



**APPLICATION FOR AN ENVIRONMENTAL PERMIT
UNDER THE ENVIRONMENTAL PERMITTING
(ENGLAND AND WALES) REGULATIONS 2016 (AS
AMENDED)**

ENVIRONMENTAL RISK ASSESSMENT



**PLOT 1C,
WILTON INDUSTRIAL ESTATE,
REDCAR,
TS10 4RF**

**MorGen Ref: 006-HS-STU-00003
MorGen Rev:D01
ECL Ref: H2EE.02.01/ERA
Version: Issue 2
October 2025**

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ACRONYMS/TERMS USED IN THIS REPORT

AW	Ancient Woodland
ASCR	Application Site Condition Report
CCTV	Closed Circuit Television
EA	Environment Agency
ECL	Environmental Compliance Limited
EMS	Environmental Management System
EP	Environmental Permit
ERA	Environmental Risk Assessment
H ₂	Hydrogen
H ₂ Plant	60MW Electrolytic Hydrogen Plant
LNR	Local Nature Reserve
LWS	Local Wildlife Site
MAGIC	Multi-Agency Geographical Information for the Countryside
MorGen	MorGen Energy UK Limited
N ₂	Nitrogen
NGR	National Grid Reference
NNR	National Nature Reserve
O ₂	Oxygen
Ramsar	The Ramsar Convention on Wetlands of International Importance
SAC	Special Areas of Conservation
SPA	Special Protection Areas
SSSI	Sites of Special Scientific Interest
The Installation	MorGen Energy H ₂ Plant

1. INTRODUCTION

1.1. Overview

- 1.1.1. Environmental Compliance Limited (“ECL”) has been appointed by MorGen Energy (“MorGen”) to prepare an Environmental Risk Assessment (“ERA”) to form part of the Environmental Permit (“EP”) application in relation to a proposed Hydrogen (“H₂”) Plant, hereafter referred to as “the Installation”, located at Plot 1C, Wilton Industrial Estate, Redcar, TS10 4RF.
- 1.1.2. This permit application is for a 60 MW electrolytic hydrogen (H₂) plant of 1080 kg H₂/h of nominal capacity. The H₂ plant would therefore comprise a listed activity under Section 4.2 Part A(1), sub paragraph (a)(i) *“Producing inorganic chemicals such as gases (for example....hydrogen)”*.
- 1.1.3. An ERA has been undertaken in accordance with the relevant requirements of the current version of the Environment Agency (“EA”) online risk assessment guidance¹, in order to:
- identify potential risks that site operations may present to the environment;
 - screen out any insignificant risks;
 - assess potentially significant risks in detail; and
 - decide on the appropriate control measures.
- 1.1.4. Accordingly, the assessment has addressed the potential risks relating to the operation of the proposed Installation, namely:
- amenity risks (e.g. point and fugitive emissions to water/sewer, noise, etc.); and
 - accidents (e.g. fire, loss of containment, loss of power, vandalism).

¹ EA online guidance – ‘Risk assessments for your environmental permit’. Available at <https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit>

2. IDENTIFICATION OF RECEPTORS

2.1. Site Settings

- 2.1.1. The Installation is located approximately 3km southwest of Redcar at Wilton Industrial Estate. The Installation occupies an approximate area of 3 hectares and is centred on National Grid Reference ("NGR") NZ 57430 20790.
- 2.1.2. Figure 1 provides the indicative location of the H₂ Plant within the context of the surrounding environment.

Figure 1: Indicative H₂ Plant Location



- 2.1.3. In general, within 2.5km of the EP boundary, the surrounding land use is made up of industrial and commercial activities to the north and northwest, residential areas to the northeast and west and green space (comprising a golf course, agricultural land and woodland) to the south and southeast.
- 2.1.4. The towns of Grangetown and Redcar are located approximately 1.8km to the west and 2.5km northeast of the EP boundary, respectively and the villages of Lazenby and Olds Lackenby are located approximately 650m south and 1.6km southwest of the EP boundary, respectively. Middlesbrough town centre lies approximately 7.5km west of the Installation.
- 2.1.5. At their approximate nearest points, the A174 and A1053 lie 770m south and 1.25km southwest of the EP boundary, respectively, and the River Tees lies circa 4km to the northwest.

