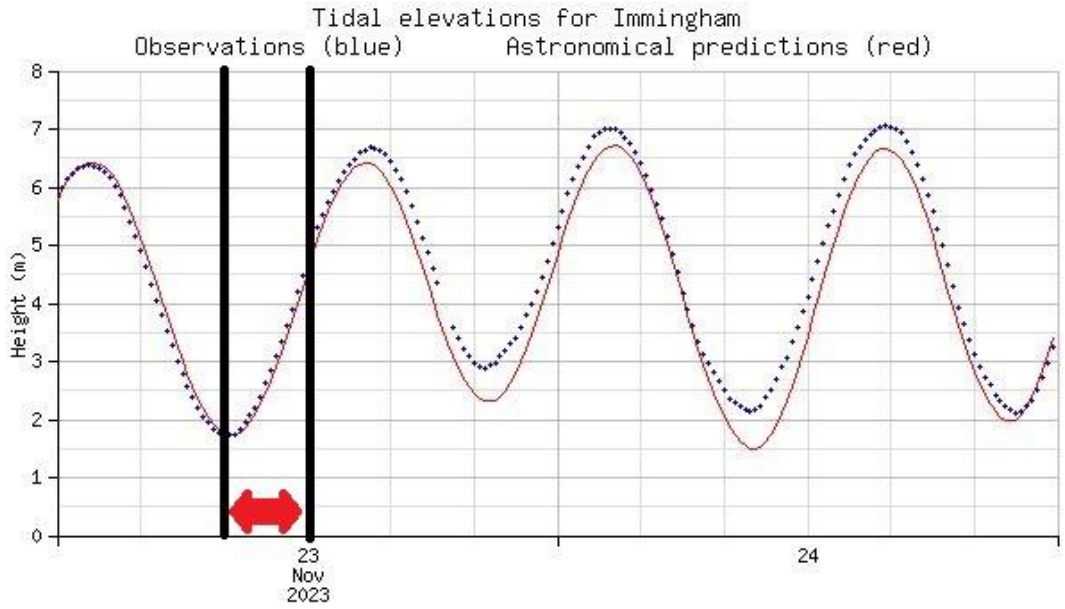
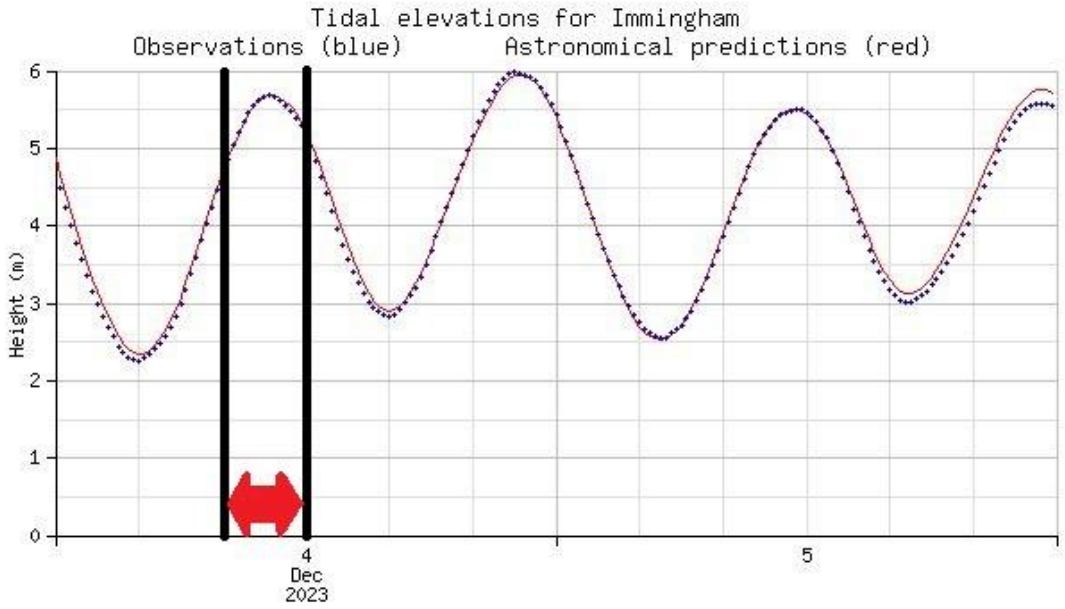



**Plate 3: Sampling time for the second round of monitoring with a high tide between 08:00 – 12:00 on the 4 December 2023 (Ref 3-2)**



# Annex D: Site Photos

Note: Red arrow indicates direction of flow.

