Immingham Green Energy Terminal
Green Hydrogen Production Facility

EPR/VP3425SV/A001

Environmental Permit Application

Appendix B – Site Condition and Baseline Report

Environmental Permitting (England and Wales) Regulations 2016

Applicant: Air Products BR Ltd

September 2024

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Revision 1	01 March 2024	EPR Application
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1 Report Context

1.1 Introduction

1.1.1 This document has been prepared by AECOM Limited ('AECOM') on behalf of Air Products (BR) Limited ('APBRL'), referred to as 'the Operator', in support of an Environmental Permit application for the proposed Green Hydrogen (H_2) Production Facility ('proposed installation') which forms part of the wider Immingham Green Energy Terminal ('IGET') Nationally Significant Infrastructure Project (NSIP) being developed by Associated British Ports ('ABP') on the eastern side of the Port of Immingham, situated in northeast Lincolnshire on the south bank of the Humber Estuary.

1.1.2 This report has been prepared to support the permit application and details the history and current state of the site and surrounding land. The report should be read in conjunction with other supporting application documents.

1.2 Proposed Installation

1.2.1 The proposed installation comprises the development of a green H_2 production facility which includes infrastructure for the offloading and transfer of green ammonia (NH_3) from ships to ammonia storage facilities, the main H_2 production facility and vehicle and trailer H_2 refuelling facilities.

1.2.2 The proposed installation will be located in North East Lincolnshire on the south bank of the Humber Estuary on the eastern side of the Port of Immingham. The installation location will be approximately centred on National Grid Reference (NGR) E520783 N415271.

1.2.3 The environmental permit application is therefore for an H_2 production facility which comprises the following within the installation boundary:

- NH3 ship offloading infrastructure to facilitate the receipt of NH3 for H2 production. The offloading infrastructure will be located on a new jetty being constructed by Associated British Ports (ABP). Only the offloading infrastructure is incorporated in the application and the jetty itself remains outside the installation boundary.
- NH3 transfer pipeline which links the ship offloading infrastructure with the NH3 storage tanks located on the east site.
- East site which comprises:
    - (a) a NH_3 storage tank and related plant including an NH_3 tank flare stack and oil-off gas compression system to liquefy the generated boil-off gas during offloading from Ship and static boil-off from Ammonia Tank .
    - (b) H_2 production facility comprising up to three H_2 production units including associated flue gas and flare stacks.
    - (c) Power distribution buildings for NH_3 and H_2 production plant.
    - (d) Instrumentation buildings for NH_3 and H_2 processes.
    - (e) Analyser shelters for the H_2 production plant.
    - (f) Pipe-racks, pipelines, pipes, utilities and other infrastructure associated with both NH_3 and H_2 equipment.
    - (g) Welfare facility.

- West site which comprises:
  - (a) H_2 production facility comprising up to three H_2 production units including associated flue gas and flare stacks.
  - (b) Up to four liquefier units.
  - (c) H_2 storage tanks.
  - (d) H_2 trailer filling stations.
  - (e) H_2 vent stack and associated process equipment.
  - (f) H_2 vehicle and trailer filling stations.
  - (g) H_2 compressors and associated process equipment.
  - (h) Control room and workshop building.
  - (i) Security and visitor building.
  - (j) Contractor building.
  - (k) Warehouse.
  - (l) Driver administration building.
  - (m) Safe haven building.
  - (n) Electrical substation and metering station.
  - (o) Power distribution buildings.
  - (p) Process instrumentation buildings.
  - (q) Analyser buildings.
  - (r) Process and utility plant including cooling towers and pumps, fire water tank, instrument air equipment, pipe racks, pipelines, pipes, cable racks, utilities and other infrastructure nitrogen generation package (HPN) with LIN Tank and LIN Vaporizers and steam generation package.
- Pipeline corridor for underground pipelines, pipes, cables and other conducting media for the transfer of NH_3, H_2, nitrogen (N_2) and utilities, with cathodic protection against saline corrosion.

1.2.4 Prior to construction of the above infrastructure, the land will be raised by 0.3m in the northern part of the East Site and 0.6m in the southern part of the East Site, giving finished ground levels of approximately 3.8mAOD and 3.6mAOD. Additionally, the West Site will be raised to a final ground level of approximately 2.5mAOD.

2 Site Details

2.1 The Site

2.1.1 The details of the site are summarising in below:

Table 2-1 Details of the Installation

Details of the Installation	
Name of the applicant	Air Products (BR) Limited
Name of the installation	Immingham Green Energy Terminal (IGET) Hydrogen Production Facility
Activity address	Land Off Queens Road Immingham Northeast Lincolnshire DN40 1QR
National grid reference	E520783 N415271

2.2 Application Document References

Table 2-2 Document References

Document Reference and Dates for SCR at Permit Application	• VP3425SV/APP/SCBR Site Condition and Baseline Report • Groundsure Report (Appendix A) • MAGIC Search (Appendix B) • EA Nature and Heritage Screen (Appendix C) • ALC Survey (Appendix D) • Phase II Ground Investigation Interpretative Report (Appendix E)
Document References for Site Plans	• Figure 1 Site Location Plan • Figure 2 Installation Boundary • Figure 3 Site Layout • Figure 5 Human and Nature Receptor Plan • Figure 6 Human Receptor Plan • IGET ES CH18 Fig18-2 EA Flood Map for Planning • IGET ES Fig18-3 EA Surface Water Flooding • 60673509-ACM-XX-XX-0002 West Site Drainage Plan • 60673509-ACM-XX-XX-0003 East Site Drainage Plan • 60673509-ACM-XX-XX-0004 Existing Drainage Pathways • IGET ES CH21 Fig21-1 Superficial Geology Artificial Geology • IGET ES CH21 Fig21-2 Bedrock Geology • IGET ES CH21 Fig21-3 Groundwater Features • IGET ES CH21 Fig21-4 West Site Constraints Plan • IGET ES CH21 Fig21-5 East Site Constraints Plan • IGET ES CH21 Fig21-6 Source Protection Zones • IGET ES CH21 Fig21-7 Agricultural Land Classification • IGET ES CH21 Fig21-8 Previous Ground Investigations

2.3 Site Location

2.3.1 The proposed installation will be located in North East Lincolnshire on the south bank of the Humber Estuary on the eastern side of the Port of Immingham. This is shown on Figure 1, Supporting Statement, Appendix A.

2.3.2 The proposed Jetty and proposed installation will be located to the east of the existing Immingham Oil Terminal jetty. This area falls within the boundaries of the Humber Estuary Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar Site, which collectively form the Humber European Marine Site (EMS).

2.3.3 A proposed Pipeline Corridor will connect the West Site to the East Site and will extend to the Terminal (see Appendix A Figure 2). It crosses an area that has mostly already been impacted by industrial development alongside Queens Road and Laporte Road, and also crosses the Grimsby Docks Branch Line. At the eastern end, the Pipeline Corridor area includes a section of woodland known as 'Long Strip' between Laporte Road and the Humber Estuary that is subject to a Tree Preservation Order (TPO).

2.3.4 The East Site comprises two parcels of land, which are bisected by Laporte Road. The first parcel of land consists of an area of hardstanding to the north of Laporte Road which is in use by the Applicant as a storage area. The second parcel of land is a triangular shaped area of brownfield land that is currently covered by gravel and various stockpiles, which is accessed via Queens Road (A1173) and lies to the south of Laporte Road. The Associated Petroleum Terminals works complex is situated to the north/north-east of the East Site, whilst to the south are various industrial facilities. To the west and north-west is the Port and associated industrial facilities and the 'Immingham Dock East Gate' Port entry point from Queens Road. To the east the East Site is bordered by a woodland belt which is subject to a Tree Preservation Order (TPO), and through which a bridleway passes, connecting users to a coastal access path that follows the Humber Estuary east to Grimsby.

2.3.5 The West Site currently comprises three agricultural fields, which are bounded by linear hedgerows and drainage ditches. An electrical sub-station and a gas-fired power generator proposed installation are situated to the north-west. The north west and western boundaries of the West Site are defined by Kings Road and the A1173. A landfill is located to the south separated by a landscape buffer strip. Queens Road forms the north-eastern boundary of the West Site with a number of residential and commercial properties included within the Site boundary. The east and south-eastern boundary is adjacent to another gas fired power generator proposed installation, the community recycling centre and a large waste gypsum landfill. A short tarmac access road has been constructed from Kings Road into the West Site and a series of overhead power cables run across the middle and southern boundary of the site, with a buried mains water and a buried high-pressure gas pipeline also along the southern boundary.

