



Immingham Green Energy Terminal

TR030008

Volume 6

6.4 Environmental Statement Appendices
Appendix 21.C: Outline Remediation Strategy

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Regulation 5(2)(a)

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Forms and Procedure) Regulations 2009 (as
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Immingham Green Energy Terminal Development Consent Order 2023

6.4 Environmental Statement Appendices

Appendix 21.C: Outline Remediation Strategy

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Executive summary

This Outline Remediation Strategy sets out the measures required during the construction of the Immingham Green Energy Terminal (“IGET”) Project, hereafter known as the ‘Project’, to reduce any impacts arising from contamination. As an outline document, it will inform the preparation of a Final Remediation Strategy (or Strategies), which may be submitted and approved on a phased basis and which will be in general accordance with the outline measures set out in this document. These final strategies are secured by a Requirement included in the **draft Development Consent Order (“DCO”)** **[TR030008/APP/2.1]**.

This document reviews the existing information in respect of contamination, based upon previous and existing land uses as well as historic and recent ground investigation data undertaken in designing and assessing the Project. The data identifies local exceedances of relevant standards for chloroform (in water) on the East Site (**Work No. 3** and **Work No. 5**) but no exceedance in soils. The approach to the remediation of this known contamination of water is outlined.

The document also outlines the approach for identifying and testing unexpected contamination to determine whether further remediation responses are required as well as the likely monitoring requirements.

1 Introduction

- 1.1.1 This Outline Remediation Strategy has been prepared for the landside elements of the IGET Project, hereafter known as the 'Project'. The Site Boundary for the Project (also referred to as the 'Site') is shown on **Figure 1.1 [TR030008/APP/6.3]** and the main parts of the Project are split into a series of Work Numbers as shown on the **Works Plans [TR030008/APP/4.2]**
- 1.1.2 The purpose of this Outline Remediation Strategy is to set out the mitigation measures required during the works in designated Work Number areas to reduce any impacts arising from contamination resulting from the landside works. As an outline document, this will inform the preparation of a Final Remediation Strategy (or Strategies), which may be submitted and approved on a phased basis and which will be in general accordance with the outline measures set out in this document. These final strategies are secured by a Requirement included in the **draft DCO [TR030008/APP/2.1]**.
- 1.1.3 This Outline Remediation Strategy is based primarily on the following documents:
- AECOM (June 2023). Immingham Ammonia Import Terminal. Ground Investigation Report. Air Products. Report Reference 60687114 (Ref 1-2) and provided as **Appendix 21.B [TR030008/APP/6.4]**.
 - Geotechnical Engineering Limited (May 2023). AP Ammonia Import Terminal Factual Ground Investigation Report. Report Reference 37312 (Ref 1-6).
 - AECOM (February 2022). Immingham NH₃ Project Development Appraisal Report. Document 60673509-GTN-DAR-001 Revision 00 (Ref 1-1).
- 1.1.4 The data obtained from these investigations provide coverage of the majority of the landside part of the Site Boundary and are reported in full in **Appendix 21.B [TR030008/APP/6.4]** and so are not repeated here.

2 Contextual Information

2.1 Site and surroundings

- 2.1.1 The surrounding land uses and the existing land uses of the Site itself are described in **ES Chapter 2: The Project [TR030008/APP/6.2]**, which also includes a detailed description of the Project. A brief description of the Site and surroundings of the main terrestrial works areas is presented below along with an indication of the approach to finished ground levels associated with the operational Project.
- 2.1.2 The Site is located on the south bank of the Humber Estuary to the east of the Port of Immingham (“the Port”) in Northeast Lincolnshire, UK. The Site is located approximately on National Grid Reference N: 520477.7 E: 414904 and covers an area of approximately 121 ha.
- 2.1.3 The main work areas on the terrestrial side are the West Site (Work No. 7), East Site – Hydrogen Production area (Work No 5), East Site– Ammonia Storage area (Work No. 3), the Temporary Construction Area off Laporte Road (Work No. 9) and the Pipeline Corridor (Work No. 6) which links the West and East Sites. These areas are shown on **Figure 2.3 [TR030008/APP/6.3]**.