**Plate 4: SW1 at 09:35AM on the 23 November 2023**

**Plate 5: SW1 at 10:21AM on the 4 December 2023**

**Plate 6: SW2 at 10:55AM on the 23November 2023**

**Plate 7: SW2 at 11:47AM on the 4 December 2023**

**Plate 8: SW3 at 09:55AM on the 23 November 2023**

**Plate 9: SW3 at 09:37AM on the 4December 2023**

# Annex E: Water Quality Results

## Table 3: WFD Assessment of the water quality results for all four sampling rounds

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| **Sample Code** | | | | | 27786434 | 27786435 | 28018579 | 28018758 | 28018760 | 28993116 | 28993117 | 28993118 | 29047468 | 29047469 | 29047470 |
| **NGR** | | | | TA 20679 15370 | TA 19948 14978 | TA 21315 14966 | TA 20679 15370 | TA 19948 14978 | TA 21315 14966 | TA 20679 15370 | TA 19948 14978 | TA 21315 14966 | TA 20679 15370 | TA 19948 14978 | TA 21315 14966 |
| **Weather** | | | | Overcast | Overcast | Overcast | Clear skies | Clear skies | Clear skies | Slightly cloudy | Slightly cloudy | Slightly cloudy | Overcast | Overcast/ Light rain | Overcast/ Light rain |
| **Notes** | | | | Unable to sample | | | | | | | | | | | |
| **Tide Type** | | | | Outgoing | | | Incoming | | | Outgoing | | | Incoming | | |
| **Carbon** | | | | | | | | | | | | | | | |
| Carbon, Organic (diss.filt) | mg/l | | | | 6.51 | 4.81 | 6.37 | 5.05 | 8.16 | 6.48 | 7.27 | <3 | 7.96 | 7.79 | 6.24 |
| Organic Carbon, Total | mg/l | | | | 6.53 | 3.9 | 5.71 | <3 | 5.33 | 6.52 | 6.69 | 3.12 | 8.15 | 8.79 | 6.01 |
| **Inorganics** | | | | | | | | | | | | | | | |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| Alkalinity, Total as CaCO3 | mg/l | | | | 223 | 243 | 255 | 177 | 268 | 288 | 286 | 246 | 185 | 158 | 199 |
| Ammoniacal Nitrogen as N | mg/l | 0.6 | | | <0.2 | <0.2 | 0.314 | 1.3 | 0.202 | 1.34 | 0.219 | <0.2 | 0.306 | <0.2 | 0.348 |
| BOD, unfiltered | mg/l | | | | <1 | <1 | <1 | <1 | <1 | 2 | 1.87 | 1.92 | 2.56 | 2.63 | 3 |
| Chloride | mg/l | 200 | | | 66.2 | 70.8 | 105 | 8280 | 133 | 144 | 53.3 | 49.2 | 128 | 43 | 65.2 |
| COD, unfiltered | mg/l | | | | 16.1 | 14.6 | 22.7 | 638 | 28.2 | 24.2 | 26.9 | 19.9 | 36.4 | 36.3 | 40.7 |
| Conductivity @ 20 deg.C | mS/cm | | | | 0.896 | 0.914 | 1.07 | 24 | 1.26 | 1.28 | 1 | 0.805 | 0.889 | 0.561 | 0.779 |
| Cyanide, Total (low level) | ug/l | 1 | 1 | | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 |
| Nitrate as N | mg/l | | | | 12.1 | 8.55 | 2.38 | 0.588 | 4.57 | 7.57 | 6.99 | 13.7 | 6.97 | 7.12 | 5.69 |
| Nitrite as NO2 | mg/l | | | | 0.111 | 0.15 | 0.197 | 0.178 | 0.203 | 0.227 | 0.181 | 0.084 | 0.064 | <0.05 | 0.097 |
| pH | pH Units | 9 | | | 8.32 | 8.2 | 8.28 | 7.92 | 8.15 | 8.16 | 8.15 | 8.22 | 7.77 | 8.08 | 7.73 |
| Phosphate (Ortho as P) | mg/l | 0.064 | | | 0.093 | 0.453 | 0.0852 | 0.0274 | 0.354 | 0.0702 | 0.0728 | 0.192 | 0.0816 | 0.104 | 0.208 |
| Sulphate | mg/l | 400 | | | 151 | 160 | 210 | 1250 | 270 | 226 | 210 | 95.6 | 112 | 80 | 125 |
| Suspended solids, Total | mg/l | | | | 28.4 | 9.8 | 7.2 | 89.6 | 21.7 | 34.3 | 57.3 | 50.3 | 77.2 | 120 | 95.2 |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| Total Inorganic Nitrogen as N | mg/l | | | | 12.2 | 8.62 | 2.75 | 1.94 | 4.83 | 8.98 | 7.26 | 13.9 | 7.29 | 7.21 | 6.07 |
| Total Oxidised Nitrogen as N | mg/l | | | | | | | | | 7.64 | 7.05 | 13.7 | 6.99 | 7.12 | 5.72 |
| Turbidity | ntu | | | | 25.1 | 8.12 | 7.32 | 73.7 | 13.3 | 27 | 36.7 | 35.8 | 88.6 | 140 | 99 |
| **Filtered (Dissolved) Metals** | | | | | | | | | | | | | | | |
| Arsenic (diss.filt) | ug/l | 50 (Long term average) | 25 | | 0.642 | 0.796 | 1.15 | 2.02 | 1.26 | 1.15 | 1.15 | 0.839 | 0.799 | 0.897 | 0.778 |
| Boron (diss.filt) | ug/l | | | | 105 | 75.2 | 169 | 1870 | 202 | 171 | 126 | 25.7 | 83.9 | 58 | 103 |
| Cadmium (diss.filt) | ug/l | 0.25 (Class 5) | | | <0.08 | <0.08 | <0.08 | 0.272 | <0.08 | <0.08 | <0.08 | <0.08 | <0.08 | <0.08 | <0.08 |
| Calcium (Dis.Filt) | mg/l | | | | 133 | 148 | 140 | 244 | 148 | 165 | 161 | 142 | 99.5 | 83.7 | 104 |
| Chromium (diss.filt) | ug/l | 3.4 (Cr VI) | 0.6 (Cr VI) | | <1 | <1 | <1 | <1 | 2.76 | <1 | <1 | <1 | 1.19 | <1 | <1 |
| Copper (diss.filt) | ug/l | 1 (Bioavailable) | 3.76 (ug/l dissolved, where DOC ≤1mg) | | 2.58 | 1.32 | 2.41 | 3.53 | 2.61 | 1.66 | 1.39 | 0.696 | 2.26 | 2.78 | 2.14 |
| Iron (Dis.Filt) | mg/l | 1 | | | | | 0.0367 | <0.019 | 0.0204 | | | | | | |
| Lead (diss.filt) | ug/l | 1.2 (Bioavailable) | | | <0.2 | 0.264 | <0.2 | <0.2 | 0.318 | <0.2 | <0.2 | <0.2 | <0.2 | 0.244 | 0.28 |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| Mercury (diss.filt) | ug/l | 0.07 (Dissolved, 0.07ug/l bioavailable) | | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Nickel (diss.filt) | ug/l | 4 (Dissolved, 4 ug/l bioavailable) | | | 2.12 | 2.07 | 1.95 | 2.42 | 4.1 | 1.99 | 1.77 | 0.949 | 1.98 | 1.96 | 2.71 |
| Selenium (diss.filt) | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | - |
| Zinc (diss.filt) | ug/l | 10.9 (Bioavailable) | 6.8 (Bioavailable) | | 5.92 | 6.38 | 4.24 | 16.7 | 10.7 | 7.09 | 5.25 | 3.73 | 11.3 | 5.48 | 10.8 |
| **Unfiltered (Total) Metals** | | | | | | | | | | | | | | | |
| Arsenic (tot.unfilt) | ug/l | 50 | 25 | | <2 | <2 | <2 | 3.41 | <2 | <2 | <2 | <2 | <2 | 3.49 | 2.32 |
| Boron (tot.unfilt) | ug/l | | | | 117 | 70.7 | 176 | 1900 | 213 | 186 | 145 | 28.3 | 77.3 | 41.3 | 106 |
| Cadmium (tot.unfilt) | ug/l | 0.25 (Class 5) | | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Chromium (tot.unfilt) | ug/l | 3.4 (Cr VI) | 0.6 (Cr VI) | | <3 | <3 | 7.62 | 10.3 | 12.7 | <3 | 3.09 | <3 | <3 | 10.1 | 4.02 |
| Copper (tot.unfilt) | ug/l | 1 (Bioavailable) | 3.76 (ug/l dissolved, where DOC ≤1mg) | | 3.97 | 2.02 | 2.37 | 5.62 | 3.37 | 3.26 | 4.46 | 2.63 | 6.94 | 8.9 | 5.76 |
| Iron (Tot. Unfilt.) | mg/l | 1 | | | | | 0.45 | 1.92 | 0.603 | | | | | | |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| Lead (tot.unfilt) | ug/l | 1.2 (Bioavailable) | | | 1.63 | 1.61 | <1 | 6.27 | 3.15 | 2.04 | 3.02 | 2.17 | 3.32 | 6.22 | 6.42 |
| Mercury (tot.unfilt) | ug/l | 0.07 (Dissolved, 0.07ug/l bioavailable) | | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| Nickel (tot.unfilt) | ug/l | 4 (Dissolved, 4 ug/l bioavailable) | | | 3.3 | 1.94 | 2.64 | 4.29 | 3.91 | 3.1 | 3.98 | 3.25 | 2.79 | 7.37 | 6.59 |
| Phosphorus (tot.unfilt) | ug/l | 196 | | | 183 | 333 | 118 | 263 | 468 | 182 | 184 | 271 | 168 | 312 | 398 |
| Selenium (tot.unfilt) | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Zinc (tot.unfilt) | ug/l | 10.9 (Bioavailable) | 6.8 (Bioavailable) | | 13.7 | 7.66 | 8.05 | 33.3 | 22.3 | 17.3 | 24.5 | 14.6 | 55.1 | 42 | 42.2 |
| **Phenols** | | | | | | | | | | | | | | | |
| Cresols | mg/l | | | | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 |
| Phenol | mg/l | 0.0077 | | | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Phenols, Total Detected monohydric | mg/l | 0.0077 | | | <0.016 | <0.016 | <0.016 | <0.016 | <0.016 | <0.016 | <0.016 | <0.016 | <0.016 | <0.016 | <0.016 |
| Xylenols | mg/l | | | | <0.008 | <0.008 | <0.008 | <0.008 | <0.008 | <0.008 | <0.008 | <0.008 | <0.008 | <0.008 | <0.008 |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| **EPH (Extractable Petroleum Hydrocarbons)** | | | | | | | | | | | | | | | |
| EPH (DRO) (C10-C40) (diss.filt) | ug/l | | | | 108 | 107 | <100 | 107 | 126 | 136 | 128 | 131 | <100 | <100 | <100 |
| EPH Range >C10 - C40 (aq) | ug/l | | | | <100 | <100 | 119 | <100 | 173 | 148 | <100 | <100 | 176 | 132 | 144 |
| **TPH Criteria Working Group (TPH CWG)** | | | | | | | | | | | | | | | |