2.4 Surrounding Area

2.4.1 The area surrounding the Port is industrial in nature and dominated by chemical manufacturing, oil processing and power generation facilities. Residential and commercial properties are present to the south of the Port

on Queens Road and lie within, and adjacent to, the proposed site boundary. Beyond the industrial facilities, the wider area is largely agricultural. The nearest residential area is on the eastern edge of the town of Immingham approximately 460m from the western edge of the Site.

2.4.2 The closest receptors to the Site boundary include ten residential properties located on the west side of Queens Road:

- Houses at Numbers 1-5 and 31 Queens Road (six houses in total).
- Number 6 Queens Road (two flats in total).
- Numbers 7-8 (one flat) and 18 Queens Road (one flat). Numbers 7-8 Queens Road contains vacant commercial premises at ground floor level. The ground floor at 18 Queens Road is understood to be used by the owner for storage.

2.4.3 Residential properties on the eastern edge of Immingham, including Somerton Road, Worsley Road, Dunster Walk, Ings Lane, Oakham Walk, Kendal Road, Chestnut Avenue, Waterworks Street and Spring Street, which at the closest point are located between approximately 460m and 480m west of the West Site.

2.4.4 Mauxhall Farm off Stallingborough Road, located approximately 1km south-west of the West Site.

2.4.5 Other settlements nearby include Grimsby (approximately 5km) to the southeast; Healing (approximately 3.5km) and Great Coates (approximately 5.5km) to the south-east; Stallingborough (approximately 2.5km) to the south; Keelby (approximately 5km) to the south-west; and Habrough (approximately 4.5km) to the west.

2.4.6 The residential use of certain properties on the west side of Queens Road would need to cease as residential use is not considered to be compatible with the operation of the hydrogen production facility on the West Site (based on an assessment undertaken on behalf of Air Products). This matter is covered in the Development Consent Order application reference TR030008

2.4.7 There are a number of other business/commercial receptors adjacent to the Site Boundary in the vicinity of Queens Road. It is considered that the continued use of these business / commercial properties would be compatible with the operation of the hydrogen production facility following assessments undertaken on behalf of Air Products.

2.4.8 The Humber Estuary forms the north-eastern boundary of the Site. There are also a number of surface water features within the vicinity of the Site. The North Beck Drain is located immediately east from the site and the Habrough Marsh Drain is to the west of the site. Middle Drain is also located in the vicinity of the Site.

3 Condition of Land at Permit Issue

3.1.1 The following sections detail the sources of desk study information searched in order to describe the condition of the site and, in particular, to determine the potential for substances to be present in, on or under the land associated with present and past uses of the site and its surrounding areas.

3.2 Environmental Consents, Permits and Designations

3.2.1 A Groundsure Report for the site is reproduced in Appendix A. This report provides extensive information and details on:

- waste management licences;
- environmental permits;
- discharge consents;
- groundwater vulnerability;
- trade effluent consents;
- records of any land pollution incidents associated with the site; and
- sensitive land uses

3.2.2 The Multi-Agency Geographic Information for the Countryside (Magic) website was searched to provide details of any:

- European Nature Conservation Sites;
- Special Protection Areas (SPAs);
- Special Areas of Conservation (SACs);
- RAMSAR sites; and
- Sites of Special Scientific Interest (SSSIs).

3.2.3 The search was completed for a 2km and a 10km radius of the site boundary, and the results are contained in Appendix B – these were confirmed by a Nature and Heritage screen completed by the EA during the pre-application process which is attached in Appendix C. In summary the searches identified:

- Part of the Site boundary is within the boundary of the Humber Estuary EMS, which is a statutory designated site that encompasses the Humber Estuary SPA, SAC, RAMSAR and Site of Special Scientific Interest (SSSI) designations.
- Laporte Road Brownfield Site Local Wildlife Site (LWS) is located approximately 150m south-east of the Site. The site is also sits on a Wild Bird General Licence Protected Sites Condition Zone.
- North Killingholme Haven Pits SSSI is located approximately 6.5km from the East Site.
- Homestead Park Pond LWS which is woodland and freshwater habitat located approximately 1.8 km from the West Site.
- Woodland and freshwater habitat within a LWS located off Rosper Road approximately 2.3 km from the West Site.
- Cress Marsh LWS is a grassland habitat located approximately 3km from the East and West sites.

3.3 Environmental Setting

Geology

3.3.1 Information from the Provisional Agricultural Land Classification Grade map classifies the East Site as being underlain by urban soils. Most of the West site has been designated as Grade 3b (moderate quality land). A small area of land parallel to and including the properties on Queens Road is designated as Grade Urban.

3.3.2 Although not mapped, Artificial Ground is anticipated to be widespread across the installation site and is associated with the long historical industrial use of the site.

3.3.3 The Coal Authority Interactive Viewer indicates the landside infrastructure areas within the Site are not within a Coal Mining Reporting Area or within a Development High Risk Area. The information does, however, identify the Humber Estuary as designated as a Coal Mining Reporting Area and the marine infrastructure areas therefore lie within an area which may contain unrecorded coal mining related hazards.

3.3.4 The geology beneath the Site is shown on the BGS GeoIndex (Onshore) Map, BGS 1:50,000 Sheet 81 (and including parts of Sheets 82 and 90) (Partington) and on the 1:50,000 Geology Maps provided as part of the Groundsure Report (GS-9009838). The maps show the Site to be underlain by three types of superficial deposits, Beach and Tidal Flat deposits, Tidal Flat Deposits and Devensian Till

3.3.5 The BGS maps show the bedrock geology underlying the Site to be Flamborough Chalk Formation and Burnham Chalk Formation.

3.3.6 A summary of the superficial and bedrock deposit underlying the site, in order of occurrence, is shown below:

Table 3-1 The superficial and bedrock deposit underlying the Site

Stratum		Expected Location	Description (according to the BGS Lexicon of Named Rock Units)
Artificial	Made Ground (Undivided) Artificial Deposit	Made Ground (Undivided) is shown on the BGS GeoIndex in the western half of the East Site. Although it is not mapped across most of the Site, Made Ground is anticipated to be present across the majority of the Site.	Made Ground is described as “an area where the pre-existing (natural or artificial) land surface is raised by artificial deposits. The purpose of the made ground is unspecified. Variable composition.”
Superficial Deposits	Beach and Tidal Flat Deposits (Clay, Silt and Sand)	Not found beneath the East or West Sites. Deposits found in various areas along the bank of the Humber Estuary, mainly not included in this permit application.	Beach and Tidal Flat Deposits are described as “composite of ‘Beach deposits’: Shingle, sand, silt, and clay; may be bedded or chaotic; beach deposits may be in the form of dunes, sheets or banks, and ‘Tidal Flat Deposits’: commonly silt and clay with sand

Stratum		Expected Location	Description (according to the BGS Lexicon of Named Rock Units)
			and gravel layers; possible peat layers; from the tidal zone".
	Tidal Flat Deposits (Clay and Silt)	Entire Site, apart from the bank of the Humber Estuary.	Tidal Flat Deposits are described as "unconsolidated sediment, mainly mud and/or sand. They may form the top surface of a deltaic deposit. Normally a consolidated soft silty clay, with layers of sand, gravel, and peat."
	Devensian Till (Diamicton)	Entire Site, underlying the Tidal Flat Deposits.	There is no description on the BGS Lexicon of Named Rock Units. Till usually comprises clay, sand, gravel, and boulders.
Bedrock	Flamborough Chalk Formation	The BGS GeoIndex indicates the Flamborough Chalk Formation is present beneath most of the Site, mainly the East Site, underlying the Devensian Till. However, the BGS Sheet 81 for Patrington 1:50,000 Map (Ref 21-6) indicates that the Flamborough Chalk Formation is present across most of the Site, apart from a thin strip along the western boundary of the West Site.	The Flamborough Chalk Formation is described as "White, well-bedded, flint-free chalk with common marl seams (typically about one per metre). Common stylolitic surfaces and pyrite nodules."
	Burnham Chalk Formation	The Burnham Chalk Formation underlies the Flamborough Chalk Formation across the entire Site and underlies the western boundary of the West Site.	The Burnham Chalk Formation is described as "white, thinly bedded chalk with common tabular and discontinuous flint bands; sporadic marl seams."

3.3.7 There is one historic landfill 100m to the north of the project on the northern side of the railway line (i.e. Dock South East, Immingham). First waste inputs to the landfill occurred in 1986, whilst the licence was surrendered in 1990. The landfill was licensed to accept inert and industrial waste.

3.3.8 There is also a mid- 20th century landfill site, Immingham H.C.C Landfill (MNL1063) and is recorded on the southern edge of the West Site, the very northern extent of this asset overlapping with the southern boundary of West Site. The extent of the landfill is visible today as a series of earthworks and "scars".