West Site

- 2.1.4 The West Site comprises three former agricultural fields with an Agricultural Land Classification of Grade 3b moderate quality land, which are separated by hedgerows and drainage ditches. Existing ground elevations are generally in the range 1.5m to 2.0m OD (ordnance datum). The northern boundary follows Kings Road, and the western boundary follows the A1173. A spine road across the West Site, starting from Kings Road leading to the centre of the Site and was prepared for a consented light industrial project and some soil removal has already taken place.
- 2.1.5 The vertical parameters for the Project, which are defined in **Chapter 2: The Project [TR030008/APP/6.2]**, indicate that the Finished Ground Level (“FGL”) would be no greater than 2.5m AOD.

East Site – Hydrogen Production Area (Work No. 5)

- 2.1.6 The East Site – Hydrogen Production area (Work No. 5) currently comprises an area of concrete hardstanding used for temporary storage of materials for the Port of Immingham. Photographs from the period 2007-2016 show that the area housed various stockpiles, which appeared black in colour (potentially coal/slag). It is likely that these were associated with disused coal stockpiling but these stockpiles are no longer present. Existing ground elevations are generally in the range 3.5m to 4.0m OD.
- 2.1.7 The East Site (Work No. 5) is surrounded by earth embankments, to a maximum height of approximately 4m, which are heavily vegetated with scrub and trees. A drain is present at the base of the slope around much of the perimeter of this part of the East Site.

2.1.8 The vertical parameters for the Project indicate that it is intended to raise the FGL to no greater than 3.8m AOD.

East Site – Ammonia Storage Area (Work No. 3)

2.1.9 The East Site – Ammonia Storage area (Work No. 3), comprises an area of hardstanding surrounded by woodland (the Long Strip woodland on the east edge) and other lines of scrub and trees. Existing ground elevations are generally in the range 3.0m to 3.5m OD. An embankment, approximately 2m high, is present along the south and east boundary of the area of hardstanding.

2.1.10 The vertical parameters for the Project indicate that it is intended to raise the FGL to no greater than 3.5m AOD.

Temporary Construction Area (Work No 9)

2.1.11 The Laporte Road Temporary Construction Area comprises an arable field with an Agricultural Land Classification of Grade 3b moderate quality land.

2.1.12 The compound would be the main laydown area during Phase 1 of the construction of the Project for the storage of materials and accommodate storage containers for such purposes. The project phases are defined in **Chapter 2: The Project [TR030008/APP/6.2]**.

2.2 Published Geology and Environmental Setting

2.2.1 A detailed description of the geological baseline, the hydrogeology and the surface water courses is presented at Section 21.6 of **Chapter 21: Ground Conditions and Land Quality [TR030008/APP/6.3]** and is not repeated here.

2.3 Summary of Ground Investigation

2.3.1 A summary of the GI undertaken on the Site is presented in summary form in **Chapter 21: Ground Conditions and Land Quality [TR030008/APP/6.3]** and in much greater detail in **Appendix 21.B [TR030008/APP/6.4]** and so is not repeated here. **Table 1** below provides a high level summary of the main findings:

Table 1: Summary of Ground Investigation Findings

Work No.	Site Name	Ground Investigation (date)	Observations made during the ground investigation	Medium	Elements for concern	Assessment results
Work No. 3	East Site Storage Ammonia Site	2023	Ammonia odour within made ground in location E-BH14, E-BH14A and E-BH15.	Soil	Made Ground	No exceedances of the GAC were identified within the soil samples analysed in regard to risks to human health.
			None	Soils	pH	Two soils samples recorded pH in excess of 11.5 and considered to be HP8 corrosive.
			None	Soils	Asbestos (Chrysotile)	Loose fibres (E-BH10)
			None	Water	Chloroform	Exceedances of EQS (E-BH02 and E-BH07)
			None	Gas		CS5 at E-BH04 in chalk CS1 at E-BH02 in chalk, E-BH07 and E-BH11 in glacial till deposits.

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Work No.	Site Name	Ground Investigation (date)	Observations made during the ground investigation	Medium	Elements for concern	Assessment results
Work No. 5	East Site Hydrogen Production	2023	None	Soil	Made Ground	No exceedances of the GAC were identified within the soil samples analysed in regard to risks to human health.
			None	Soil	Asbestos (Chrysotile)	Quantification concentration <0.001& w/w (E-BH25)
				Water	Ammoniacal nitrogen and ammonia	E-BH15 (870mg/l and 1,100mg/l, respectively), with the second highest concentrations recorded in groundwater within E-BH14A (9.4mg/l and 12mg/l, respectively)
				Water	Chloroform	Exceedances of EQS (E-BH25)
			A sulphurous odour was observed within E-BH25 during the ground gas monitoring.	Gas		CS5 at E-BH18 in chalk CS4 at E-BH25 in glacial deposits CS2 at E-BH15 in made ground and E-BH14a in TFD