| Aliphatics >C10-C12 | ug/l | | | | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Aliphatics >C12-C16 (aq) | ug/l | | | | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Aliphatics >C16-C21 (aq) | ug/l | | | | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Aliphatics >C21-C35 (aq) | ug/l | | | | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Aliphatics >C5-C6 | ug/l | | | | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Aliphatics >C6-C8 | ug/l | | | | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Aliphatics >C8-C10 | ug/l | | | | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Aromatics >EC10-EC12 | ug/l | | | | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| Aromatics >EC12-EC16 (aq) | ug/l | | | | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Aromatics >EC16-EC21 (aq) | ug/l | | | | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Aromatics >EC21-EC35 (aq) | ug/l | | | | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Aromatics >EC5-EC7 | ug/l | | | | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Aromatics >EC7-EC8 | ug/l | | | | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Aromatics >EC8-EC10 | ug/l | | | | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| GRO >C5-C12 | ug/l | | | | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 | <50 |
| GRO Surrogate % recovery** | % | | | | 89 | 82 | 88 | 75 | 81 | 97 | 91 | 96 | 100 | 101 | 97 |
| Total Aliphatics & Aromatics >C5-35 (aq) | ug/l | | | | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Total Aliphatics >C12-C35 (aq) | ug/l | | | | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |
| Total Aromatics >EC12-EC35 (aq) | ug/l | | | | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 | <10 |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| **Polyaromatic Hydrocarbons (PAHs)** | | | | | | | | | | | | | | | |
| Acenaphthene (aq) | ug/l | | | | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Acenaphthylene (aq) | ug/l | | | | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Anthracene (aq) | ug/l | 0.1 | | | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Benzo(a)anthracene (aq) | ug/l | | | | 0.0206 | 0.013 | <0.005 | 0.0129 | <0.005 | <0.005 | <0.005 | <0.005 | 0.0242 | 0.0209 | 0.0389 |
| Benzo(a)pyrene (aq) | ug/l | 0.00017 | | | <0.002 | 0.0212 | <0.002 | 0.0197 | <0.002 | 0.0048 | 0.0123 | 0.011 | <0.002 | <0.002 | <0.002 |
| Benzo(b)fluoranthene (aq) | ug/l | 0.017 | | | 0.0348 | 0.0279 | <0.005 | 0.0239 | 0.0194 | 0.0088 | 0.0131 | 0.0133 | 0.0403 | 0.0401 | 0.0784 |
| Benzo(g,h,i)perylene (aq) | ug/l | 0.0082 | | | <0.005 | 0.014 | <0.005 | 0.0084 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Benzo(k)fluoranthene (aq) | ug/l | 0.017 | | | 0.0152 | 0.0143 | <0.005 | 0.0079 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Chrysene (aq) | ug/l | | | | 0.0373 | 0.0243 | <0.005 | 0.0179 | <0.005 | 0.0149 | 0.0199 | 0.0121 | 0.0512 | 0.0504 | 0.0757 |
| Dibenzo(a,h)anthracene (aq) | ug/l | | | | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Fluoranthene (aq) | ug/l | 0.0063 | | | 0.0309 | 0.0244 | 0.0124 | 0.0263 | 0.0202 | 0.0113 | 0.0177 | 0.0176 | 0.0531 | 0.0497 | 0.0707 |
| Fluorene (aq) | ug/l | | | | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| Indeno(1,2,3-cd)pyrene (aq) | ug/l | | | | 0.0154 | 0.0121 | <0.005 | 0.0114 | <0.005 | <0.005 | 0.0078 | 0.006 | <0.005 | <0.005 | 0.0283 |
| Naphthalene (aq) | ug/l | | | | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| PAH, Total Detected USEPA 16 (aq) | ug/l | | | | 0.216 | 0.192 | <0.082 | 0.169 | <0.082 | <0.082 | 0.0996 | 0.0836 | 0.254 | 0.237 | 0.414 |
| Phenanthrene (aq) | ug/l | | | | 0.0135 | 0.00639 | <0.005 | 0.012 | <0.005 | <0.005 | 0.0074 | 0.0055 | 0.0231 | 0.0214 | 0.0182 |
| Pyrene (aq) | ug/l | | | | 0.0484 | 0.0347 | <0.005 | 0.0287 | 0.0291 | 0.0149 | 0.0214 | 0.0181 | 0.0626 | 0.0543 | 0.104 |
| **PCBs - (Solids)** | | | | | | | | | | | | | | | |
| PCB congener 101 | ug/l | | | | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 |
| PCB congener 118 | ug/l | | | | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 |
| PCB congener 138 | ug/l | | | | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 |
| PCB congener 153 | ug/l | | | | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 |
| PCB congener 180 | ug/l | | | | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 |
| PCB congener 28 | ug/l | | | | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 |
| PCB congener 52 | ug/l | | | | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 |
| Sum of detected EC7 PCB's | ug/l | | | | <0.105 | <0.105 | <0.105 | <0.105 | <0.105 | <0.105 | <0.105 | <0.105 | <0.105 | <0.105 | <0.105 |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| **Semi-Volatile Organic Compounds (SVOCs)** | | | | | | | | | | | | | | | |
| 1,2,4-Trichlorobenzene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 1,2-Dichlorobenzene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 1,3-Dichlorobenzene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 1,4-Dichlorobenzene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 2,4,5-Trichlorophenol (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 2,4,6-Trichlorophenol (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 2,4-Dichlorophenol (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 2,4-Dimethylphenol (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 2,4-Dinitrotoluene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 2,6-Dinitrotoluene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| 2-Chloronaphthalene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 2-Chlorophenol (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 2-Methylnaphthalene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 2-Methylphenol (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 2-Nitroaniline (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 2-Nitrophenol (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 3-Nitroaniline (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 4-Bromophenylphenylether (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 4-Chloro-3-methylphenol (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 4-Chloroaniline (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 4-Chlorophenylphenylether (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 4-Methylphenol (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| 4-Nitroaniline (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| 4-Nitrophenol (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Acenaphthene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Acenaphthylene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Anthracene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Azobenzene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Benzo(a)anthracene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Benzo(a)pyrene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Benzo(b)fluoranthene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Benzo(g,h,i)perylene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Benzo(k)fluoranthene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| bis(2-Chloroethoxy)methane (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| bis(2-Chloroethyl)ether (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| bis(2-Ethylhexyl) phthalate (aq) | ug/l | | | | <2 | <2 | <2 | <8 | <2 | <2 | <4 | <2 | <4 | <4 | <4 |