3.3.9 The Site has been classified as a Negligible risk for collapsible ground stability hazards and ground dissolution hazards and has been classified as a Very Low risk associated with landslide ground stability hazards.

Hydrogeology

3.3.10 The EA Groundwater Protection Policy adopts aquifer designations consistent with the Water Framework Directive.

3.3.11 According to this system the Beach and Tidal Flat Deposits are classified as Secondary (Undifferentiated) Aquifers. The Tidal Flat Deposits are classified as an Unproductive Aquifer. The Flamborough Chalk Formation and Burnham Chalk Formation are classed as Principal Aquifers; these are layers of sedimentary rock deposit that have high fracture permeability meaning they usually provide a high level of water storage. They may support water supply and / or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifers.

3.3.12 An SPZ 1 (Inner Catchment) is located in the southern half of the Site including the West Site, near Queens Road. The EA describes an SPZ 1 as a "50 day travel time of pollutant to source with a 50m default minimum radius". An SPZ 2 (Outer Catchment) radiates out from the SPZ 1 towards the south, and encompasses the southern half of the Site, including the West Site. The EA describe an SPZ 2 as a "400 day travel time of pollutant to source. This has a 250 or 500m minimum radius around the source depending on the amount of water taken". An SPZ 3 (Total Catchment) is located around the SPZ 2, and encompasses the remainder of the Site, including the East Site. The EA describe an SPZ 3 as "the area around a supply source within which all the groundwater ends up at the abstraction point."

Hydrology

3.3.13 The Humber Estuary is approximately 0.3km northeast of the East Site boundary.

3.3.14 Mapping of fluvial flood extents shows the Site is located in Flood Zone 1 (low risk) and only small areas of surface water flooding from low to high risk associated with topographical low spots and constrained to watercourse corridors.

3.3.15 The Environment Agency Flood Map for Planning shows the Site is located in a Flood Zone 3a (tidal) when the tidal flood defences are not accounted for. The Site benefits from the presence of flood defences up to and including the 0.5% AEP flood event, therefore the actual risk of flooding to the Site from tidal sources is low. However, there remains a residual risk of flooding should there be overtopping or a breach in the flood defences.

3.3.16 There are no historical flood records from groundwater flooding within the Site or the wider Port of Immingham area, whilst the Site is also at very low to low risk of flooding from surface water sources.

3.3.17 Anglian Water asset mapping shows that there is no surface water drainage infrastructure operated by them within the Site. An Anglian Water foul sewer main and the Immingham Sea Outfall are located in proximity to the Site. Surface water from hard standing areas is generally discharged directly to the adjacent watercourses and ultimately to the Humber Estuary, or directly to the Humber Estuary.

3.4 Pollution History

Pollution incidents which may have affected the land

3.4.1 The following pollution incidents are recorded on the Site and within 500m of the Site Boundary:

(a) A pollution incident was recorded on 21 February 2003 associated with adhesives approximately 15m northwest from the Site. The land and air impact were recorded as Category 4 (No Impact) and the water impact was recorded as Category 3 (Minor).

(b) A pollution incident occurred on 20 August 2001 approximately 78m northwest associated with oils and fuels. The water impact was recorded as Category 3 (Minor) and the air and land impact was recorded as Category 4 (No Impact). Another pollution incident occurred on 27 June 2003 approximately 79m southeast associated with organic chemicals / products. The air impact was recorded as Category 3 (Minor) and the water and land impact was recorded as Category 4 (No Impact). A pollution incident occurred on 25 July 2002 approximately 339m southeast associated with specific waste materials. The water, land and air impact were recorded as Category 4 (No Impact).

Historical Land Uses and possible associated contaminants

3.4.2 Available historical maps from the Groundsure Report for the Site have been studied to determine the previous land uses within the area of the Site and immediately surrounding the Site Boundary. The mapping shows no notable development on the Site until 1930–31 when residential housing is shown on Queens Road adjacent to the Site boundary. In addition, the L.N.E.R Grimsby District Electric Light Railway is shown through the centre of the Site. A sewage works was established by 1922 adjacent to south of the Site boundary and is still present.

3.4.3 No notable land use changes occurred at the Site until the period 1951–56. At this time a Gypsum Disposal Bed is shown as being present adjacent to the Site Boundary at the south-western extent. Buildings and railway lines associated with a Chemical Factory were shown as being established approximately 350m south-east of the Site Boundary.

3.4.4 By 1964, the Port had developed more extensively, including the establishment of jetties within the Humber, to the west of the area proposed for the proposed Installation. By this time a number of small buildings are mapped as present on the western part of the Site, whilst electricity lines run

through the East Site. No notable changes have occurred within the Site since this period other than further electricity pylons which were erected across the western part of the Site and also pipelines on the northern boundary of the Site which were established during the period 1969–72.

3.4.5 Multiple changes have occurred between 1964 and the present day in areas within 500m of the Site Boundary. The industrial landscape has continued to develop, including but not limited to the establishment of an Oil Storage Depot and associated infrastructure, further structures associated with the sewage works (now an Anglian Water operational facility), pipelines, and most recently, by 2010 the establishment of a Recycling Centre.

3.4.6 Some of the mapped infrastructure including the mapped Chemical Works and associated railway lines have become disused between 1969 and the present day.

Visual and Olfactory evidence of existing and historic contamination

3.4.7 The Immingham BCP Phase 2 Geo-environmental and Geotechnical Site Investigation report by RSK in 2020 noted that there were generally no signs of soil contamination across the Site. Hydrocarbon odours were noted between 1.7m bgl and 2.4m bgl within Made Ground in BH01. Organic odours were observed within Made Ground and Tidal Flat Deposits, and an occasional sulphurous odour was noted within Tidal Flat Deposits.

3.4.8 During the Ground Investigation undertaken by Geotechnical Engineering Limited (supervised by AECOM) on the East Site and West Site, an ammonia odour was detected within the Made Ground.

Other Potentially Contaminative Industries

3.4.9 An active landfill is partially located on the eastern side of the Site Boundary. The landfill is operated by Integrated Waste Management Ltd with a capacity of >25,000 tonnes excluding inert waste. The status is recorded as effective.

3.4.10 The border of a historical gypsum disposal bed waste site encroaches on the south-eastern side of the Site Boundary, within the West Site and Pipeline Corridor of the site. A further historical waste site (landfill works) is located within the Site Boundary in the West Site. A waste transfer station is located 458m east from the Site.

3.4.11 Two historical landfill sites are recorded on the south eastern boundary of the West Site and Pipeline Corridor and 369m southeast from the West Site within the Site, associated with refuse tips. A further historical landfill is located approximately 92m northwest from the proposed pipeline route within the Site associated with inert and industrial waste. The last input date was recorded as 31 December 1990.

3.4.12 There are five licenced waste sites located between 41m and 304m from the Site Boundary:

(a) Immingham Household Waste Recycling Centre encroaches within the Pipeline Corridor and Queens Road Temporary Construction Area, and is associated with household, commercial and industrial waste with a capacity for 25,000 tonnes. The status is recorded as ‘modified’.

(b) Immingham Landfill Site is located 41m southeast from the West Site associated with household, commercial and industrial waste with a capacity of 25,000 tonnes. The permit status is recorded as To Pollution Prevention Control ("PPC").

(c) Sandstop Recycling is located approximately 98m northwest from the Queens Road Temporary Construction Area (Work No. 8) and is associated with inert and excavation waste and treatment with a capacity of 25,000 tonnes. The status is recorded as 'surrendered' dated March 2017.

(d) Immingham Oil Terminal is located approximately 108m north from the East Site Hydrogen Production site (Work No. 5 and 5-A) and is associated with household, commercial and industrial waste with a capacity of 75,000 tonnes. The status is recorded as 'modified'.

(e) Immingham Landfill Site is located approximately 213m southeast from the West Site and is associated with a co-disposal landfill site and household, commercial and industrial waste. The capacity of the co-disposal site is recorded as 75,000 tonnes and the capacity of the household, commercial and industrial waste site is recorded as 25,000 tonnes. The permit status of the site is recorded as Integrated Pollution Prevention and Control ("IPPC").

3.4.13 Immingham Dock Special Waste Transfer Station is located approximately 304m north from the East Site with a 25,000-tonne capacity. The status is recorded as 'surrendered' dated March 2000.

3.4.14 There are five records for waste exemptions between 50m and 250m from the Site, and a further twelve between 250m and 500m from the Site Boundary.

Other Regulated Industries

3.4.15 The following regulated processes are recorded within 500m of the Site Boundary:

(a) Recent industrial land uses on the Site include water pumping stations, energy production (landfill gas and a power station), vehicle services (hire, rental, services and repairs), industrial engineers, pylons, a chimney, tools and machine shops, recycling, reclamation and disposal and a gas governor.