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Work No.	Site Name	Ground Investigation (date)	Observations made during the ground investigation	Medium	Elements for concern	Assessment results
						CS1 at E-BH22 in made ground and TFD and E-BH20 in made ground
Work No. 7	West Site	2023	None	Soil	Made Ground	No exceedances of the GAC were identified within the soil samples analysed with regards to risks to human health.
		Agricultural Land Survey	Land classified as subgrade 3b	Not applicable	Soil	Subgrade 3b
Work No. 9	Temporary Construction Area	Agricultural Land Survey	Land classified as subgrade 3b	Not applicable	Soil	Subgrade 3b

2.4 Assessment of Potential Contamination

- 2.4.1 Indication of potential soil contamination was recorded during the most recent ground investigation at the Site (see **Appendix 21.B [TR030008/APP/6.4]**) and the following observations were made:
- Made Ground was encountered across the East Site and West Site (Work No's 3, 5, 7,) and comprised varying compositions of anthropogenic materials including brick, concrete, macadam, clinker, glass and wood,
 - Asbestos (Chrysotile) was identified within two soil samples of Made Ground in the East Site within E-BH10 (Work No. 3) and E-BH25 (Work No.5),
 - An ammonia odour was observed within locations E-BH14, E-BH14A and E-BH15 in the East Site (Work No. 3) within the Made Ground during the GI,
 - A sulphurous odour was observed within E-BH25 (Work No. 5) in the East Site during the ground gas monitoring.
- 2.4.2 Borehole locations are presented in **Appendix 21.B [TR030008/APP/6.4]**.

2.5 Human Health Risk Assessment

- 2.5.1 A Tier 2 Human Health Risk Assessment was undertaken using geo-environmental data presented in **Appendix 21.B [TR030008/APP/6.4]**. Soil samples were screened against the Generic Assessment Criteria ("GAC") for a Commercial/Industrial land-use with a Total Organic Carbon ("TOC") of 0.58-1.45 %. A total of 65 Made Ground samples and 157 natural stratum samples were tested and there were no exceedances of the GAC of soil samples with regards to risks to human health.
- 2.5.2 Two samples in the East Site – Ammonia Storage area (Work No. 3) were identified to have a pH which was alkaline in excess of pH 11.5. According to the Environment Agency "Guidance on the Classification and Assessment of Waste (1st Edition v1.2.GB), Technical Guidance WM3A" (Ref 1-11), these samples should be considered HP8 Corrosive. The depth sampled was 0.1 m bgl which is considered to be a hazard to construction workers and control of dust is considered prudent during groundworks.
- 2.5.3 Thirty samples were analysed for the presence of asbestos across the East and West Site areas. Two samples within the East Site, E-BH10 (East Site – Ammonia Storage Area (Work No. 3) and E-BH25 (East Site – Hydrogen Production Area (Work No. 5) identified asbestos to be present in the form of chrysotile. The asbestos was identified at ground level within the Made Ground deposits. The sample within E-BH25 was described by the laboratory as loose fibres. The sample in E-BH10 was quantified with a concentration of <0.001 % w/w.

2.6 Controlled Waters Risk Assessment

Summary

- 2.6.1 A Tier 2 Controlled Waters Risk Assessment was undertaken using geo-environmental data presented in **Appendix 21.B [TR030008/APP/6.4]**. The

groundwater and leachate samples were screened against the Drinking Water Standards (“DWS”) and Environmental Quality Standards (“EQS”) for Freshwater (Ref 1-8). The exceedances are summarised below.

