

Engreen Environmental Consultants Ltd.

Report Title: Risk and Impact Assessment

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1 Introduction

1.1 General

1.1.1 Summary

This document provides information in support of the Environmental Permit variation application for the Geopura Hydrogen Production Installation. Fuller details of the applicant and permit requirements are contained in the accompanying report P207-R01-SI.

1.2 Guidance Documents

Sector Specific

- Environment Agency Sector Guidance, "" (The Inorganic Chemicals Sector (EPR 4.03)), March 2009;
- Environment Agency guidance, "How to comply with your Environmental Permit", (EPR 1.00), version 5, August 2012.

1.3 Report Format

This risk and impact assessment document is structured as follows:

- Introduction;
- Receptors Table
- Screening Assessment
- Risk Review
- Environmental Impact Review
- Conclusions

2 Receptors

The following environmental sensitive receptors have been identified, all as the closest point to the Installation and covering a full range of compass directions:

- Human receptors, either as individual property or the closest point of a block, referenced as residential, industrial/commercial/educational, recreational, hospital.
- Water receptors (watercourses, ponds, lakes, reservoirs, open drainage channels), within 1 km or if there is a direct connection.
- Natural Receptors including SACs, SPAs, SSSIs, RAMSARs, local and national nature reserves, local wildlife sites, priority habitats.

Other relevant environmental risk information (e.g. AQMA and flood zones) are also provided.

Sensitive Receptors Identified				
Nature of Receptor		Direction	Approximate Distance from the Installation Boundary³	Plan Reference⁵
Human Receptors⁸				
Residential		S	550m	R1
Leisure (Caravan Park)		SE	600m	R2
Residential (Farm)		W	1200m	R3
Residential		NE	1900m	R4
Watercourses and Ground Water Receptors⁸				
				W1
				W2
Groundwater Status		Site is not located within a Groundwater Source Protection Zone. It is anticipated the underlying geology will have variable permeability.		
Nature and Conservation Receptors¹				
AONB	-	-	None within 2km	-
Local Nature Reserve (LNR) ^{1,7}	-	-	None within 2km	-
National Nature Reserve (NNR) ^{1,7}	-	-	None within 2km	-
SSSI	Spalford Warren, DWARF SHRUB HEATH - Lowland	SE	3800m	H7
RAMSAR	-	-	None within 10km	-
SAC	-	-	None within 10km	-
SPA	-	-	None within 10km	-
Priority Habitat Inventory - Coastal and Floodplain Grazing Marsh	-	NE	900m	H1
		SE	700m	H2
Priority Habitat Inventory - Deciduous Woodland		S	500m	H3
		NE	650m	H4
		NW	950m	H5

Sensitive Receptors Identified				
Nature of Receptor		Direction	Approximate Distance from the Installation Boundary ³	Plan Reference ⁵
Woodpasture and Parkland BAP Priority Habitat		S	400m	H6
Local Wildlife Sites ⁷	-	-	None within 2km	-
Other Receptors				
Highways and Transportation ²	Public Highway	NNW	200m	T1
	Public Highway	E	700m	T2
Air Quality Management Areas ⁴		The site is not located within an Air Quality Management Area AQMAs interactive map (defra.gov.uk) . No AQMA within 10km		
Flood Risk Status ⁶		All of the installation is located in a Flood Zone 1 – This means it has a low probability of flooding from rivers and the sea.		
<p>Notes:</p> <p>*: Closest receptor identified;</p> <p>1: Receptors identified using the MAGIC Website (unless stated), February 2023.</p> <p>2: Closest local road network only, identified on OS mapping provided by Promap;</p> <p>3: Distance shown measured using Ordnance Survey data provided by Promap to closest Identified Receptors;</p> <p>4: AQMA locations reviewed through DEFRA's website – February 2023</p> <p>5: Locations shown on Sensitive Receptor Plan</p> <p>6: Flood Zone identified using the .Gov's https://flood-map-for-planning.service.gov.uk/, February 2022</p> <p>7: Nottinghamshire Wildlife Trust, February 2023: 9678 NWT Reserves Map Update Feb 2023 (nottinghamshirewildlife.org)</p> <p>8: OS mapping, provided by Promap, February 2023</p>				

3 Potential Hazards Screening Review

3.1 Materials Held

Potentially polluting materials held on site in the process equipment include:

- Hydraulic oil in compressors
- Equipment lubricants
- Captured moisture

3.2 Potential to Affect receptors

3.2.1 Ground(water)

Oils and lubricants have the potential to cause pollution to ground and groundwater and this risk needs to be assessed and minimised.