| Butylbenzyl phthalate (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Carbazole (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Chrysene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Dibenzo(a,h)anthracene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Dibenzofuran (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Diethyl phthalate (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Dimethyl phthalate (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Fluoranthene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Fluorene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Hexachlorobenzene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| Hexachlorobutadiene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Hexachlorocyclopentadiene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Hexachloroethane (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Indeno(1,2,3-cd)pyrene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Isophorone (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Naphthalene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| n-Dibutyl phthalate (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| n-Dioctyl phthalate (aq) | ug/l | | | | <5 | <5 | <5 | <20 | <5 | <5 | <10 | <5 | <10 | <10 | <10 |
| Nitrobenzene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| n-Nitroso-n-dipropylamine (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Pentachlorophenol (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Phenanthrene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| Phenol (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| Pyrene (aq) | ug/l | | | | <1 | <1 | <1 | <4 | <1 | <1 | <2 | <1 | <2 | <2 | <2 |
| **Volatile Organic Compounds (VOCs)** | | | | | | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 1,1,1-Trichloroethane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 1,1,2,2-Tetrachloroethane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 1,1,2-Trichloroethane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 1,1-Dichloroethane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 1,1-Dichloroethene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 1,1-Dichloropropene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 1,2,3-Trichlorobenzene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 1,2,3-Trichloropropane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 1,2,4-Trichlorobenzene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| 1,2,4-Trimethylbenzene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 1,2-Dibromo-3-chloropropane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 1,2-Dibromoethane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 1,2-Dichlorobenzene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 1,2-Dichloroethane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 1,2-Dichloropropane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 1,3,5-Trichlorobenzene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 1,3,5-Trimethylbenzene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 1,3-Dichlorobenzene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 1,3-Dichloropropane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 1,4-Dichlorobenzene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 2,2-Dichloropropane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 2-Chlorotoluene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| 4-Bromofluorobenzene ** | % | | | | 96.3 | 97.2 | 96.1 | 97.1 | 95.7 | 98.4 | 100 | 102 | 102 | 97.8 | 101 |
| 4-Chlorotoluene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| 4-iso-Propyltoluene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Benzene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bromobenzene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bromochloromethane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bromodichloromethane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bromoform | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Bromomethane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Carbon disulphide | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Carbontetrachloride | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chlorobenzene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloroethane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| Chloroform | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Chloromethane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| cis-1,2-Dichloroethene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| cis-1,3-Dichloropropene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Dibromochloromethane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Dibromofluoromethane** | % | | | | 115 | 115 | 119 | 128 | 118 | 112 | 112 | 106 | 113 | 112 | 111 |
| Dibromomethane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Dichlorodifluoromethane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Dichloromethane | ug/l | | | | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 | <3 |
| Ethylbenzene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Hexachlorobutadiene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Isopropylbenzene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| m,p-Xylene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| Methyl tertiary butyl ether (MTBE) | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Naphthalene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| n-Butylbenzene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| o-Xylene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Propylbenzene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| sec-Butylbenzene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Styrene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Sum of BTEX | ug/l | | | | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 | <5 |
| Sum of detected Xylenes | ug/l | | | | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| tert-Amyl methyl ether (TAME) | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| tert-Butylbenzene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Tetrachloroethene | ug/l | | | | <1 | <1 | <1 | 1.01 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Toluene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Toluene-d8** | % | | | | 97.6 | 98.1 | 98.6 | 99.3 | 98.6 | 96.4 | 96.8 | 95.3 | 100 | 99 | 99.3 |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| trans-1,2-Dichloroethene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| trans-1,3-Dichloropropene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Trichloroethene | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Trichlorofluoromethane | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Vinyl chloride | ug/l | | | | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| **Miscellaneous Organics** | | | | | | | | | | | | | | | |
| Branched PFOS | ng/l | | | | 26.5 | 0.906 | 46.8 | 27.7 | 2.14 | 21.9 | 24 | <0.65 | 13.6 | 10.3 | <3.25 |
| Linear PFOS (1763-23-1) | ng/l | | | | 56.6 | 1.26 | 82 | 49 | 3.03 | 38.8 | 43 | <0.65 | 26.5 | 20 | <3.25 |
| PFOA (335-67-1) | ng/l | | | | 7.48 | 1.98 | 11.4 | <6.5 | 3.53 | 5.3 | 6.5 | <0.65 | 3.93 | <3.25 | <3.25 |
| Total PFOS | ng/l | 36000 | | | 83.1 | 2.16 | 129 | 76.7 | 5.17 | 60.7 | 67 | <0.65 | 40.2 | 30.3 | <3.25 |
| **EPH CWG (Speciated)** | | | | | | | | | | | | | | | |
| Aliphatics >C16-C35 Aqueous | ug/l | | | | <10 | <10 | <10 | <10 | <10 | | | | | | |
| **Organics** | | | | | | | | | | | | | | | |