EQS Exceedances

- 2.6.2** The groundwater, soil leachate and surface water results which were in exceedance of the EQS GAC are tabulated in **Appendix 21.B [TR030008/APP/6.4]**.
- 2.6.3 It is considered that the groundwater quality within Made Ground and Tidal Flat Deposits beneath the West Site (Work No. 7) and East Site (Work No. 3, 5) may pose a risk to surface water quality. This is mostly associated with the presence of elevated inorganics, particularly ammonium and ammoniacal nitrogen within the East Site – Hydrogen Production Area (Work No. 5). The exceedances of metals were mostly within the same order of magnitude or one order of magnitude above the EQS and were recorded across a range of strata. Therefore, these exceedances are not considered to pose a risk to the surface water. The exceedances of PAHs and TPH are also considered marginal as they are within the same order of magnitude as the EQS and were also isolated occurrences. Chloroform was detected in the groundwater at concentrations which exceeded the EQS for surface water quality within the East Site -Hydrogen Production area (Work No. 5) and Ammonia Storage area (Works No. 3).
- 2.6.4 Widespread exceedances of ammoniacal nitrogen and ammonium were recorded within the East Site proposed Hydrogen Production area (Work No. 5) and Ammonia Storage area (Work No. 3). The highest concentrations of ammonium and ammoniacal nitrogen were recorded within E-BH15 (870mg/l and 1,100mg/l, respectively), with the second highest concentrations recorded in groundwater within E-BH14A (9.4mg/l and 12mg/l, respectively). This correlates to an ammonia odour recorded during drilling of exploratory holes EBH14, E-BH14A and E-BH15 within Made Ground during the ground investigation. Therefore, there may be a localised hotspot of inorganic contamination within Made Ground in the East Site Hydrogen Production area (Work No. 5) which poses a risk to surface water quality.
- 2.6.5 Surface water monitoring was undertaken within Habrough Marsh Drain upstream of the West Site (SW2) and approximately 40m west of the East Site (SW1), and the North Beck Drain approximately 450m east from the East Site (SW3). Exceedances of PAHs, metals and inorganics were recorded within the surface water samples across two monitoring rounds. However, it is likely that the exceedances within surface water samples are associated with off-site sources due to the industrial nature of the surrounding land use.
- 2.6.6 It is considered that the groundwater quality beneath the East Site Hydrogen Production Area (Work No. 5) and Ammonia Storage Area (Work No. 3) may pose a risk to the aquifers beneath the Site, particularly associated with metals and inorganics. The exceedances of C12-C16 aromatics and naphthalene are considered to be isolated occurrences and are within the same order of magnitude as the DWS. All the exceedances of metals were recorded within the same order of magnitude as the DWS. However, as there is an SPZ 1, 2 and 3 located on the Site and the Flamborough Chalk Formation is designated as a

Principal Aquifer, there is considered to be a risk to groundwater quality in the Flamborough Chalk Formation. Although exceedances of metals were recorded in Made Ground and Tidal Flat Deposits, there is not considered to be a risk to groundwater quality associated with metal exceedances as the Tidal Flat Deposits are designated as Unproductive Strata. Exploratory hole E-BH15 within Made Ground and E-BH14A within Tidal Flat Deposits recorded the highest concentrations of ammonium and nitrate (up to four orders of magnitude and two orders of magnitude above the DWS respectively). Therefore, this may represent a localised hotspot of inorganic contamination within the East Site Hydrogen Production area (Work No. 5).

2.6.7 No exceedances of the DWS were recorded in the West Site (Work No. 7) in the single sample taken to date and there is unlikely to be a risk to groundwater quality. Additional groundwater monitoring will be undertaken to confirm the assumptions which have been used to inform this Strategy.

2.7 Ground Gas Risk Assessment

2.7.1 A ground gas risk assessment was undertaken using the method outlined in BS8485 (Ref 1-3) and CIRIA C665 (Ref 1-4). This is provided in full in **Appendix 21.B [TR030008/APP/6.4]** and is summarised below.

2.7.2 The maximum flow rates and maximum concentrations of methane and carbon dioxide were used to calculate a worst-case scenario gas screening value to determine the characteristic situation (“CS”) of the Site. The characteristic situation for the Site was determined to be CS5, high risk, with ground gas protection measures being required under this scenario. The Project classifies as a Type D (commercial / industrial) building in accordance with Table 3 in BS 8485 (Ref 1-3). The gas protection score for a Type D building constructed on a CS5 Site is 4.5 (refer to Table 4 in BS 8485 (Ref 1-3)).

2.7.3 Due to the uncertainty of the source of elevated gas concentrations and potential over-estimation in monitoring wells, an alternative approach to gas risk assessment was undertaken, using guidance from CL:AIRE RB17 A Pragmatic Approach to Ground Gas Risk Assessment for the 21st Century (Ref 1-5). The alternative approach takes into account the average Total Organic Carbon (“TOC”) percentage within Made Ground across the Site, with the average TOC then compared this to Wilson and Card, Table 2, Limiting Values of organic content in Made Ground. The Site was then subsequently determined to be a CS2, i.e. ‘low risk’.