(b) Within 50m from the Site Boundary, there are electrical features (pylons, electric sub stations), telecommunications, engineering services, distribution and haulage services, hoppers and silos, gas valve compounds, industrial products, fuel distributors and supplies, moorings and unloading facilities, recycling centres plasterboard manufacturer and a gas governor.

(c) Three current Control of Major Accident Hazards ("COMAH") Upper Tier sites associated with Exolum Immingham Limited and Associated British Ports ("ABP") are recorded within the Site Boundary. An historical Notification of Installations Handling Hazardous Substances ("NIHHS") site is located within the Site Boundary associated with Arkema Coatings Resin Limited.

(d) A current COMAH site is located approximately 23m southeast from the Site Boundary relating to Tronox Pigment UK Limited. A current lower tier COMAH site is operated by Associated British Ports approximately 432m northwest from the Site.

(e) There are three hazardous substance storage/usage sites located at the following locations: approximately 68m south currently associated with Arkema Coatings Ltd; 118m northeast operated by Associated Petroleum Terminals and 365m northwest operated by Origin UK Ltd.

(f) Permits for Integrated Pollution Control records are held approximately 57m northeast for petroleum processes operated by Associated Petroleum Terminals. Permits are held by the following operators approximately 400m south from the Site: Innogy Cogeneration Ltd (for combustion processes); Millennium Inorganic Chemicals Ltd (for acid processes) (revoked) and Npower Cogen Energy Ltd (for combustion processes) (revoked). Millennium Inorganic Chemicals Ltd held permits for halogen processes approximately 486m southeast from the Site.

(g) UK Power Reserve Limited hold a permit for licenced industrial activity (fuel combustion) immediately adjacent to the Site Boundary. There are multiple records for licenced industrial activities within 500m from the Site including Arkema Coatings Resins Limited approximately 80m south; UK Power Reserve Limited approximately 80m southwest; Immingham Power Limited approximately 81m southeast; Associated Petroleum Terminals Ltd approximately 110m north; Associated Petroleum Terminals Ltd approximately 145m northeast; Knauf UK approximately 300m northwest and 370m northwest; North Beck Energy Limited approximately 320m east; Integrated Waste Management approximately 320m southeast; PX Ltd and Npower Cogen Ltd approximately 350m southeast and 380m southeast; and Millennium Inorganic Chemicals, Tronox Pigment UK Ltd and Cristal Pigment UK Ltd approximately 486m southeast.

(h) Knauf UK (Gypsum) hold a permit for other mineral processes within approximately 180m northwest from the Site.

(i) There are no records for radioactive substance authorisations within the Site Boundary. FCC Recycling (UK) Limited have an approved permit for keeping and use of radioactive materials and disposal of radioactive waste. Millennium Inorganic Chemicals Ltd held a permit for radioactive substance authorisations for the disposal of radioactive waste approximately 480m south. The status is recorded as revoked/cancelled.

(j) Anglian Water Service Limited and Immingham Water Recycling Centre hold permits for licenced discharges to controlled waters for sewage discharges into the River Humber located next to the Site Boundary.

(k) Two permits for licenced discharge into controlled waters were held on the Site Boundary for sewage discharges into an unknown tributary of the North Beck Drain, although these were revoked in May 1995 and December 2000. Further permits are held between 60m northwest and 260m northwest associated with sewage discharges, trade effluent and miscellaneous surface water discharges.

(l) Pollution inventory substance records indicate that Non-Methane Volatile Organic Compounds ("NMVOCs"), methane, nitrogen oxides are reported annually as part of the Queens Road Power Station adjacent to the Site Boundary. Records are provided for reporting thresholds of other substances as a result of the Queens Road landfill which encroaches on the boundary of the Site. In addition records are provided for methane, nitrogen oxides and carbon dioxide relating to Knauf GmBH, a plasterboard manufacturer which is located approximately 100m from the West Site.

(m) Pollution inventory waste transfer records are held immediately adjacent to the Site Boundary associated with the Queen's Road Power Station and Queens Road landfill which are next to the Site Boundary. The descriptions relate to septic tank sludge, mixed municipal waste, street cleaning residues, landfill leachate.

(n) Pollution inventory substance records are held approximately 80m southwest (UK Power Reserve Limited), 81m southeast (Integrated Waste Management Limited), 347m southeast (Tronox Pigment UK Limited) and 367m northwest (Knauf UK).

(o) Pollution inventory waste transfer records are held approximately 80m southwest (UK Power Reserve Limited), 81m southeast (Integrated Waste Management Limited), 347m southeast (Tronox Pigment UK Limited) and 367m northwest (Knauf UK).

(p) List 1 Dangerous Substance, taken from the Groundsure report GS-9009838, records include Riverside Electroplaters who operate a discharge of cadmium into the River Humber located next to the Site Boundary. List 1 Dangerous Substances are held at Immingham Landfill Site and the Tankclean Tankwash site approximately 124m southeast. Immingham Oil Terminal and Millenium Inorganic Chemicals (now Tronox) have authorisation for the discharge of mercury (other) and cadmium approximately 375m northwest and 486m southeast respectively. Immingham STW discharged List 1 Dangerous Substances approximately 124m southeast, however, this is no longer active.

(q) List 2 Dangerous Substance, taken from the Groundsure report GS-9009838, records within 50m of the Site Boundary include historical releases of pH by Jefco Services Ltd approximately 9m northeast and unknown substances by Immingham STW approximately 50m southeast. Associated Petroleum Terminals discharge iron and zinc into the River Humber approximately 59m northwest. Further List 2 Dangerous Substance discharge records are held between approximately 124m southeast and 375m northwest.

Evidence of damage to pollution prevention measures

3.4.16 There is no evidence of damage to pollution prevention measures at the site.

Baseline data

3.4.17 A previous site investigation was conducted by RSK in 2020, however this did not include the areas covered by the permit.

3.4.18 A site investigation was conducted by Geotechnical Engineering Limited (supervised by AECOM) at the East Site and West from November 2022 to February 2023 to inform the design of the project, and information gathered has been used to assist the establishment of baseline conditions at the Site to inform the assessment of the installations impacts and effects. The ALC Survey and Phase II Ground Investigation Interpretative Report are presented in Appendix D and E respectively.

3.4.19 Chemical and geotechnical data from the above site investigation (via site and laboratory testing) has been used to develop a Conceptual Site Model (CSM) and provide adequate, good quality data for undertaking human health, controlled waters and ground gas risk assessments.

3.4.20 The groundwater level monitoring data indicates that groundwater is present in all geological units beneath the Site. Perched groundwater was encountered within Made Ground, mostly within the East Site. No monitoring boreholes were installed within Made Ground in the West Site. Two boreholes were scheduled to be installed within Made Ground – W-BH26 and W-BH31. However, due to shallow depths of Made Ground at these two locations (0.4m bgl and 0.30m bgl respectively) it was not possible to install monitoring boreholes into Made Ground. Groundwater levels within Made Ground varied between ground level and 2.5m bgl. The groundwater levels in boreholes screened within Tidal Flat Deposits within the East Site varied between 33.97m AOD to 1.63m OD. Groundwater levels within Glacial Till Deposits varied between 0.5m OD and 1.06m OD in the West Site and 1.82m OD and 2.65m OD in the East Site. Groundwater levels within monitoring wells within the Flamborough Chalk Formation varied between 0.72m OD and 3.1m OD in the East Site. All nine Chalk monitoring boreholes installed recorded artesian conditions during the monitoring period, except W-BH17 which recorded slightly lower levels (up to 1.46m bgl) on two occasions. The groundwater generally flows in a north-easterly direction towards the Humber Estuary.

3.4.21 Geo-environmental test samples from the East Site show no exceedances of the Generic Assessment Criteria (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 where ground investigation results at the East Site have been received.

3.4.22 Groundwater samples recorded exceedances of Environmental Quality Standards (EQS) and Drinking Water Standards (DWS). GAC for chloroform has been identified in the East Site -Ammonia Storage area. 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 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 at this area of the East Site and the water processed through a standard water treatment system and discharged back to either surface water or foul sewer via a discharge permit.

3.4.23 Geo-environmental test samples from the East Site show 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 in the East Site where ground investigation results have been received.

3.4.24 Groundwater samples recorded exceedances of EQS and DWS GAC for ammoniacal nitrogen, and ammonia in the East Site – Hydrogen Production Area. 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 in Section 8 Controlled Waters Protection will be undertaken, to ascertain what further action is required.