| | Units | The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 | Environmental Quality Standards (EQS) | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 | SW1 | SW2 | SW3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampled Date | | | | 31 March 2023 | | | 18 May 2023 | | | 23 November 2023 | | | 4 December 2023 | | |
| BDE 100* | ng/l | | | | | | | | | <0.13 | <0.14 | <0.12 | <0.27 | <0.27 | <0.17 |
| BDE 153* | ng/l | | | | | | | | | <0.15 | <0.17 | <0.13 | <0.38 | <0.4 | <0.25 |
| BDE 154* | ng/l | | | | | | | | | <0.16 | <0.19 | <0.15 | <0.42 | <0.45 | <0.27 |
| BDE 183* | ng/l | | | | | | | | | <0.18 | <0.35 | <0.15 | <0.25 | <0.3 | <0.21 |
| BDE 209* | ng/l | | | | | | | | | <4.3 | <4.1 | <5 | <2 | <1.8 | <1.9 |
| BDE 28* | ng/l | | | | | | | | | <0.16 | <0.2 | <0.12 | <0.18 | <0.17 | <0.1 |
| BDE 47* | ng/l | | | | | | | | | <0.48 | <0.47 | <0.12 | <0.39 | <0.37 | <0.2 |
| BDE 99* | ng/l | | | | | | | | | <0.3 | <0.31 | <0.13 | <0.3 | <0.3 | <0.2 |
| Sum of selected BDEs* | ng/l | | | | | | | | | 0 | 0 | 0 | 0 | 0 | 0 |
| Key | | Below WFD Standards | | | | | | | | | | | | | |
| | | Above EQS | | | | | | | | | | | | | |
| | | Above WFD Standards | | | | | | | | | | | | | |