2.7.4 Additional ground gas monitoring will be undertaken prior to construction to confirm the gas and flow rate regime across the Site and gas sampling and laboratory analysis will be undertaken to identify any potential sources of the gas and so validate the results of monitoring. The approach is further defined in **Section 7** below.

2.8 Conceptual Site Model

2.8.1 A Conceptual Site Model is provided in **Appendix 21.B [TR030008/APP/6.4]** and is not repeated here.

3 Outline Remediation Strategy for Known Contamination

3.1 Objectives

3.1.1 The objectives of the Outline Remediation Strategy for the Site for the areas where contamination is known are as follows:

- a. A site that is geo-environmentally suitable for the proposed industrial end use.
- b. That on-site ground gas hazards, where confirmed, and the associated risks to development are mitigated, so that potential risks to human health and development infrastructure are minimised.
- c. That remediation activities are undertaken in such a way as to avoid potential pollution to the environment during works.

3.1.2 The Final Remediation Strategy (or Strategies) will be produced in accordance with this Outline Remediation Strategy and approved by NELC in consultation with the Environment Agency so far as relevant to its functions, before any relevant remediation works are undertaken. The Final Remediation Strategy (or Strategies) may be phased and / or developed by individual Work Numbers (or parts thereof).

3.1.3 The objective for identified remediation relating to individual Work Numbers is to ensure that hazards and related risks from earthworks arisings, including controlled waters pollution hazards, are managed by measures which are specifically relevant to each Work Number and, where necessary, independently of other Work Numbers.

3.2 Known contamination relevant to Work No. 3 and response

3.2.1 Geo-environmental test sample results are available for soil, surface water and groundwater samples within the East Site (Work No. 3) as summarised in **Section 2** above.

3.2.2 No exceedances of the GAC for metals, organics or inorganic determinands were identified in soil samples analysed with regards to risks to human health. Therefore, no response is required in respect to soil remediation.

3.2.3 Groundwater samples recorded exceedances of EQS and DWS GAC for chloroform were however recorded. The level and extent of contamination within the groundwater is unknown. There is a risk to shallow water and surface water from chloroform. A discovery strategy based around sampling and testing of groundwater, as described below, will be undertaken, to ascertain what further action is required. Once the discovery strategy has identified the extent of chloroform contamination, ponds, ditches and incidental water shall be drained from Work No. 3 and the water processed through a standard water treatment system and discharged back to either surface water or foul sewer via a discharge permit.

- 3.2.4 Chemical analysis of the incidental water from Work No. 3 shall be carried out at the frequencies given in Table 22 [1/5d] of the DMRB Series 600 Earthworks Specification (Ref 1-7). This suite of determinands to be included in the laboratory analysis of this incidental water is detailed in the notes to Table 22 [1/5d] (Ref 1-7).
- 3.2.5 During the remediation works, it will be necessary to ensure any watercourse close to the working area is protected. The main surface water critical receptor is the Humber Estuary which is located within the marine part of the Site. The North Beck Drain is also located approximately 400 m to the south. Various other surface waters are close to the Site and include an unnamed drain to the north.
- 3.2.6 Uncontaminated surface water run-off will be prevented from entering areas of open excavation in potentially contaminated ground, by means of ditches or bunds, to ensure it does not become contaminated.
- 3.3 Known contamination relevant to Work No. 5 and response
- 3.3.1 Geo-environmental test sample results are available for soil, surface water and groundwater samples within the East Site (Work No. 5) as summarised in **Section 2** above.
- 3.3.2 No exceedances of the GAC for metals, organics or inorganic determinands were identified in soil samples analysed with regards to risks to human health. Therefore, no response is required in respect of soil remediation for Work No. 5.
- 3.3.3 Groundwater samples recorded exceedances of EQS and DWS GAC for ammoniacal nitrogen, and ammonia in the East Site – Hydrogen Production Area (Work No. 5). The level and extent of contamination within the groundwater is currently unknown. There is a risk to shallow water and surface water from ammoniacal nitrogen and ammonia. A discovery strategy based around sampling and testing of groundwater, described below, will be undertaken, to ascertain what further action is required.
- 3.3.4 Once the discovery strategy has identified the extent of ammoniacal nitrogen and ammonia contamination, ponds, ditches and incidental water shall be drained at the Site of Work No. 5 and the water processed through a standard water treatment system and discharged back to either surface water or foul sewer via a discharge permit.
- 3.3.5 Chemical analysis of the incidental water From Work No. 5 shall be carried out at the frequencies given in Table 22 [1/5d] of the DMRB Series 600 Earthworks Specification (Ref 1-7). This suite of determinands to be included in the laboratory analysis of this incidental water is detailed in the notes to Table 22 [1/5d] (Ref 1-7).
- 3.3.6 The measures to protect watercourses described for Work No. 3 (see above) are also relevant to Work No. 5.

