Northfleet Green Hydrogen

Environmental Permit Application Site Condition Report

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Project/Proposal No:	6551
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0.1	2023-09-11	T Hatch	G M Bollan	G M Bollan	First Draft for Client Comment
1.0	2024-01-22	T Hatch	G M Bollan	G M Bollan	Final for Issue
1.1	2024-08-27	T Hatch	G M Bollan	G M Bollan	Amendments requested by EA

Contents

1. Introduction

1.1 Terms of Reference

HYRO Limited ("HYRO") provides green hydrogen solutions for energy intensive business, supporting hard-to-electrify processes to reach their decarbonisation goals. HYRO is a joint venture between Octopus Energy Generation and RES. RES is the world's largest independent renewable energy developer, having delivered 23GW of generation capacity in 11 countries. Octopus Energy Generation is one of Europe's largest investors in renewable energy. The Octopus team manages over 3 GW of green power assets worth £5bn across 11 countries. It is the generation arm of Octopus Energy Group, the global energy technology pioneer.

The applicant for this permit will be special purpose vehicle Green Hydrogen 3 Limited (Companies House Number 14314761) which is a fully owned subsidiary of HYRO.

In compliance with the Environment Agency's (EA) H5 guidance document titled – "*H5 – Environmental Permitting Regulations, Site Condition Reports – guidance and templates*", an Application Site Condition Report (SCR) has been generated to support the EP application. **Appendix 1 – H5 Site Condition Report Template Summar** includes a completed copy of the H5 template encompassing sections 1, 2 and 3.

The primary objective of this SCR is to describe and document the condition of the land and groundwater at the Site before commencing any activities under the EP. To facilitate this Application SCR, a desk-based assessment known as a Phase I Desk Study has been carried out. The collected information, coupled with records of Site activities and regular audits/inspections is essential for the Applicant to demonstrate their commitment to safeguarding the land and groundwater during EP operations.

1.2 Scope of Work

The scope of work for this Application SCR included the following activities:

- Preparation of a Phase I desk-based assessment for the Site, incorporating:
  - Review and description of geological, hydrological, topographic, hydrogeological information, flood information and historical land use data of the Site and its surrounding areas. This analysis aimed to provide insights into relevant geographical and environmental sensitivities within the Site and its vicinity;
  - Collecting and reviewing available information regarding the present and historical land use and activities at the Site and its surrounding area, whenever such data was accessible. This included gathering information from Site personnel regarding past and ongoing activities, processes, storage facilities for chemicals and wastes, as well as any changes that have occurred in these activities over time.

1.3 Data Sources

The information pertaining to the geology, hydrology, hydrogeology, environmental sensitivity and land use history of the Site and its surrounding area has been gathered from various sources, including:

- The Landmark Envirocheck Report, which includes the Groundwater Vulnerability, Site Sensitivity, Geology, and Flood Screening Reports. This report was acquired by ITPEnergised in September 2023 and can be provided via filesharing site if required by the EA, it is far too large to travel by email;
- Historical maps and aerial photography, such as Ordnance Survey (OS) Maps and National Grid Surveys, which are incorporated within the Landmark Envirocheck Report;
- The MAGIC website (www.magic.gov.uk accessed in September 2023), which provides access to the statutory land designations map compiled and maintained by Natural England; and
- Other relevant online resources, freely available, that are specifically referenced within this report.

2. Condition of the Land at Permit Application

2.1 Proposed Site Location and Layout

The Applicant plans to establish a green HPF adjacent to the Kimberley-Clark's Northfleet Paper Mill in Northfleet, Kent (Northfleet Mill, Crete Hall Road, Gravesend, DA11 9AD). The Proposed Development is centred on Grid Reference TQ 62672 74590. The Site is currently a hardstanding at the Kimberley-Clark's Northfleet Paper Mill comprising an area of approximately 2.2 hectares (ha). The Site Layout is depicted in the Figures accompanying this application.

Table 2-1 provides of a summary of the land use within a 500 m (metre) radius of the Site.

Table 2-1 - Land Use Close to Site

Cardinal Direction	Description
North	The River Thames is c50m from the northern boundary. In between the Thames and the site boundary are tanks and land associated with the dockside.
South	The Kimberly-Clark Northfleet Paper Mill forms the sites southern boundary.
East	The Site is bound to the east by an access road with a storage yard further east.
West	The Site is bound by Granby Road to the west. Further west is a vehicle storage yard.

2.2 Environmental Site Setting

2.2.1 Topography

The location of the Site exhibits no variations in land elevation. The site is 3m above ordnance datum (AOD).