[1]SW1 water quality sampling was not possible during the first round, due to access issues as the bridge on Associated British Ports (ABP) land was too high above the water level for sample collection using a telescopic sampling pole.

[2]Error occurred with the sonde and so a recording of turbidity was not performed for SW2 on the 31 March 2023

# 4 Survey Updates to ES Chapter 21: Ground Conditions and Land Quality (Ground Investigation)

## 4.1 Introduction

4.1.1 This survey update presents the baseline data from a Ground Investigation ("GI") for the Pipeline Corridor (Work No. 6, see **Works Plans [AS-002]**). This assessment of the ground conditions of the Pipeline Corridor is additional to the information presented within **ES Chapter 21: Ground Conditions and Land Quality [APP-063]** of the Project's DCO Application. The information within this survey update therefore supplements the initial GI undertaken for the rest of the Site and describes the additional GI work undertaken, the new data available and considers whether there is a need to update the conclusions presented within the IGET Environmental Statement ("ES") as a result of the findings.

## 4.2 Description of the Pipeline Corridor Ground Investigation

4.2.1 A GI was undertaken along the Pipeline Corridor by Geotechnical Engineering Ltd between 31 May and 20 June 2023. The results of this GI were not available prior to submission of the DCO application in September 2023, therefore the findings were not considered within **ES Chapter 21: Ground Conditions and Land Quality [APP-063]**.

## 4.3 Results

4.3.1 In general, the encountered geological sequence within the Pipeline Corridor comprised Topsoil/ Made Ground over Tidal Flat and Glacial Till Deposits over Flamborough Chalk Formation, as originally described within **ES Chapter 21: Ground Conditions and Land Quality [APP-063]**.

4.3.2 Within the pipeline corridor (Work No. 6) GI, varying thicknesses of Made Ground was found to be underlying the area. The typical thickness of Made Ground in the East Site – Hydrogen Production (Work No. 5) was less than 1.8m (maximum of 4m), typical thickness in the East Site – Ammonia Storage (Work Nos. 3, 3A) was less than 0.75m (maximum 2m), typical thickness in the West Site was 0.5m (maximum of 2.1m) and typical thickness along the Pipeline Corridor was 2.05m (maximum 2.40m). Made Ground encountered generally comprised firm clay with roots, rootlets, brick, chalk, flint, clinker, macadam and concrete.

4.3.3 The groundwater level monitoring data obtained from the boreholes and piezometers show that groundwater is present in all the geological units (including Made Ground) encountered below the pipeline corridor (Work No. 6). The details of the encountered hydrogeological conditions for the Site are presented in **ES Appendix 21.B: Phase II Ground Investigation Interpretative Report [APP-216]** and **ES Chapter 21: Ground Conditions and Land Quality – Gas Monitoring Addendum [APP-063]**. The Pipeline Corridor is underlain by a principal aquifer in the Flamborough Chalk Formation bedrock. The GI Report indicated that there is potential for tidal influences on the groundwater levels, given the proximity of the site to the tidal Humber estuary.

**Summary of Risks Relating to Soils**

4.3.4 A soil screening assessment was undertaken as part of the GI for the Pipeline Corridor, the results of which inform the outcome of the risks relating to soils. The soil screening assessment compared results of laboratory test data to Generic Assessment Criteria ("GAC") (designed to be protective of human health for the proposed commercial/industrial end use).

4.3.5 During the Pipeline Corridor GI, three Polycyclic Aromatic Hydrocarbon ("PAH") compounds were detected within Made Ground at concentrations exceeding their corresponding GAC for the proposed end-use. For risks to construction workers, five PAH compounds were recorded in exceedance of their respective GAC in Made Ground at two locations. It is therefore considered that a medium risk to construction workers exists within Made Ground from PAHs at locations sampled along the Pipeline Corridor. When compared to the assessment of data relating to the initial GI undertaken within the western and eastern areas of the Site, no risk to human health from the determinands analysed was identified. The medium risk identified during the Pipeline Corridor GI will be mitigated by the standard mitigation measures outlined in **ES Chapter 21: Ground Conditions and Land Quality [APP-063]**.

4.3.6 No elevated concentrations of metals were identified in soil samples analysed during the Pipeline Corridor GI, this was consistent with the initial GI undertaken for the Project.