4 Procedures for any unanticipated contamination

4.1 Identifying possible contamination

- 4.1.1 This section addresses the procedures if any unexpected contamination is encountered within individual Work Number areas, at any time during the works at the Site, that was not previously identified. If unexpected contamination is suspected, an investigation and a risk assessment will be undertaken to characterise the contamination within the relevant Work Number. Where remediation is considered necessary, a remediation scheme will be prepared and agreed with the relevant authorities in accordance with the Requirement secured by the **draft DCO [TR030008/APP/2.1]**.
- 4.1.2 Main works activities in the relevant part of the designated Work Number area shall be stopped immediately and the incident reported to the Site Manager, in the event one or more of the following are found:
- Discoloured or oily soil (chemical or oil residues).
 - The soil, or components of, has a fibrous texture (asbestos) (other than known loose fibres of asbestos known to be present in Work No 3, which are covered in **Appendix E – Outline Asbestos Management Plan** to the Outline Construction Environmental Management Plan [TR030008/APP/6.5])
 - Presence of foreign objects (chemical/oil containers).
 - Evidence of underground structures and tanks.
 - Existence of waste pits or landfill material.
 - Old drain runs and potential contamination within building, tanks, and flues.
- 4.1.3 In these circumstances, the Site Manager must contact the Health and Safety Manager and Environmental Manager for expert advice.
- 4.1.4 Where unanticipated areas of potential contamination are identified within designated Work Number areas then the process set out here will be followed:
- Delineation and sample area of potentially contaminated material.
 - Demarcation of potentially contaminated area, with access restricted to key personnel with appropriate PPE.
 - Excavation, aeration and oxidation of material.
 - Sampling for, and undertaking chemical analysis.
 - Assessment of chemical data.
 - Sentencing for re-use within the scheme [subject to passing re-use acceptability criteria], remediation or offsite disposal, as necessary.

- 4.1.5 The location, depth, and extent of any such unanticipated contamination encountered will be recorded using the testing protocols outlined in **Section 6** below, including the results of chemical testing, the volumes sentenced for treatment by remediation, the validation data showing compliance with the relevant RACs and the location of the designated Work Number area of use of the remediated material within the scheme, or the details of off-site disposal of the impacted materials.

5 Testing of soils

5.1 Introduction

5.1.1 This section sets out the requirements for geochemical sampling and testing of earthworks materials at point of excavation where contamination is either known (see **Section 3**) or suspected (see **Section 4**). The sampling will be supervised by a suitably qualified Engineer and the results will be recorded in a verification report. The duties of the Engineer will be defined in the Final Remediation Strategy.

5.2 Soil testing

5.2.1 Sampling and testing shall be undertaken in accordance with the specification presented in Table 1/5b of the DMRB Series 600 Earthworks Specification (Ref 1-7). This table also presents the scope and frequency of testing of soils at point of excavation and again at point of placement as verification.

5.2.2 Testing of all earthwork materials shall be undertaken at a minimum frequency listed in Table 1/5b of the DMRB Series 600 Earthworks Specification (Ref 1-7).

5.2.3 All earthworks materials shall be subject to geochemical testing at point of excavation, at point of placement and following any treatment.

5.2.4 Where, at the point of excavation, exceedances of the RACs are identified following statistical analysis then additional trial pits shall be undertaken around the area exhibiting elevated concentrations and samples taken at the appropriate depths in order to delineate the zone of exceedances.

5.2.5 The Final Remediation Strategy for areas of known contamination Work No. 3 and Work No.5 and the strategies for any additional areas where contamination is confirmed, will define the soil and leachate analysis suites, together with the required limits of detection and relevant determinands.

5.2.6 The geochemical suitability of all earthworks materials to be used in the Project are to be assessed against Site specific soil Reuse Acceptability Criteria ("RAC") derived for risks to a Commercial/Industrial end-uses.

5.2.7 The soil RAC for means of assessing human health risk from soils have been selected based on in-house GAC derived using the Contaminated Land Exposure Assessment (CLEA) v1.07 software (Ref 1-13) (utilising toxicological and chemical parameter information from various sources including the EA, LQM/CIEH and CL:AIRE). The GAC provide a conservative Tier 2 screening assessment against which to compare the levels of contaminants recorded.