2.3 Geological

2.3.1 BGS 1:625,000 Solid Geology

The Landmark Envirocheck Report identifies the onsite solid Geology to be of a White Chalk Subgroup.

Online British Geological Survey (BGS) published geological data shows the Bedrock Geology at the site is Lewes Nodular Chalk Formation and Newhaven Chalk Formation which is Chalk Sedimentary bedrock formed between 93.9 and 72.1 million years ago during the Cretaceous period. The Online BGS does not provided data for Superficial Geology at the site. The closest available data for Superficial deposits is identified as Alluvium – Clay, silt, sand and peat. Sedimentary superficial deposit formed between 11.8 thousand years ago and the present during the Quaternary period.

2.3.2 BGS Recorded Mineral Sites

The site is not located within a coal mining area.

There are 17 recorded mineral sites within 1km of the site. 15 of these are either ceased or dormant. The remaining 2 are active and are both located 440m east of the site and are related to Red Lion Wharf.

2.3.3 Potentially Infilled Land (Non-Water and Water)

Whilst there are no areas of artificial ground noted, there are areas of infilled or made ground resent within the surrounding area. There are 10 sites of either potentially infilled land (non-water) and potentially infilled land (water) within 2km of the site. All of their uses are related to unknown filled ground (pit, quarry etc).

2.3.4 Gas Pipelines

There are no National Grid pipeline that run across or pass through the Site.

2.3.5 Areas of Adopted Green Belt

There are no areas of adopted Green Belt within 2km of the site.

2.3.6 Geological Hazards

The potential for geological hazards is summarised in **Table 2-2**.

Table 2-2 - Geological Hazards

Description	Hazard Potential on Site
Potential for Collapsible Ground	Very low
Potential for Compressible Ground	No hazard
Potential for Ground Dissolution	Very low
Potential for Landslides	No hazard
Running Sand	No hazard
Shrinking or Swelling Clay	Low
Radon Potential	Lower probability radon area

2.3.7 BGS Estimated Soil Chemistry

Visual representations of soil chemistry are included in the Landmark Envirocheck Report. Heavy metal concentrations on Site are summarised in **Table 2-3**.

Table 2-3 – Site Soil Chemistry Data

Potentially Harmful Elements (PHE)	Site Concentration (mg/kg)
Arsenic (As)	<15-25
Cadmium (Cd)	<1.8
Chromium (Cr)	90-120
Lead (Pb)	100-200
Nickel (Ni)	30-45

2.4 Hydrological

2.4.1 Discharge Consents

There are 42 discharge consents within 1 km of the Site. None are within the Site boundary. The closest of these discharge consents is 86m north of the site and is associated with the Northfleet Mill (Kimberly Clark).

2.4.2 Permitted Sites

There are 73 permits and waste exemptions within 1 km of the Sites postcode as per the Environment Agency's Public Register (Online) which aim to control the environmental impact of certain industrial activities as regulated and licensed by the EA under the Environmental Permitting Regulations.

The closest permitted site is the Northfleet Paper Mill operated by Kimberly-Clark Limited (EPR/BJ7379IZ).

2.4.3 Local Authority Permitted Sites

There are several Local Authority (Part B) permits regulated and licensed by the Local Authority. The closest of these is a local authority air pollution control relating to quarry process including roadstone plants and the size reduction of bricks, tiles and concrete.

2.4.4 Water Abstractions

There are 35 EA registered groundwater abstractions within 1 km of the Site. The nearest is located approximately 39 m to the east of the Site and is abstracted by Kimberley-Clark Limited for Paper and Printing: Boiler Feed. It is noted to be abstracting from groundwater.

2.4.5 Bedrock and Superficial Aquifer Designations (Hydrogeology)

The Envirocheck has identified that the bedrock aquifer designation underlying the site is a principal aquifer. No data is available for the superficial aquifer designation indicating there is no superficial aquifer. The principal bedrock aquifer is designated as having high vulnerability which an intermediate pollutant speed and well connected fractures.

The groundwater of the principal aquifer underlying the site is classified by the EA to be of high vulnerability.

2.4.6 Source Protection Zones

The site location is within a groundwater Source Protection Zone II (Total Catchment and Outer Protection Zone) (SPZ2), as designated by the EA.

2.4.7 Flooding and Extreme Flooding from Rivers or Seas without Defences

Review of the EA Flood Risk Map for planning shows that the Site is located within a Flood Zone 2 and 3. This is an area with a relatively high probability of flooding.