3.2.2 Water

The risk of surface water containing water pollutants needs to be addressed.

3.2.3 Air

Nitrogen can be screened out as having no environmental impact since it is the majority component of the atmosphere and the amounts involved in the process are trivial.

Hydrogen is not known as an air pollutant, either as the element hydrogen or as its combustion product, water.

Oxygen can be screened out as having no environmental impact since it is a major component of the atmosphere and the amounts involved in the process are trivial.

3.3 Ground(water) Impacts of Deliveries and Storage

3.3.1 Oils etc

Any lubricants and hydraulic oils are ordered in and delivered on an as-required basis and delivered in 25-205 litre containers. There is no bulk storage of oils etc on site.

Any drums not for immediate use are stored indoors on dedicated meshed tray bunds to contain any leaks. The indoors storage means there is no risk of rainwater filling the bund and causing containment problems.

Materials delivery procedures are incorporated into the site's EMS to ensure that deliveries of oils and lubricants are made correctly and that personnel are aware of their responsibilities for handling the materials in an environmentally sound manner.

The EMS will contain an infrastructure inspection plan which will ensure any lubricant and oil stores are inspected regularly. Spill kits will be maintained on site to provide immediate control of any spills and the EMS will contain a spill and incident control procedure to ensure correct and appropriate use of the kits.

Any incidents or problems will be reported on an Incident and Corrective Action Form and reviewed by site management who will instigate and manage any necessary corrective actions.

3.4 Wastes

3.4.1 Wastes for Recovery

The contents of the electrolysis bath are collected and sent for regeneration approximately every 18-24 months. The collection is carried out by specialist contractors using dedicated tankers and transfer equipment. The operation is highly unlikely to create a leak or spill. Nonetheless the tanker will have a spill kit (booms etc) which can be deployed to contain any spills. Contained material will be sucked into the tanker as far as possible and any residual absorbed by absorbent granules for subsequent disposal as hazardous waste.

Spent catalyst is sent for regeneration/recovery approximately every 2 years.

3.4.2 Wastes for Disposal

Hydraulic fluid will eventually need to be replaced due to moisture and particle pickup and degradation of the oil additives. At this point it will be drained from the system into drums. Where possible the oil will be sent for recovery. Only if this is not possible will it be sent for disposal as hazardous waste. Site will monitor the transfer and will have a spill kit (booms etc) available which can be deployed to contain any spills. Contained spilled material will be absorbed by absorbent granules for subsequent disposal as hazardous waste.

Ion exchange cartridges from the water softening system will be picked up by the suppliers as and when necessary and sent for regeneration and recovery

3.5 General Amenity

3.5.1 Noise

The closest relevant receptor is c. 600m away. The noise source from the each compressor etc is 78dB which equates to approximately 22 DB at the receptor and is of negligible impact.

3.5.2 Dust

No particulate materials are used or generated on site. Site access roads have hard-top to minimise dust risks. No further evaluation is necessary.

3.5.3 Litter

Site receives minimal items in packaging and has a dedicated welfare block for staff where any litter items can be disposed of. Consequently, there is no risk of adverse amenity impact from litter.

3.5.4 Odour

None of the materials used at site have the potential to create adverse odours and no further evaluation is necessary.

3.5.5 Pests

No food or putrescible materials are used or stored on site and there is no risk of adverse amenity impact from pest and vermin.

4 Effluent Environmental Impact

4.1 Water Impacts

The RO effluent is discharged via existing connections to the River Trent. This is the only effluent discharged from the process.