4.3.7 Alkaline pHs of 10.2 and 10.5 were recorded at two locations within the Pipeline Corridor GI (at P-BH03A and P-TP02, respectively). Both samples were obtained from within the Made Ground. Due to P-BH03A terminating in Made Ground, no samples were collected within superficial deposits or bedrock. An alkaline pH, pH 9.1, was also recorded within the Glacial Till Deposits encountered in P-BH06. The sample P-BH06 at 0.10m, taken within the Made Ground recorded pH values closer to neutral pH 7.6. The pH values were similar across the different strata, indicating potentially a single source of material with high pH.

4.3.8 No asbestos was detected during the Pipeline Corridor GI, therefore the risk from asbestos is considered to be Very Low in this area. Asbestos was detected during the initial GI at the East Site as outlined within **ES Appendix 21.B: Phase II Ground Investigation Interpretative Report [APP-216]**, encroaching the boundary of the Pipeline Corridor, therefore it is plausible that asbestos may be encountered along the Pipeline Corridor in areas which have not been investigated.

4.3.9 Leachate testing was undertaken on one sample collected from P-BH03B within the Pipeline Corridor. The leachate sample recorded exceedances of the Environmental Quality Standards ("EQS") Coastal GAC for copper, lead and zinc. The leachate concentrations recorded did not exceed the corresponding Drinking Water Standard (GAS) GAC (see **Table 4**). Further groundwater monitoring rounds have been undertaken to determine the impact and effect of these exceedances and a further survey update will be submitted into the examination when the survey data is available. Therefore, this information does not currently change the outcome presented within **ES Chapter 21: Ground Conditions and Land Quality [APP-063]**. When the result of the additional groundwater

monitoring is available this will be submitted into the examination as a further survey update.

**Table 4: Summary of determinands in leachate samples exceeding EQS GAC**

| Determinand | Concentration (microgram per litre µg/L) | EQS (µg/L) |
|---|---|---|
| Copper | 11 | 3.76 |
| Lead | 3.7 | 1.3 |
| Zinc | 13.0 | 6.8 |

**Summary of Risk to Controlled Waters**

4.3.10 Based on the leachate analysis, a low risk to groundwater is thought to exist along the Pipeline Corridor from soil leachate where copper, lead and zinc concentrations exceeded the coastal EQS GAC. The leachate analysed came from a soil sample taken at P-BH03B.

4.3.11 It is considered that there is no risk to drinking water along the Pipeline Corridor as the nearest abstractions, from the underlying chalk, are protected by a 20m thick cover of the superficial strata. Furthermore, the leachate result for a soil sample from borehole P-BH03B did not record any exceedance of the corresponding DWS GAC.

4.3.12 One groundwater sample was obtained during the Pipeline Corridor GI, from Made Ground, at location P-BH03C. Concentrations above their corresponding DWS GACs of the following metal and inorganic determinands were identified: sodium (filtered), chloride (filtered) and ammonium (as NH4 BRE). A summary of the determinands in groundwater exceeding DWS GAC is summarised in **Table 5**. This information does not change the outcome presented within the **ES Chapter 21: Ground Conditions and Land Quality [APP-063]**.

**Table 5: Summary of determinands in groundwater exceeding DWS GAC**

| Determinand | Concentration (milligram per litre mg/L) | EQS (mg/L) |
|---|---|---|
| Sodium | 320 | 200 |
| Chloride | 530 | 250 |
| Ammonium | 14 | 0.5 |

4.3.13 Further groundwater monitoring along the Pipeline Corridor has been undertaken in conjunction with additional groundwater monitoring across the Site to characterise the groundwater regime and groundwater contamination status. Three further groundwater monitoring rounds were undertaken during December 2023 at all locations across the Site. When the result of the additional groundwater monitoring is available this will be submitted into the examination as a further survey update.

## 4.4 Conclusions

4.4.1 Following an assessment of the Pipeline Corridor GI data, it is concluded that there are no changes to the likely significant effects that were reported within **ES Chapter 21: Ground Conditions and Land Quality [APP-063]**. A medium risk to construction workers was identified within Made Ground from PAHs at locations sampled along the Pipeline Corridor, however this risk will be mitigated by the standard mitigation measures outlined in **ES Chapter 21: Ground Conditions and Land Quality [APP-063]**. No elevated concentrations of metals were identified in soil samples analysed during the Pipeline Corridor GI, no asbestos was detected during the Pipeline Corridor GI, a low risk to groundwater is thought to exist along the Pipeline Corridor and no risk to drinking water along the Pipeline Corridor was identified. DWS GAC exceedances of the determinands in groundwater were identified, therefore further groundwater monitoring rounds have been undertaken to determine the impact and effect of these exceedances. The results of the monitoring will be submitted into the examination at a future deadline when analysis is complete.

4.4.2 In conclusion, the residual effects reported within **Section 21.10** of **ES Chapter 21: Ground Conditions and Land Quality [APP-063]** are unchanged as a result of the new GI data for the Pipeline Corridor.

## 4.5 References

Ref 4-1 Water, England & Wales - Water Supply (Water Quality) Regulations, 2016 No. 614

# 5 Survey Updates to ES Chapter 21: Ground Conditions and Land Quality (Gas Monitoring)

## 5.1 Ground Gas Conditions

5.1.1 Intrusive ground investigations ("GI"), which included installation of monitoring wells and ground gas monitoring were undertaken across the Site from November 2022 to May 2023 and a ground gas risk assessment was undertaken as part of **ES Appendix 21.B: Phase II Ground Investigation Interpretive Report [APP-216]**.