Soil Leachate Concentration

5.2.8 The chemical suitability of soil leachate (solutes from soil pore water) concentrations will initially be assessed against Tier 2 Assessment Criteria based on EQS and DWS. Leachate testing is to be undertaken to provide corroborative data that controlled waters will not be impacted by the earthworks. The reuse acceptability criteria for soil leachate will be defined in the Final Remediation Strategy.

Total Soil Concentration

- 5.2.9 Compliance targets for the listed substances in materials located at depths greater than 1m below formation level may exceed the RAC [to be defined in the Final Remediation Strategy] but no hydrocarbon free product may be present within the soil materials, nor may materials be present which contain volatile substances exceeding the relevant RACs.

Free Product

- 5.2.10 Where specific organic determinands are recorded at concentrations below the RAC but above the theoretical soil saturation limit then assessment shall be made as to the presence of free product within the soil matrix.
- 5.2.11 No Site won materials and/or imported soils or materials shall be used within the bulk earthworks, where free product hydrocarbons are identified.

Contaminant Odour and Volatility

- 5.2.12 No material shall be used in the works within 1m of the formation level, irrespective of whether the concentrations of organic determinands are within the RAC, should this material have the potential to give rise to odour nuisance.
- 5.2.13 Materials exhibiting exceedances of metal/inorganic or non/negligibly volatile organic RAC for public open space end-uses shall be deemed geochemically suitable for use at depths greater than 1m below the formation level.
- 5.2.14 The Final Remediation Strategy (or Strategies) will summarise the main contaminants in terms of volatility. An assessment as to their potential volatility shall be made before determining final placement or disposal options for the material in question. Materials containing potential volatile contaminants may be placed at depth subject to a site-specific risk assessment indicating that the potential risk is acceptable.

6 Ground Gas

- 6.1.1 The Ground Gas Risk Assessment (Ref 1-5) (RB17 methodology) using the average TOC of 1.25% in Made Ground has classified the Site areas as Characteristic Situation CS2. This is defined as a low risk associated with ground gas.
- 6.1.2 It is anticipated that buildings will be designed for a Characteristic Situation CS2 unless the further ground gas risk assessment revises the designation of the Site. The Characteristic Situation rating is based on the CL:AIRE RB17 (Ref 1-5) methodology and is anticipated to represent the worst-case scenario. The risk relating to the accumulation of ground gas across the Site is considered to be present during construction and potentially also during the operational phase if confined/enclosed spaces are present.
- 6.1.3 During construction, access to confined spaces and excavations would be restricted. Where work in confined spaces is unavoidable, a site-specific and task specific risk assessment would be undertaken prior to the commencement of the works. This assessment would cover potential risks to both the construction staff and the local population. Monitoring of confined spaces for potential ground gas accumulation would be carried out and the works should be undertaken by suitably trained personnel with the use of specialist personal protective equipment where necessary.

7 Offsite disposal

- 7.1.1 All wastes to be disposed of off-Site shall be subject to basic waste characterisation (e.g. source and origin of waste, composition of the waste, and the relevant European waste code) and WAC testing at the frequencies given in Table 1/5b in accordance with the Environmental Permitting (England and Wales) Regulations 2016 (Ref 1-10). It is anticipated that materials will be reused where possible and there will be limited disposal off-Site.
- 7.1.2 The Final Remediation Strategy will provide the statutory limits (Ref 1-9) from The Landfill (England and Wales) (Amendment) Regulations 2005 that apply to the waste acceptance criteria. Waste materials shall only be disposed of at the appropriate classification of landfill for that type of waste. The landfill operator shall be issued with the basic characterisation and WAC testing results for review before disposal.
- 7.1.3 Before off-site disposal, materials requiring pre-treatment in accordance with applicable legislation will be pre-treated. Pre-treatment may take the form of the following combination of processes which shall be in accordance with applicable requirements of the landfill operator and Environment Agency:
- a. Removal and separate disposal of identified free product where these can be practicably separated from the soil matrix.
 - b. Possible soil washing and screening to remove oversize brick, concrete and hardcore.
- 7.1.4 All off-site disposal of waste shall be undertaken by an appropriately registered waste carrier and each transfer shall be accompanied by a waste transfer note in accordance with The Waste (England and Wales) Regulations 2011 (Ref 1-12).