3.4.25 Once the discovery strategy has identified the extent of ammoniacal nitrogen and ammonia contamination, ponds, ditches and incidental water shall be drained at the East Site and the water processed through a standard water treatment system and discharged back to either surface water or foul sewer via a discharge permit.

3.4.26 Ground investigation results from the West Site show no exceedances of GAC in soil.

3.4.27 The proposed installation is to be installed on concrete hardstanding with controlled drains and will use a limited type and quantity of potentially contaminating raw materials which will be stored in appropriately secured and bunded containers, therefore the likelihood of the new operations adversely affecting the surrounding environment is considered to be minimal. Therefore, based on the review of existing ground conditions and proposed installation operations, it is considered that the proposed activities do not pose a significant risk to the environment.

3.4.28 Indicative potential pollution risks from the proposed operations and associated mitigation measures are shown in Section **Error! Reference source not found.**

3.4.29 Reports used for this information include:

- Chapter 21: Ground Conditions and Land Quality, Document Ref. 6.2, Environmental Statement: Volume 6, AECOM Ltd, September 2023
- Appendix 21.C: Outline Remediation Strategy, Document Ref. 6.4, Environmental Statement: Volume I, AECOM Ltd, September 2022
- Groundsure. (2022). Enviro+Geo Insight Report (GS-9009838).

4 Permitted Activities

4.1 Site Permitted Activities

4.1.1 The activities proposed under the environmental permit are summarised in Table 4-1 below:

Table 4-1 Permitted Activities

No	Activity under EPR 2016 Schedule 1	Description of specified activity	Limits of specified activity
A1	Schedule 1, Section 4.2, Part A (1)(i) Production of inorganic chemicals.	Production of hydrogen from green ammonia.	From receipt of ammonia
Directly Associated Activities			
A2	Directly Associated Activity	Offloading of ammonia from ship	Jetty top-side ammonia offloading infrastructure from connection point to ship, through transfer pipework to the ammonia storage tank.
A3	Directly Associated Activity	Raw material storage	From receipt of raw materials to handling, on-site storage and handling for use.
A4	Directly Associated Activity	Hydrogen liquefaction	From receipt of gaseous hydrogen to transport of liquid hydrogen to hydrogen storage tanks.
A5	Directly Associated Activity	Hydrogen Storage	Storage of hydrogen after liquefaction and loading.
A6	Directly Associated Activity	Vehicle and tanker loading	Hydrogen vehicle loading area.
A7	Directly Associated Activity	Surface water management	Handling of site drainage until discharge to the site surface water system.
A8	Directly Associated Activity	Effluent Management	From receipt of process effluent its discharge to foul sewer.
A9	Directly Associated Activity	Emergency generator	Diesel powered generator to provide back-up in the event of a power cut.
A10	Directly Associated Activity	Cooling System	Site wide cooling system and cooling towers.

4.1.2 A number of raw materials are stored on site which have the potential to impact ground and groundwater is not managed appropriately. These are summarised in Table 4-2 below.

Table 4-2 Raw Materials Stored On Site

Material	Hazardous Materials Classification	Hazard Statements	Purpose	Estimated Storage Quantity (tonnes)	Storage Type	Annual Consumption (Waste)
Ammonia solution	Hazardous. Toxic	H314 – Causes severe skin burns and eye damage H335 – May cause respiratory irritation H400 – Very toxic to aquatic life	Process	277 tonnes (for 6 HPUs)	Process unit SCR	6,896 tonnes per year (for 6 HPUs)
Ammonia	Hazardous. Toxic, cryogenic.	H332 – Harmful if inhaled H314 – Causes severe skin burns and eye damage H221 – Flammable Gas H280 – Contains gas under pressure: May explode if heated H400 – Very toxic to aquatic life	Process	59,743 tonnes	Tank	None
Hydrogen	Hazardous. Highly flammable.	H220 – Extremely Flammable Gas H280 – Contains gas under pressure, may explode if heated	Product	248 tonnes	Pressurised tank	None

Material	Hazardous Materials Classification	Hazard Statements	Purpose	Estimated Storage Quantity (tonnes)	Storage Type	Annual Consumption (Waste)
Diesel	Hazardous	H226 – Flammable liquid and vapor. H315 – Causes skin irritation. H304 – May be fatal if swallowed and enters airways. H336 – May cause drowsiness or dizziness. H350 – May cause cancer. H411 – Toxic to aquatic life with long lasting effects. H319 – May cause eye damage/irritation	Common utility	10,000 litres	Tank	<1 tonnes consumed only during power outage scenario
MS Corrosion Inhibitor	Hazardous due to phosphoric acid. Dangerous to the environment.	H290 – May be corrosive to metals H314 – Causes severe skin burns and eye damage H318 – Causes serious eye damage	Cooling water treatment	<1,500 litres	Bunded tank	Approx. 2.33 tonnes per year

Material	Hazardous Materials Classification	Hazard Statements	Purpose	Estimated Storage Quantity (tonnes)	Storage Type	Annual Consumption (Waste)
Cu Inhibitor	Non-hazardous	H314 – Causes severe skin burns and eye damage H318 – Causes serious eye damage H335 – May cause respiratory irritation	Cooling water treatment	<1,500 litres	Bunded tank	Approx. 0.75 kg per year
Scale inhibitor/dispersant	Non-hazardous	No hazard statement(s), no precautionary statement (s) required	Cooling water treatment	<1,500 litres	Bunded tank	Approx. 7.137 tonnes per year
Non-oxidising biocides	Hazardous. Dangerous to the environment.	H319 – Causes eye irritation H312 – May be harmful in contact with skin H302 – Harmful if swallowed H332 – Harmful if inhaled	Cooling water treatment and fire water tank	< 1	Bunded tank	< 1
Propylene Glycol	Dangerous to the environment.	No hazard statement(s), no precautionary statement (s) required	Closed loop cooling system	52.8 tonnes (for 6 HPUs)	Pressurised equipment	<1 for making-up the glycol closed loop losses

Material	Hazardous Materials Classification	Hazard Statements	Purpose	Estimated Storage Quantity (tonnes)	Storage Type	Annual Consumption (Waste)
Sodium hypochloride	Hazardous due to being corrosive and an oxidizer.	H290 – May be corrosive to metals H314 – Causes severe skin burns and eye damage H318 – Causes serious eye damage H400 – Very toxic to aquatic life H411 – Toxic to aquatic life with long lasting effects.	Cooling water treatment	< 5,000 litres	Bunded tank	Approx. 32 tonnes per year
Sulphuric acid 98%	Hazardous. Toxic due to high pH.	H314 – Causes severe skin burns and eye damage H350 – May cause cancer by inhalation H402 – Harmful to aquatic life	Cooling water treatment	< 15,000 litres	Double containment tank (inside kerbed area)	Approx. 120 tonnes per year
Antiscalant	Non-hazardous	No hazard statement(s), no precautionary statement (s) required	Blowdown treatment package	3 daily tanks 100 litres each	Bunded tank	Approx. 0.32 tonnes per year
Ferric chloride 38%	Hazardous	H290 – May be corrosive to metals	Blowdown treatment package	2 daily tanks 200 litres each	Bunded tank	Approx. 1.1 tonnes per year

Material	Hazardous Materials Classification	Hazard Statements	Purpose	Estimated Storage Quantity (tonnes)	Storage Type	Annual Consumption (Waste)
		H302 – Harmful if swallowed H314 – Causes severe skin burns and eye damage				
Sodium metabisulfite (SMBS)	Hazardous	H290 – May be corrosive to metals H302 – Harmful if swallowed	Blowdown treatment package	2 daily tanks 100 litres each	Bunded tank	Approx. 0.49 tonnes per year
Cleaners	Hazardous	H290 – May be corrosive to metals H315 – Causes skin irritation H318 – Causes serious eye damage H373 – May cause damage to organs through prolonged or repeated exposure	Blowdown treatment package	500 litres	Tank	Approx. 0.13 tonnes per year
Sulphuric acid 33%	Hazardous	H314 – Causes severe skin burns and eye damage H402 – Harmful to aquatic life	Blowdown treatment package	2 canisters 25 litres each	Bunded tank	Approx. 0.026 tonnes per year