5.1.2 Ground gas monitoring was undertaken weekly during the GI via the installed monitoring wells between 13 January and 27 February 2023. Six rounds of post-GI ground gas monitoring were undertaken from the monitoring wells, between 27 February and 9 May 2023. These were reported in the ES within **Paragraph 21.6.32** of **ES Chapter 21: Ground Conditions and Land Quality [APP-063]**.

5.1.3 Five additional rounds of GI and ground gas monitoring were undertaken along the Pipeline Corridor between 29 June and 9 August 2023 but the data was not available for inclusion in the application and the ref listed above. The additional data for the ground gas monitoring is presented below and aggregated with the ground gas monitoring that has already been presented in the application. The location of the wells monitored for ground gas and the results of the ground gas monitoring are presented, with the new data added in bold, in **Table 6**.

## Table 6: Monitored Wells

| Location ID | Max CH4 percentage volume per volume (% v/v) | Max CO2 (% v/v) | Min O2 (% v/v) | Max Flow (litres per hour l/hr) | Differential pressure (millibar mbar) | Monitored groundwater depth range (metres below ground level mbgl) | Well screen | | Response zone strata | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Top (mbgl) | Bottom (mbgl | | |
| E-BH02 | 0 | 0.1 | 19.8 | 0.00 | 0.00 | 0.37 – 1.33 | 24.5 | 32 | Chalk | Fully saturated |
| E-BH04 | 83.3 | 3.7 | 0 | 120.80 | 22.70 | 0.32 – 2.48 | 23.1 | 34.3 | Glacial Till Deposits (GTD) / Flamborough Chalk Formation (FCF) | Fully saturated |
| E-BH07 | 1.6 | 0.5 | 19.1 | 0.00 | 0.00 | 0.3 – 1.56 | 21 | 22.1 | GTD | Fully saturated |
| E-BH11 | 0 | 0.1 | 19.8 | 0.00 | 0.00 | 0.5 – 1.42 | 19.45 | 23.3 | GTD | Fully saturated |
| E-BH14A | 0 | 2.2 | 17.2 | 11.80 | 1.22 | 0.58 – 1.74 | 1.75 | 5 | Tidal Flat Deposits (TFD) | Fully saturated |
| E-BH15 | 0 | 0 | 13.5 | 120.40 | 16.52 | 0 – 1.1 | 0.7 | 1.35 | Made Ground (MG) | Fully saturated |
| E-BH18 | 93.9 | 5.9 | 0.2 | 122.00 | 18.53 | 0.45 – 2.38 | 27.9 | 34.1 | FCF | Fully saturated |
| E-BH20 | 1.6 | 0.7 | 7.8 | 1.80 | 0.08 | 0.72 – 2.5 | 1.4 | 4 | MG | Partially/ fully saturated |
| E-BH22 | 61.1 | 1.5 | 3.2 | 0.20 | 0.01 | 0.5 – 2.32 | 1.1 | 4 | MG / TFD | Fully saturated |
| E-BH25 | 83.6 | 5.4 | 0.8 | 12.80 | 1.16 | 0.9 – 2.03 | 12.5 | 24 | GTD | Fully saturated |
| W-BH26 | 0.1 | 2.4 | 13.1 | 0.20 | 0.02 | 1.32 – 1.39 | 0.7 | 1.7 | TFD2 | Partially saturated |
| W-BH31 | 0 | 0 | 19.8 | 0.10 | 0.00 | 0 – 0 | 17.8 | 18.8 | GTD | Fully saturated |
| **P-BH03C** | **95.4** | **4.6** | **19.8** | **108.6** | **12.66** | **1.02 – 1.58** | **1.02** | **4.1** | **MG** | **Fully saturated** |
| **P-BH05A** | **0.0** | **1.4** | **19.1** | **0.0** | **0.00** | **Dry** | **0.6** | **2.1** | **MG** | **Dry** |

## 5.2 Results of Ground Gas Monitoring

5.2.1 The updated ground gas monitoring results indicate that the maximum methane and carbon dioxide concentrations recorded over the monitoring period were 95.4% v/v and 5.9% v/v respectively, with flow rate recorded up to 122 l/hr. However, the conceptual site model (as described in **ES Appendix 21.B: Phase II Ground Investigation Interpretative Report [APP-216]**) and the encountered ground conditions do not show significant sources of ground gas.

5.2.2 As shown in **Table 6**, the response zones for the monitoring wells were either fully or partially saturated (flooded) during the ground gas monitoring, with artesian conditions encountered in some of the exploratory holes. This suggests that the measured ground gas concentrations and flow measured are influenced by the presence of compressed gas in the confined unsaturated zone headspace located above the response zones. Therefore, the monitored readings are considered to not be representative of the ground conditions and gas regime at the Site.

## 5.3 Summary of Updated Likely Significant Residual Effects

5.3.1 In summary, there are no changes to the likely significant effects as reported within **Chapter 21: Ground Conditions and Land Quality [APP-063]** of the submitted ES for the Project. The residual effects would remain as reported within **Section 21.10** of **ES Chapter 21: Ground Conditions and Land Quality [APP-063]**.

## 5.4 References

Ref 5-1 National House Builders Council (NHBC). (2023). NF94 Hazardous Ground Gas – an essential guide for housebuilders.

Ref 5-2 Card, G.; Wilson, S.; Mortimer, S. (2012) A Pragmatic Approach to Ground Gas Risk Assessment. CL:AIRE Research Bulletin RB17. London.

Ref 5-3 CL:AIRE, GSS Limited and GB Card & Partners (2019) Continuous Ground-Gas Monitoring and the Lines of Evidence Approach to Risk Assessment. CL:AIRE Research Bulleting TB18. London.