2.4.8 Surface Water 1 in 30/100/1000-Year Flood Extent

The flood risk assessment undertaken for HYRO Energy Ltd (Kimberly-Clark Industrial Estate, Crete Hall Road, Northfleet, Gravesham, Flood Risk Assessment and Drainage Strategy, September 2023) identified that the proposed development site lies within an area that is designated by the EA as Flood Zone 2 and 3. The site is protected by defences and is therefore considered to be an area of low flood risk. The flood risk assessment also stated that "The proposed development is classified as 'less vulnerable' and therefore considered appropriate within the Flood Zone."

2.4.9 BGS Groundwater Flooding Susceptibility

According to the Landmark data sheet there is limited potential for groundwater flooding to occur.

2.4.10 BGS Boreholes

There are multiple boreholes within 1 km of the Site. None are on Site.

2.5 Surface Water Features

The nearest surface water feature is 54m north west of the site and is the River Thames.

2.6 Pollution History

There have been several recorded pollution incidents to controlled water between the years of 1990 and 1996:

- 1992 – Pollutant Miscellaneous (unknown) 84m north of the Site (not stated but likely to be to the River Thames), classed as a minor incident;
- 1990 – Pollutant Chemical (unknown) 379m east of the Site, classed as a minor incident;
- 1991 – Pollutant Chemical (unknown) 457m south east, classed as a minor incident;
- 1997 – Pollutant Chemicals (other inorganic) 482m north east, classed as a minor incident
- 1997 - Pollutant Chemicals (other inorganic) 486m south east, classed as a minor incident
- 1993 - Pollutant Miscellaneous (unknown) 570m north east, classed as a minor incident
- 1997 – Pollutants Oils (unknown) 752m north west, classed as a minor incident
- 1996 - Pollutants Oils (unknown) 786m east, classed as a significant incident
- 1996 - Pollutants Oils (unknown) 854m south west, classed as a minor incident
- 1998 - Pollutants Oils (unknown) 887m north, classed as a minor incident
- 1995 - Pollutants Oils (unknown) 892m north, classed as a minor incident

There have been two substantiated pollution incidents on the EA register:

- 2006 – Pollutant General Biodegradable Materials and Wastes: Other Animal Matter 135m east, Air and Land Category 2 – significant incident
- 2004 – Pollutant Dust 755m south west, Air impact Category 2 – significant incident and Land impact Category 3 – Minor Incident.

No pollution incidents on the actual site boundary have ever been recorded.

2.7 Historical Land Use

The following table (Table 2-4) details the historical land uses on and within 500 m of the Site, based on a review of available historical mapping.

Table 2-4 - Historical Land Use

Age of Map	On-site	Off-site
1864-1876 (1:2,500)	The site is shown to have development on it although the usage cannot be confirmed. Due to the proximity of the Wharf it can be assumed that the site is associated with storage.	The surrounding area shows developments such as Wharfs, Building Slips and Taverns. These developments are all related to the marine industry.
1869 (1:10,560)	The site is shown to be developed with evidence of what seems small buildings however due to the resolution of the image further detail cannot be confirmed	No significant changes.
1885 (1:2,500)	A label to the left of the site indicates “Cooks Cottages”. This could be the use for the small buildings identified in within the site boundary. On the east of	A Tavern labelled the “Half Moon” is located on the north east boundary.

	the site the small buildings are labelled as Chappel Cottages.	
1897-1898 (1:2,500)	Shows an iron foundry on the east of the site and also extends beyond the site boundary.	No significant changes.
1898 (1:2,500)	No significant changes	A tramway is to the west of the site.
1898-1899 (1:10,560)	The site is shown to be more developed than in 1869 with similar small buildings. There is also a foundry in the south east site.	A old dock is seen to the east of the site. There is additional road developments t the south of the site. There is open land to the west with more developments further afield. The Crown Portland Cement Works is shown to the far west of the site on the River Thames.
1909 (1:2,500)	No significant changes	
1910 (1:10,560)	The site remains the same as in 1898-1899 aside from the lack of label for the foundry.	The surrounding area remains to be industry with the cement works and the disused dockyard remaining. A number of piers (deep water) and Jettys have been constructed to the east of the site showing further development related to the River Thames. To the south of the site are roads and open land and then a Brick Works.
1923 (1:10,560)	No significant changes.	The surrounding area remains largely the same with the addition of a tramway to the south.
1932 (1:10,560)	No significant changes.	There appears to be less development surrounding the site related to industry. There is no longer evidence of the cement works to the west of the site. The Portland cement works are also labelled as disused. The land to the south of the site is shown to be allotment gardens. To the east of the site is a paper mill.
1938 (1:10,560)	No significant changes.	The surrounding area remains the same as in 1938. The London Portland Cement Works reappears to the south west of the site.
1939 (1:2,500)	No significant changes.	
1947 (Historical Aerial Photography) (1:10,560)	No significant changes.	No significant changes.
1951 (1:10,560)	No significant changes.	The surrounding area remains industrial. There is no evidence of the London Portland Cement Works to the southwest of the site.
1953	No significant changes.	No significant changes.