8 Monitoring Requirements

8.1 Groundwater and Surface Water

- 8.1.1 A programme of groundwater monitoring and surface water monitoring shall be carried out during the remediation works for Work No. 3, Work No. 5 and for any other remediation works at locations where unexpected contamination poses a substantive risk to water bodies. The Final Remediation Strategy (or Strategies) will define the range of determinands and the frequency of testing but will be based in the first instance on the suite of determinands and frequencies in Table 1/5D of the Highways Agency Series 600 Earthworks Specification (Ref 1-7).
- 8.1.2 All incidental groundwater in such areas shall be subject to sampling and subsequent laboratory analysis. Samples shall be obtained from holding tank(s) and/or storage lagoons.
- 8.1.3 All water chemical testing data from such areas shall be presented to the Engineer in a standard electronic format within 24 hours of receiving the test results.
- 8.1.4 The chemical suitability of the groundwater and surface water is to be initially assessed against Tier 2 Assessment Criteria based initially on EQS.
- 8.1.5 If free product is encountered during sampling from a groundwater monitoring well additional sampling and/or assessment may be required.
- 8.1.6 No free product, whether light non-aqueous phase liquids or dense non-aqueous phase liquids, shall be acceptable in incidental groundwater. If either is present the groundwater shall be remediated prior to discharge.

9 Verification Strategy

- 9.1.1 A verification report (or reports) will be prepared to evidence completion and effectiveness of the remediation works undertaken and to demonstrate that the Site is suitable for the proposed industrial use. The verification report(s), are secured by a Requirement included in the draft DCO [TR030008/APP/2.1] and the report(s) will be in accordance with the measures set out in this Strategy.
- 9.1.2 The verification report(s) for the works associated with land remediation shall include the following (where relevant):
- a. A general description of the ground improvement works.
 - b. Details of all remediation technologies used on the Site including results.
 - c. Results of all geochemical and geotechnical testing relating to all Site-won, imported and treated materials.
 - d. The results of the assessments of material acceptability.
 - e. Details of the final placement of Site-won or imported materials (linked to the assessment of material acceptability).
 - f. Details of the materials sent for off-Site disposal; including waste classification, volumes and disposal location.
 - g. Results of all WAC testing.
 - h. The monitoring records and laboratory analysis results for all the ground gas, groundwater and surface water monitoring.
 - i. Details of any alterations/amendments made to the Final Remediation Strategy (or Strategies).
 - j. Details of any contingencies undertaken during the works.
 - k. Details of all correspondence with the regulator authorities during the works.
 - l. As-built drawings showing surveyed finished ground levels and areas of ground improvements works and tests carried out.

10 References

- Ref 1-1 AECOM (2022). Immingham NH3 Project Development Appraisal Report, 60673509-GTN-DAR-001 Revision 00.
- Ref 1-2 AECOM (2023). Immingham Ammonia Import Terminal. Ground Investigation Report. Air Products PLC. 60687114.
- Ref 1-3 British Standards Institution (2019). BS8485:2015+A1:2019 Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings.
- Ref 1-4 Construction Industry Research and Information Association (CIRIA) (2007). C665. Assessing risks posed by hazardous ground gases to buildings .
- Ref 1-5 CL:AIRE (2012). RB17 A Pragmatic Approach to Ground Gas Risk Assessment.
- Ref 1-6 Geotechnical Engineering Limited (2023). AP Ammonia Import Terminal Factual Ground Investigation Report, 37312.
- Ref 1-7 Highways England (2016). Series NG 600 Earthworks.
- Ref 1-8 SoBRA (2020). Development of Acute Generic Assessment Criteria for Assessing Risks to Human Health from Contaminants in Soil, Version 2.0. Society of Brownfield Risk Assessment.
- Ref 1-9 UK Statutory Instruments (2005). The Landfill (England and Wales) (Amendment) Regulations 2005.
- Ref 1-10 UK Statutory Instruments (2016). The Environmental Permitting (England and Wales) Regulations.
- Ref 1-11 Environment Agency, Natural Resources Wales and Scottish Environment Protection Agency (SEPA) (2021). Guidance on the classification and assessment of waste (1st Edition v1.2.GB) Technical Guidance WM3.
- Ref 1-12 UK Statutory Instruments (2011). The Waste (England and Wales) Regulations 2011.
- Ref 1-13 Environment Agency (2015). Contaminated Land Exposure Assessment (CLEA) Tool version 1.07.