Material	Hazardous Materials Classification	Hazard Statements	Purpose	Estimated Storage Quantity (tonnes)	Storage Type	Annual Consumption (Waste)
Sodium hypochlorite	Hazardous due to it being corrosive, oxidizer	H290 – May be corrosive to metals H314 – Causes severe skin burns and eye damage H400 – Very toxic to aquatic life H411 – Toxic to aquatic life with long lasting effects.	Blowdown treatment package	2 daily tanks 100 litres each	Bunded tank	Approx. 0.53 tonnes per year
Oxygen binder	Corrosive	No hazard statement(s), no precautionary statement (s) required	Electric boiler package	30 litre drum	Inside container	Approx. 360 litres per year
Nitrogen	Non-hazardous, cryogenic, asphyxiant only. Common utility, back up considered non-hazardous in EU.	H281 – Contains refrigerated gas: may cause cryogenic burns or injury	HPN package	470,000 litres	Pressurised tank	< 1 tonne Will be used only during emergencies or during maintenance of nitrogen generation system
Fired heater catalysts	Hazardous. Dangerous to the environment, pyrophoric, toxic	H350 – May cause cancer by inhalation H317 – May cause an allergic skin reaction H372 – Causes damage to organs	6 x Precious/semi-precious metal based catalyst	0.25	Intermediate bulk container/drums	0.25 (2-3 years life)

Material	Hazardous Materials Classification	Hazard Statements	Purpose	Estimated Storage Quantity (tonnes)	Storage Type	Annual Consumption (Waste)
		through prolonged or repeated exposure				
C141/C142 catalysts	Hazardous. Dangerous to the environment, pyrophoric, toxic	H319 – Causes serious eye irritation H315 – Causes skin irritation H251 – Self heating may catch fire H317 – May cause an allergic skin reaction H351 – Suspected of causing cancer H372 – Causes damage to organs through prolonged or repeated exposure H350 – May cause cancer by inhalation H402 – Harmful to aquatic life H412 – Harmful to aquatic life with long lasting effects.	6 x Precious/semi-precious metal based catalyst	0.5	Intermediate bulk container/drums	0.25 (average2-3 years life)
SCR catalyst	Non-hazardous.	-	6 x catalyst	1	Intermediate bulk container/drums	0.5 tonnes (average 2-3 years life)

Material	Hazardous Materials Classification	Hazard Statements	Purpose	Estimated Storage Quantity (tonnes)	Storage Type	Annual Consumption (Waste)
PSA absorber catalyst	Non-hazardous. Non-toxic and inert, aluminium toxic to fish in acid conditions. (Only carbon is hazardous, while sieve and alumina are not).	H316 – Eye irritant (only for carbon)	carbon, molecular sieve, alumina	15	Intermediate bulk container/drums	3 tonnes (average 4-6 year life)
Compressors oil	Not classified	None known	LHY compressor, H_2 Blowers	< 1 tonne	Storage containers	< 1

4.2 Non-Permitted Activities

4.2.1 The following activities are associated with the but are not included in the installation boundary.

- The proposed single berth jetty is being developed and operated by ABP and will extend 1.2km seawards into the Humber Estuary. The jetty infrastructure will include a loading platform, topside infrastructure for the handling of bulk liquids including loading arms and pipelines, berthing and mooring dolphins with link walkways and related landside infrastructure including jetty ramps. The jetty will operate 24 hours a day, seven days a week and 365 days a year and will accommodate up to 292 ship calls per year. Only 12 ship calls will be associated with the receipt of NH_3 and only the specific NH3 offloading infrastructure will form part of the proposed installation boundary.
- The private access road between the new jetty and Laporte Road will include security gates, a security building, a power distribution building and associated utilities and are part of the wider ABP development.

4.3 Document References

4.3.1 The following documents support this section of the SCR and Baseline Report:

- Figure 3 Site Layout drawing which can be found in Appendix A of the Supporting Statement (ref: VP3425SV/APP/SS);
- Environmental Risk Assessment of substances which present a risk to soil and groundwater is presented in Section 4.4 below; and
- Overall impact assessment of wider site activities is presented in Section 7 and Appendix E of the Supporting Statement (ref: VP3425SV/APP/SS).

4.4 Environmental Risk Assessment

Potential Sources of Contamination

4.4.1 Potentially polluting activities, principally the storage and handling of the materials identified in Table 4-2 above.

Potential Receptors

4.4.2 The following potential receptors have been identified which would be adversely affected by any contamination at the site:

Table 4-3: Potential Receptors

Potential Receptor	Description
Human Health	• Construction workers, • Future site users; and • Operational staff.
Controlled Waters	• Groundwater within the underlying made ground deposits; • Groundwater within the underlying bedrock; • North Beck Drain Catchment; and • Humber Estuary.

Potential Receptor	Description
Construction Materials/Buildings	• Risk to concrete foundations and services; and • Risk to buildings from ground gas in underlying strata.
Vegetation	• Vegetation and landscaping along all site boundaries.

Potential Pathways

4.4.3 Potential pathways have been identified, which could link the potential sources with the potential receptors. These pathways are discussed by receptor type below in consideration of the redevelopment of the site:

Table 4-4: Potential Pathways

Potential Pathways	Description
Controlled Waters	• Migration across above ground surfaces; • Migration of contaminants with sub-surface infiltration; • Shallow ground water flow
Ground Gas	• Have the potential to migrate via permeable strata within the made ground or through service trench backfill.
Soil	• Risk from organic vapours and migrated ground gas during construction and maintenance activities and for future site users; • Potential for direct contact and potentially contaminated soils during future construction activities; and

Assessment of the Likelihood of Land Pollution

4.4.4 An assessment of the potentially polluting activities identified in Table 4-2 taking into consideration the proposed management and control arrangements has been completed and is presented in Table 4-5 on the following page.

Table 4-5: Assessment of the Likelihood of Land Pollution

Substances	Relevant activity	Potential for pollution from the relevant activity	Existence of pollution prevention measures	Nature of primary containment	Testing and inspection of primary containment	Nature of secondary containment	Testing and inspection of secondary containment	Nature of tertiary containment	Testing and inspection of tertiary containment	Adequacy of pollution prevention measures yes/no	Are the proposed integrity testing of pollution prevention measures adequate yes/no	Is there an adequate documented management system to demonstrate operator management and competence with the relevant activity (1)	Likelihood of pollution
Natural gas	Delivery via pipeline	Loss due to leak in delivery pipework	Yes	Gas supply pipework	Pipework to be subjected to regular testing under Pressure Systems Safety Regulations	N/A	N/A	N/A	N/A	Yes	Yes	Yes	Negligible
Ammonia solution	Process	Leak from process	Yes	Process tank	Routine visual checks and inspections of plant and pipework.	Tank containment bund, designed to contain110 % of the maximum volume	Scheduled inspections.	Site hard standing with drainage system and containment sump. All areas potentially contaminated with ammonia will drain to an ammonia detection and treatment sump to ensure escaped ammonia is caught and treated.	Scheduled inspections.	Yes	Yes	Yes	Negligible
Refrigerated Ammonia	Delivery via pipeline	Loss due to leak in delivery pipework	Yes	Pipework	Pipeline subject to regular testing.	N/A	N/A	N/A	N/A	Yes	Yes	Yes	Negligible
	Storage	Leak from bulk storage	Yes	55,000 tonne storage tank	Newly built above ground storage tanks to be situated outdoors. Will be subject to routine visual checks and inspection in line with manufacturer guidance. Acoustic monitoring system.	Secondary containment (concrete wall) of the storage tank.	Visual inspections of tank and secondary layer.	Site hard standing with drainage system and containment sump. Refrigerated ammonia will likely evaporate, however All areas potentially contaminated with ammonia will drain to an ammonia detection and treatment sump to ensure escaped ammonia is caught and treated.	Scheduled inspections.	Yes	Yes	Yes	Negligible
Hydrogen	Process	Leak of gas from process	Yes	Within process	Routine visual checks and inspections of plant and pipework.		Scheduled inspections.	N/A	N/A	Yes	Yes	Yes	Negligible
	Storage	Leak of liquid from storage	Yes	Storage tanks	Storage tanks will be subject to	Site hardstanding with an impermeable	Scheduled inspections.	N/A	N/A	Yes	Yes	Yes	Negligible