(1:1,250)		
1954 (1:2500)	No significant changes.	Jetty constructed to the north of the site.
1961-1962 (1:10,000)	No significant changes.	No significant changes.
1966 (1:10,000)	The site is empty and appears to be used in relation to Bowaters Wharf.	To the south of the site is building that will be labelled as Mills in the 1973-1974 map. Immediately to the north of the site are 2 tanks (unknown what they contain).
1967 (1:2500)	No significant changes.	No significant changes.
1973-1974 (1:10,000)	No significant changes.	Further activities related to the mills to the south of the site.
1977 (1:10,000)	No significant changes.	No significant changes.
1980-1984 (1:10,000)	No significant changes.	No significant changes.
1991-1993 (1:10.000)	No significant changes.	The paper mill to the east of the site have gone and the area is now used as a warehouse. Further to the east is a power station.
1999	No significant changes. The site is now on a parcel of land labelled as a depot.	The power station is not present on this map.
2006	There is a lighting tower in the centre of the site.	No significant changes.
2023	No significant changes.	Further development immediately to the south of the site.

The following table (**Table 2-5**) has been obtained from a review of the Envirocheck report. The information below is restricted to the Site with a buffer of 1 km.

Table 2-5 - Regulatory Data on Historical Land Uses

	On-site	Off-site
Historical landfills or waste management facilities	N/A	There are two BGS recorded landfill sites 817m southeast and 931 south of the site.

		There are four historical landfill sites which are 679m southeast, 823m south, 911 south and 948 south of the site. There are seven licensed waste management facilities within 1km of the site. All but one of these have been surrendered. The one that is still active is 822m north of the site and is a physical treatment facility at the Port of Tilbury.
Historical permitted industrial processes	N/A	N/A
Historical fuel stations or petrol storage licences	N/A	Chilton House Garage located 918 south east from the site, which status is now obsolete.
Historical licensed radioactive substances	N/A	N/A
Historical discharge consents	N/A	There are two revoked discharge consents within a 500 m of the Site: ➢ Authorisation revoked for a discharge to The River Thames by Scott Ltd from the Paper Mill 89m from the site. ➢ Authorisation revoked for a discharge to Saline Estuary by Blue Circle Industries Plc from a cement works 134m northwest of the site; ➢ Authorisation revoked for a discharge to Saline Estuary by Blue Circle Industries Plc related to a making of glass, ceramics, cement, cutting stone 216m northwest of the site; ➢ Authorisation revoked for a discharge to Saline Estuary by Associated Portland Cement Manufacturers related to a making of glass, ceramics, cement, cutting stone 240m west of the site. ➢ Authorisation revoked for a discharge to Saline Estuary by Independent Water Networks Limited from a sewage treatment works 316m northwest of the site; ➢ Authorisation revoked for a discharge to Saline Estuary by Cegb from a power station 393m north west of the site; ➢ Authorisation revoked for a discharge to the River Thames by Bowater Scott Corporation Ltd from a Paper Mill 488m north west of the site; ➢ Authorisation revoked for a discharge to Saline Estuary by Cegb from a power station 490m north west of the site;

2.8 Cultural Heritage

The Site is located within an area of historical industrial and marine usage. C1 mile to the east of site is Rosherville Bear Pit which was at the centre Rosherville Gardens which was a 19th century pleasure garden in a disused chalk pit. In the 1800s Northfleet was home to multiple shipyards. The area is also associated with paper and cement manufacture.

3. Relevant Hazardous Substances Assessment

The Industrial Emissions Directive (IED) requires an assessment for all hazardous substances used, produced or released within the installation. A three stage assessment is used to assess hazardous substances.

Stage 1 – identify hazardous substances on-site

Stage 2 – Identify relevant hazardous substances

Stage 3 – Assessment of site specific pollution possibility

Stage 1 – Identify hazardous substances on-site

An inventory of all chemicals and potentially pollution liquids used or held inside the installation boundary. Is provided in Table 3-1. The European Chemicals Agency's (ECHA) website has been used to determine if a substance is hazardous or not. Where the information is not available on the ECHA website a Material Safety Data Sheet (MSDS) is used.