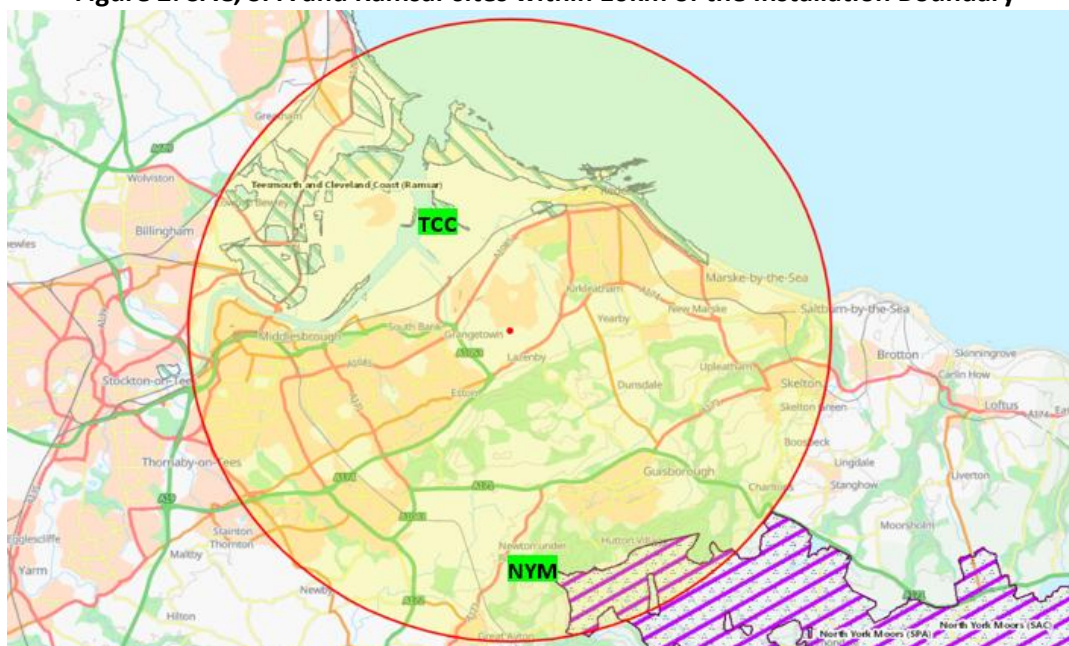
2.2. Potentially Sensitive Ecological Receptors

- 2.2.1. A review of the area using Multi-Agency Geographic Information for the Countryside (“MAGIC”)² mapping tool shared data platform identified that the H₂ Plant is located within 10km of one Special Area of Conservation (“SAC”), one Special Protection Area (“SPA”) and one Ramsar Convention on Wetlands of International Importance (“Ramsar”) site. Details of which are shown in Table 1 with a visual representation provided as Figure 2.

Table 1: SAC, SPA and Ramsar sites within 10km of the Installation Permit Boundary

Ref.	Name and Designation(s)	Easting (X)	Northing (Y)	Distance from EP Boundary (km)	Heading (°)
NYM	North York Moors (SAC and SPA)	458868	513040	7.9	169
TCC	Teessmouth And Cleveland Coast (Ramsar)	456118	524030	3.5	338

Figure 2: SAC, SPA and Ramsar sites within 10km of the Installation Boundary



- 2.2.2. A search using MAGIC was undertaken to identify Sites of Special Scientific Interest (“SSSI”), National Nature Reserve (“NNR”) and Local Nature Reserves (“LNR”) within 2km of the H₂ Plant. The search revealed that there are no SSSIs, NNRs or LNRs.
- 2.2.3. A search using MAGIC was undertaken to identify, Ancient Woodland (“AW”) sites. No AW sites were identified within 1km of the Installation boundary.
- 2.2.4. A review of Local Wildlife Sites (“LWS”) in Redcar and Cleveland Council was undertaken and there is one LWS, Wilton Woods Complex, situated approximately 1.4km to the south of the Installation.