Substances		Relevant activity	Potential for pollution from the relevant activity	Existence of pollution prevention measures	Nature of primary containment	Testing and inspection of primary containment	Nature of secondary containment	Testing and inspection of secondary containment	Nature of tertiary containment	Testing and inspection of tertiary containment	Adequacy of pollution prevention measures yes/no	Are the proposed integrity testing of pollution prevention measures adequate yes/no	Is there an adequate documented management system to demonstrate operator management and competence with the relevant activity (1)	Likelihood of pollution
						routine visual checks and inspections.	concrete surface and kerbed edging. Manual valve to contain spillages. Spill kits available on site. However refrigerated liquid hydrogen will quickly evaporate							
		Vehicle loading	Leak from connecting vehicles	Yes	Hose/tanker	Visual inspection of road tanker and delivery hoses to be carried out.	Vehicle loading areas on hardstanding site with an impermeable concrete surface and kerbed edging. Manual valve to contain spillages. Spill kits available on site. However refrigerated liquid hydrogen will quickly evaporate	Scheduled inspections.	N/A	N/A	Yes	Yes	Yes	Negligible
Diesel		Delivery by vehicle	Spillage during off-loading	Yes	Road tanker/ retractable delivery hoses	Visual inspection of road tanker and delivery hoses to be carried out. Deliveries via reputable supplier using vehicles which are fit for purpose.	Site hardstanding with an impermeable concrete surface and kerbed edging. Manual valve to contain spillages. Spill kits available on site.	Scheduled inspections.	N/A	N/A	Yes	Yes	Yes	Negligible
		Storage	Leak from bulk storage	Yes	Bulk tank	The tank will be subject to routine visual checks and inspection in line with manufacturer guidance.	The tank will be stored in a concrete bund designed to contain110 % of the maximum volume	Regular visual inspection of bunding.	Site hardstanding with an impermeable concrete surface and kerbed edging. Manual valve to contain spillages. Spill kits available on site.	Scheduled inspections.	Yes	Yes	Yes	Negligible
Water treatment chemicals	FLOGARD MS6209 (Ortho Phosphate)	Storage	Leak from storage containers	Yes	Intermediate bulk containers	Chemicals to be stored in intermediate bulk containers (IBCs) within drip trays and other suitable bunds, in the dedicated store. These will be subject to routine visual checks and inspection in line with manufacturer guidance.	Drip trays and other appropriate bund for small containers, within building. designed to contain 110 % of the maximum volume	Regular visual inspection of storage containers and drip trays.	Site hardstanding with an impermeable concrete surface and kerbed edging. Manual valve to contain spillages. Spill kits available on site.	Scheduled inspections	Yes	Yes	Yes	Negligible
	Pyro Phosphate													
	Polymeric dispersants													
	Bio dispersant													
	Non-oxidising biocides													

Substances		Relevant activity	Potential for pollution from the relevant activity	Existence of pollution prevention measures	Nature of primary containment	Testing and inspection of primary containment	Nature of secondary containment	Testing and inspection of secondary containment	Nature of tertiary containment	Testing and inspection of tertiary containment	Adequacy of pollution prevention measures yes/no	Are the proposed integrity testing of pollution prevention measures adequate yes/no	Is there an adequate documented management system to demonstrate operator management and competence with the relevant activity (1)	Likelihood of pollution
	Sodium hypochloride													
Nitrogen		Maintenance	Leak from storage	Yes	Pressurised tank	Pressurised tank will be subject to routine visual checks and inspection.	not required	Scheduled inspections.	N/A	N/A	Yes	Yes	Yes	Negligible
Catalysts	Fired heater catalysts	Storage, if required	Leak from storage	Yes	Intermediate bulk container/drums. Typically not stored on site unless prior to change out	The intermediate bulk containers/ drums will be subject to routine visual checks and inspections.	Storage within bunded area or individual bund	Scheduled inspections.	Site hardstanding with an impermeable concrete surface and kerbed edging. Manual valve to contain spillages. Spill kits available on site.	Scheduled inspections	Yes	Yes	Yes	Negligible
		Process	Leak from process	Yes	Within process	Routine visual checks and inspections of plant and pipework.	Storage within bunded area or individual bund.	Scheduled inspections.	Site hardstanding with an impermeable concrete surface and kerbed edging. Manual valve to contain spillages. Spill kits available on site.	Scheduled inspections	Yes	Yes	Yes	Negligible
		End of life	Leak from removal/ change out	Yes	Site hardstanding with an impermeable concrete surface and kerbed edging. Manual valve to contain spillages. Spill kits available on site.	Scheduled inspections. Catalysts changed out in line with the operators and manufacturers recommendations.	Storage within bunded area or individual bund	Scheduled inspections	Site hardstanding with an impermeable concrete surface and kerbed edging. Manual valve to contain spillages. Spill kits available on site.	Scheduled inspections	Yes	Yes	Yes	Negligible
	C141/C142 catalysts	Storage	Leak from storage	Yes	Intermediate bulk container/drums Typically not stored on site unless prior to change out	The intermediate bulk containers/ drums will be subject to routine visual checks and inspections.	Storage within bunded area or individual bund	Scheduled inspections.	Site hardstanding with an impermeable concrete surface and kerbed edging. Manual valve to contain spillages. Spill kits available on site.	Scheduled inspections	Yes	Yes	Yes	Negligible
		Process	Leak from process	Yes	Within process	Routine visual checks and inspections of plant and pipework.	Storage within bunded area or individual bund	Scheduled inspections.	Site hardstanding with an impermeable concrete surface and kerbed edging. Manual valve to contain	Scheduled inspections	Yes	Yes	Yes	Negligible

Substances		Relevant activity	Potential for pollution from the relevant activity	Existence of pollution prevention measures	Nature of primary containment	Testing and inspection of primary containment	Nature of secondary containment	Testing and inspection of secondary containment	Nature of tertiary containment	Testing and inspection of tertiary containment	Adequacy of pollution prevention measures yes/no	Are the proposed integrity testing of pollution prevention measures adequate yes/no	Is there an adequate documented management system to demonstrate operator management and competence with the relevant activity (1)	Likelihood of pollution
									spillages. Spill kits available on site.					
		End of life	Leak from removal/ change out	Yes	Site hardstanding with an impermeable concrete surface and kerbed edging. Manual valve to contain spillages. Spill kits available on site.	Scheduled inspections. Catalysts changed out in line with the operators and manufacturers recommendations.	Storage within bunded area or individual bund	Scheduled inspections	Site hardstanding with an impermeable concrete surface and kerbed edging. Manual valve to contain spillages. Spill kits available on site.	Scheduled inspections	Yes	Yes	Yes	Negligible
	SCR catalyst	Storage	Leak from storage	Yes	Intermediate bulk container/drums Typically not stored on site unless prior to change out	The intermediate bulk containers/ drums will be subject to routine visual checks and inspections.	Storage within bunded area or individual bund.	Scheduled inspections.	Site hardstanding with an impermeable concrete surface and kerbed edging. Manual valve to contain spillages. Spill kits available on site.	Scheduled inspections	Yes	Yes	Yes	Negligible
		Process	Leak from process	Yes	Within process	Routine visual checks and inspections of plant and pipework.	Storage within bunded area or individual bund.	Scheduled inspections.	Site hardstanding with an impermeable concrete surface and kerbed edging. Manual valve to contain spillages. Spill kits available on site.	Scheduled inspections	Yes	Yes	Yes	Negligible
		End of life	Leak from removal/ change out	Yes	Site hardstanding with an impermeable concrete surface and kerbed edging. Manual valve to contain spillages. Spill kits available on site.	Scheduled inspections. Catalysts changed out in line with the operators and manufacturers recommendations.	Storage within bunded area or individual bund.	Scheduled inspections	Site hardstanding with an impermeable concrete surface and kerbed edging. Manual valve to contain spillages. Spill kits available on site.	Scheduled inspections	Yes	Yes	Yes	Negligible
	PSA absorber catalyst	Storage	Leak from storage	Yes	Intermediate bulk container/drums Typically not stored on site unless prior to change out	The intermediate bulk containers/ drums will be subject to routine visual checks and inspections.	Storage within bunded area or individual bund	Scheduled inspections.	Site hardstanding with an impermeable concrete surface and kerbed edging. Manual valve to contain spillages. Spill kits available on site.	Scheduled inspections	Yes	Yes	Yes	Negligible