Table 3-1 Raw Materials Inventory

Substance	Volume Stored	Storage Method	Hazardous (Y/N)
Lubrication Oils	25 litres	Within a Pallet Bund	Y – May cause long lasting harmful effects to aquatic life
Glycol/Water	25 litres	Within a Pallet Bund	N
Non-Flammable Refrigerant	25 litres	Within a Pallet Bund	N
Transformer Oil	25 litres	Within a Pallet Bund	N

Stage 2 – Identify Relevant hazardous substances

This stage is to identify if the hazardous substance identified in Stage 1 (Lubrication Oils) are capable of causing soil and groundwater contamination. If this is possible, then they will be considered a relevant hazardous substances (RHS).

Table 3-2 Chemical and Physical Properties of Lubrication Oils

Substance	Composition	Solubility	Toxicity	Mobility	Persistence	Physical State (solid, liquid, gas)
Lubrication Oils	Lubricating Oil/ process Oil	Insoluble in water	Not regarded as dangerous for the environment. However, large or frequent	Soil – No data available	The degradability of the product is not known.	Liquid

			spills may have hazardous effects on the environment.			

Based on the information provided in Table 3-2 it has been determined that the substance will not cause pollution to soil or groundwater due to its solubility and its toxicity.

Stage 3 – Assessment of site specific possibility

Due to the small quantity of lubrication oil stored at the site (25 litres) and the storage method (pallet bund) it has been determined that there is no risk of pollution to soil and ground at the installation. For completeness lubrication oil is assessed in stage 3. No further baseline data is proposed to be collected.

4. Permitted Activities on Site

Currently, there are no permitted activities on most of the Site. Some areas of the proposed HPF installation overlap the existing Kimberly-Clark installation boundary (see 6551 Drawing 4), their permit reference EPR/BJ7379IZ.

Liability for remediation due to any future pollution incidents on the shared land parcels will be agreed and documented by HYRO / Green Hydrogen Three and Kimberly-Clark. The hydrogen production facility boundary does not coincide with any actual scheduled activities within the KC boundary, the shared land is part of the current KC pulp storage area, the location of site drainage and KC effluent pipe runs and part of the KC effluent treatment plant curtilage. None of the incidents noted in Section 2.6 are believed to have impacted these shared areas.

HYRO will establish a dedicated electrolytic Hydrogen Production Facility (HPF) in proximity to the existing Kimberly-Clark paper mill.

Hydrogen production is included in Schedule 1 of the Environmental Permitting Regulations under Part 2 Chapter 4 Section 4.2 Part A(1)(a)(i). The proposed process is the electrolytic production of hydrogen from purified water. As stated in the main application pack, a very small inventory of materials will be present and the only materials likely to present any risk to soil and groundwater will be lubricating oil in rotating machinery, namely pumps and compressors. These items will be designed with drip trays and/or integral bunding to hold 110% of the volume of oil present.

Section 6 of the main permit application pack includes the full Environmental Risk Assessment. The risk of contamination to soil and groundwater from activities at the proposed installation is considered negligible.

5. Summary of Findings

The assessment has been undertaken through a desk-based study of freely available environmental data, and an Envirocheck Report.

Based on the review of historic mapping and environmental record pertaining to the site, the site comprised of land associated with marine activities on the Riverside with small buildings labelled “Cooks Cottages” indicated from 1885. Activity appears to be limited at the site and is likely to have been used for storage activity related to the various industrial activity that surround the site such as Bowaters Wharf and the paper mill.

The surrounding area is related to marine and industrial activity since the earliest available map dating back to 1864. This map shows development such as Wharfs, building slips and taverns. There is then evidence of cement works in 1898.

The superficial geology at the site is not available. The underlying bedrock at the site is Lewes Nodular Chalk Formation and Newhaven Chalk Formation.

The groundwater underlying the site is a principal aquifer which is designated as having high vulnerability.

Hydrogen production is included in Schedule 1 of the Environmental Permitting Regulations under Part 2 Chapter 4 Section 4.2 Part A(1)(a)(i). The proposed process is the electrolytic production of hydrogen from purified water. As stated in the main application pack, a very small inventory of materials will be present and the only materials likely to present any risk to soil and groundwater will be lubricating oil in rotating machinery, namely pumps and compressors. These items will be designed with drip trays and/or integral bunding to hold 110% of the volume of oil present.

The risk of contamination to soil and groundwater from activities at the proposed installation is considered negligible.

Appendix 1 – H5 Site Condition Report Template Summary

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