The ultimate impact of the discharge on the river can be addressed using the impact tests specified on gov.uk website.

4.2 Specific methodology

4.2.1 Abbreviations

The following abbreviations and definitions are used in the impact assessment methodology:

- RC = Release Concentration
- EFR = Effluent Flowrate
- RFR = River Flowrate
- EQS = Environmental Quality Standard
- BC = Background Concentration
- PC = Process Contribution
- PEC = Process Environmental Contribution

$$PC = (EFR * RC) / (EFR + RFR)$$

$$PEC = [(EFR * RC) + (RFR * BC)] / (EFR + RFR)$$

4.2.2 Test Criteria

The guidance specifies a hierarchy of 4 tests of increasing complexity. The tests are to be applied in order and to each substance of interest. If the criterion is met for any test then that substance can be deemed to have met the necessary criteria for insignificance and there is no need to apply subsequent tests.

1. Test 1: $RC < 10\%$ of EQS
2. Test 2: $PC < 4\%$ of EQS
3. Test 3: $PEC - BC < 10\%$ of EQS
4. Test 4: $PEC < EQS$

4.3 Data

4.3.1 Flow Data

Effluent flow is the 360 l/hr maximum as set out in P207-R01. This is equivalent to 0.0001 m³/sec.

Historical flow data for the River Don is available from the National River Flow Archive ([Search Data | National River Flow Archive \(ceh.ac.uk\)](https://ceh.ac.uk/data/nrfa/)). A comprehensive dataset is available for the River Trent at North Muskham ([NRFA Station Mean Flow Data for 28022 - Trent at North Muskham \(ceh.ac.uk\)](https://ceh.ac.uk/data/nrfa/station/28022/)) adjacent to the site.

For the period 1968-201 the data provide the following key values:

Mean Flow 90.709 m³/s

95% Exceedance Flow 28.9 m³/s

4.3.2 Discharge Concentrations

A sample of RO discharge from a comparable RO Unit at an operating site was analysed for relevant anions and cations. The species detected and their concentrations are set out in the table below and can be used as representative discharge concentrations for the river impact assessment

Potassium (mg/l)	85
Calcium (mg/l)	123
Magnesium (mg/l)	10.50
Total Hardness as CaCO ₃ (mg/l)	48.6
Lead (mg/l)	0.01
Sodium (mg/l)	424
Chloride (mg/l)	202
Nitrate (mg/l)	15.8

4.3.3 EQS Values

Potassium, sodium, calcium and nitrate do not have published EQS values since they are considered to be naturally occurring species with widely variable concentrations depending on location.

For other species the EQS values are to be found in:

- Copy of Fresh_waters_specific_pollutants_and_operational_EQS
- Copy of Freshwater_PHS__PH_and_other_pollutants

Species	MAGNESIUM	CADMIUM	LEAD	CHLORIDE
EQS – ug/l	25	0.01	0.01	250000

4.3.4 Background Concentration Data

Background concentration data is available from River Trent gauging station, MD-36701570 (Dunham). The data is presented below as ug/l – with magnesium being evaluated as EQS/2 as per guidance.

POTASSIUM	CALCIUM	MAGNESIUM	CADMIUM	LEAD	SODIUM	CHLORIDE	NITRATE
11000	50	12.5	0.13	2.17	59000	85000	9590

4.4 Assessment

For the receiving waters the impact tests have been applied in order using the recently released H1 Assessment Spreadsheet tool. . The tables below set out the results and indicate at which point the receiving water meets the relevant criteria.

4.4.1 River Trent Assessment

Cadmium passes at Test 1 with the release concentration being below 10% of the EQS

Chloride and lead pass at Test 2 with the calculated PC < 4% of the EQS.

4.4.2 Discussion

For the ultimate environmental fate of the species, which is the River Trent, all species are seen to meet the criteria for PC<4% of EQS. Cadmium meets the criteria for Test 1 of RC<10% EQS . Thus all species can be treated as having no significant environmental impact.