Substances	Relevant activity	Potential for pollution from the relevant activity	Existence of pollution prevention measures	Nature of primary containment	Testing and inspection of primary containment	Nature of secondary containment	Testing and inspection of secondary containment	Nature of tertiary containment	Testing and inspection of tertiary containment	Adequacy of pollution prevention measures yes/no	Are the proposed integrity testing of pollution prevention measures adequate yes/no	Is there an adequate documented management system to demonstrate operator management and competence with the relevant activity (1)	Likelihood of pollution
	Process	Leak from process	Yes	Within process	Routine visual checks and inspections of plant and pipework.	Storage within bunded area or individual bund	Scheduled inspections.	Site hardstanding with an impermeable concrete surface and kerbed edging. Manual valve to contain spillages. Spill kits available on site.	Scheduled inspections	Yes	Yes	Yes	Negligible
	End of life	Leak from removal/ change out	Yes	Storage container	Scheduled inspections. Catalysts changed out in line with the operators and manufacturers recommendations.	Storage within bunded area or individual bund	Scheduled inspections	Site hardstanding with an impermeable concrete surface and kerbed edging. Manual valve to contain spillages. Spill kits available on site.	Scheduled inspections	Yes	Yes	Yes	Negligible
Steamate NA2380 (or equivalent)	Maintenance/ storage	Leak from storage	Yes	Storage tank	The tank will be subject to routine visual checks and inspection.	Storage container to be bunded in addition the hazardous waste storage containers will be kept locked to prevent accidental loss.	Regular visual inspection of storage.	Site hard standing with drainage system and containment sump	Scheduled inspections.	Yes	Yes	Yes	Negligible
Control OS5614 (or equivalent)	Maintenance/ storage	Leak from storage	Yes	Storage tank	The tank will be subject to routine visual checks and inspection.	Storage container to be bunded in addition the hazardous waste storage containers will be kept locked to prevent accidental loss.	Scheduled inspections.	Site hardstanding with an impermeable concrete surface and kerbed edging.	Scheduled inspections	Yes	Yes	Yes	Negligible
Optisperse HP3100 (or equivalent)	Maintenance/ storage	Leak from storage	Yes	Storage tank	The tank will be subject to routine visual checks and inspection.	Storage container to be bunded in addition the hazardous waste storage containers will be kept locked to prevent accidental loss.	Scheduled inspections.	Site hardstanding with an impermeable concrete surface and kerbed edging.	Scheduled inspections	Yes	Yes	Yes	Negligible
Optisperse ADJ5050 (or equivalent)	Maintenance/ storage	Leak from storage	Yes	Storage tank	The tank will be subject to routine visual checks and inspection.	Storage container to be bunded in addition the hazardous waste storage containers will be kept locked to prevent accidental loss.	Scheduled inspections.	Site hardstanding with an impermeable concrete surface and kerbed edging.	Scheduled inspections	Yes	Yes	Yes	Negligible
Compressors oil	Maintenance/ storage	Leak from storage	Yes	Storage containers	The storage containers will be subject to routine visual checks and inspection.	Storage within bunded area or individual bund	Scheduled inspections.	Site hardstanding with an impermeable concrete surface and kerbed edging.	Scheduled inspections	Yes	Yes	Yes	Negligible

Substances	Relevant activity	Potential for pollution from the relevant activity	Existence of pollution prevention measures	Nature of primary containment	Testing and inspection of primary containment	Nature of secondary containment	Testing and inspection of secondary containment	Nature of tertiary containment	Testing and inspection of tertiary containment	Adequacy of pollution prevention measures yes/no	Are the proposed integrity testing of pollution prevention measures adequate yes/no	Is there an adequate documented management system to demonstrate operator management and competence with the relevant activity (1)	Likelihood of pollution
Small quantities of waste chemicals and oils	Maintenance	Leak from storage/spill during maintenance	Yes	Dedicated waste containers, with segregated storage of hazardous and non-hazardous waste.	Waste storage containers will be subject to routine visual checks and inspection.	The hazardous waste storage containers will be kept locked to prevent accidental loss. Liquid waste will be bunded to contain 110% of the largest container with incompatible materials segregated	Regular visual inspection of storage.	Site hard standing with drainage system and containment sump	Scheduled inspections.	Yes	Yes	Yes	Negligible

Notes: (1) Documented Management System will be developed as the installation reaches operation.

4.5 Conceptual Model

4.5.1 A review of the supporting information has been used to develop the conceptual site model (CSM).

4.5.2 In developing the CSM the following has been considered:

- Surfacing of the production areas and containment bunds are of an impermeable material suitable for the materials stored and handled and are therefore unlikely to be penetrated by liquid spillage. These will be assured through regular inspections and planned preventative maintenance.
- The infrastructure for management of potentially polluting activities will be designed and constructed in accordance with regulatory standards and the principles of CIRIA C736. They will be managed via the site management system which will include relevant operating procedures and spill containment procedures.
- The site drainage system has been designed using appropriate modelling software taking into account the requirements for appropriate climate change impacts. The drainage system will be equipped with oil interceptors and pen stock valves that will allow isolation and the drainage system will be subject to regular inspection and planned preventative maintenance.

4.5.3 The CSM for the proposed operations is summarised in Table 4-6 below.

Table 4-6: Conceptual Site Model

Potential Source	Potential Contaminants	Pathway	Receptors		Medium	Sensitivity	Comments
			Primary	Secondary			
Failure of vessel/tank in bunded storage area	Ammonia Diesel Water Treatment Chemicals Boiler treatment Chemicals	Percolation through permeable surfaces. Migration through unsaturated zone, then migration into groundwater.	Bund		Low permeability structure	-	A spillage would be retained with the bund and cleaned up in line with site procedures. Site drainage can be isolated if required.
			↳	Land beneath bund	Controlled waters; site overlying a principal aquifer.	Medium – part of site in SPZ	
				Human	Spillage clean-up	Moderate	Contact by fume inhalation or dermal contact possible
				Flora / Fauna	Overland to protected areas beyond site.	Moderate - high	Woodland in close proximity to site boundary and Humber Estuary designated areas border the site.
				Property	Domestic or commercial dwelling	Low - Moderate	No domestic properties are expected to be in close proximity to site following compulsory purchase.
Failure of drum / IBC	Process catalysts Maintenance consumables	Percolation through permeable surfaces. Migration through unsaturated zone, then migration into groundwater.	Designated storage area with impermeable surface				A spillage would be contained with site storage areas and cleaned up in accordance with site storage procedures. Site drainage can be isolated if required.
				Land beneath storage area	Controlled waters; site overlying a principal aquifer.	Medium – part of site in SPZ	

Potential Source	Potential Contaminants	Pathway	Receptors		Medium	Sensitivity	Comments
			Primary	Secondary			
				Human	Spillage clean-up	Moderate	Contact by fume inhalation or dermal contact possible
				Flora / Fauna	Overland to protected areas beyond site.	Moderate - high	Woodland in close proximity to site boundary and Humber Estuary designated areas border the site.
				Property	Domestic or commercial dwelling	Low - Moderate	No domestic properties are expected to be in close proximity to site following compulsory purchase.
Failure of tanker loading/ unloading operation	Diesel Water Treatment Chemicals Boiler treatment Chemicals	Percolation through permeable surfaces. Migration through unsaturated zone, then migration into groundwater.	Designated loading points with a concrete surface	-	Impermeable surfacing	-	A spillage would be retained with the bund and cleaned up in line with site procedures. Site drainage can be isolated if required.
			↳	Concrete drains	Impermeable material	-	
				Interceptor	Vessel with isolation valves	-	
				Land beneath bund	Controlled waters; site overlying a principal aquifer.	Medium – part of site in SPZ	
				Human	Spillage clean-up	Moderate	Contact by fume inhalation or dermal contact possible
				Flora / Fauna	Overland to protected areas beyond site.	Moderate - high	Woodland in close proximity to site boundary and Humber Estuary designated areas border the site.
				Property	Domestic or commercial dwelling	Low - Moderate	No domestic properties are expected to be in close proximity to site

Potential Source	Potential Contaminants	Pathway	Receptors		Medium	Sensitivity	Comments
			Primary	Secondary			
							following compulsory purchase.
Failure of pipeline	Diesel Water Treatment Chemicals Boiler treatment Chemicals Ammonia	Percolation through permeable surfaces. Migration through unsaturated zone, then migration into groundwater.	Pipeline	-			Leak would be detected via pressure monitoring on pipeline system and pipeline would be isolated until a repair could be affected.
			↳	Land beneath or around the pipeline	Controlled waters; site overlying a principal aquifer.	Medium – part of site in SPZ	
				Human	Spillage clean-up	Moderate	Contact by fume inhalation or dermal contact possible
				Flora / Fauna	Overland to protected areas beyond site.	Moderate - high	Woodland in close proximity to site boundary and Humber Estuary designated areas border the site.
				Property	Domestic or commercial dwelling	Low - Moderate	No domestic properties are expected to be in close proximity to site following compulsory purchase.

4.6 Conclusion

4.6.1 As demonstrated in Section 4.4, the activities undertaken at the installation and the associated pollution prevention and containment measures are considered to represent a negligible risk of pollution to the underlying soil and groundwater, hence no collection of further baseline data is proposed during operation of the proposed installation.

4.6.2 The installation will maintain an incident register throughout the lifetime of the operations which will log any losses of containment or near misses, and record whether the loss was contained to the site systems (as expected) or managed to enter the underlying soil and groundwater, in which case the clean-up and remediation activities undertaken will be recorded.

4.6.3 The installation will also maintain an infrastructure monitoring log to record the schedule inspection and maintenance of containment systems and any significant maintenance or repair activities requiring details of the routine inspection and maintenance activities will be developed prior to commencement of operations.

Annex A Groundsure Report

Annex B MAGIC Report

Annex C Nature and Heritage Screen

Annex D Agricultural Land Classification Survey

Annex E Phase II Site Investigation