² Magic Map Online Mapping Tool, available at: <https://magic.defra.gov.uk/>

2.2.5. In addition to the searches undertaken for SACs, SPAs, Ramsars, SSSIs, NNRs, LNRs, LWSs and AWs, other potentially sensitive land uses within 1km of the Installation were also considered. A review of the area using MAGIC indicated that none of the following sensitive land uses are located within a 1km radius of the Installation:

- Areas of Outstanding Natural Beauty;
- Groundwater Source Protection Zones;
- Marine Conservation Zones;
- Nitrate Vulnerability Zone; and
- Scheduled Monuments.

2.3. Potentially Sensitive Human Receptors

2.3.1. In addition to a number of industrial buildings, thirteen potentially sensitive human receptors have been identified within 2km of the Installation. Details of which are displayed in Table 2 with a visual representation provided as Figure 3.

Table 2: Human Receptors within 2km of the Installation Permit Boundary

Ref.	Name	Easting (X)	Northing (Y)	Distance from Permit Boundary (km)	Heading (°)
H1	Residential area to southwest of site	457389	520060	0.73	182
H2	Brookfield care home	457436	519769	1.02	179
H3	The Half Moon	457303	519754	1.04	186
H4	Lazenby Village Hall	457192	519717	1.09	192
H5	Wilton Primary Academy	457435	519874	0.92	179
H6	Wilton Golf Club	457805	519966	0.91	155
H7	The Faraday Training Centre	458478	520689	1.07	95
H8	Kirkleatham Park and Museum	459081	521637	1.87	63
H9	Residential area to west of site	455742	519927	1.88	243
H10	J&R Bullcock	456453	519382	1.70	214
H11	Residential area to southwest of site	456522	519197	1.82	209
H12	Wilton Castle	458184	519681	1.35	145
H13	Castle Dene Retirement home	458529	519764	1.52	133

Figure 3: Sensitive Human Receptors Identified within 2km of the Installation



2.4. Risk of Flooding

- 2.4.1. The closest surface water feature is within the Installation boundary, as noted in an Envirocheck Report contained in the Application Site Condition Report (“ASCR”) (report reference: H2EE.02.01/ASCR) submitted as Section 6 of the EP application.
- 2.4.2. From a review of satellite imagery and maps of the area, it is considered that this is likely an existing drainage channel (with the land currently cleared grassland). It is anticipated the existing surface water features will be replaced by the Installation’s site surfacing and drainage infrastructure. In addition, there are small-scale reservoirs sited approximately 1.1km to the southeast of the EP boundary.
- 2.4.3. The nearest major water course is the River Tees, located approximately 4km to the northwest of the Installation. The River Tees is heavily modified and stretches approximately 137km in length and flows from the North Pennines eastwards to meet the North Sea between Hartlepool and Redcar.
- 2.4.4. The Tees waterbody is classified as being of moderate ecological potential and possesses a poor chemical status³.
- 2.4.5. As shown on the EA’s mapping service for flood risk from rivers or the sea⁴, the Site is not covered by a flood risk category for rivers or the sea and is therefore deemed to have a very low probability of flooding (meaning that the potential of flooding is less than 0.1% each year).

³ EA’s Catchment Data Explorer, available online at: <https://environment.data.gov.uk/catchment-planning/WaterBody/GB510302509900?cycle=3>

⁴ EA’s Long Term Flood Risk Map, available online at: <https://check-long-term-flood-risk.service.gov.uk/map>

- 2.4.6. As shown on the EA's mapping service for flood risk from surface waters⁸, the majority of the Site is not covered by a flood risk category for surface waters (meaning that the potential of flooding is less than 0.1% each year) or it is covered by a low chance of flooding (meaning that the potential of flooding is between 0.1% to 1% each year). It should be noted that there are also areas (notably the northwesterly portion of the Site) that possess a high flood risk (meaning that the potential of flooding from surface water is greater than 3.3%).
- 2.4.7. Figures 4 and 5 have been provided to reproduce the information displayed in the EA's mapping service for rivers and the sea and for surface waters, respectively. In Figures 4 and 5, the approximate location of the Installation has been outlined in red.

Figure 4: Long Term Flood Risk Map – Rivers and the Sea

Rivers and sea map

Yearly chance of flooding

● Extent

- High chance
More than 3.3% chance each year
- Medium chance
Between 1% and 3.3% chance each year
- Low chance
Between 0.1% and 1% chance each year
- Very low chance
Less than 0.1% chance each year

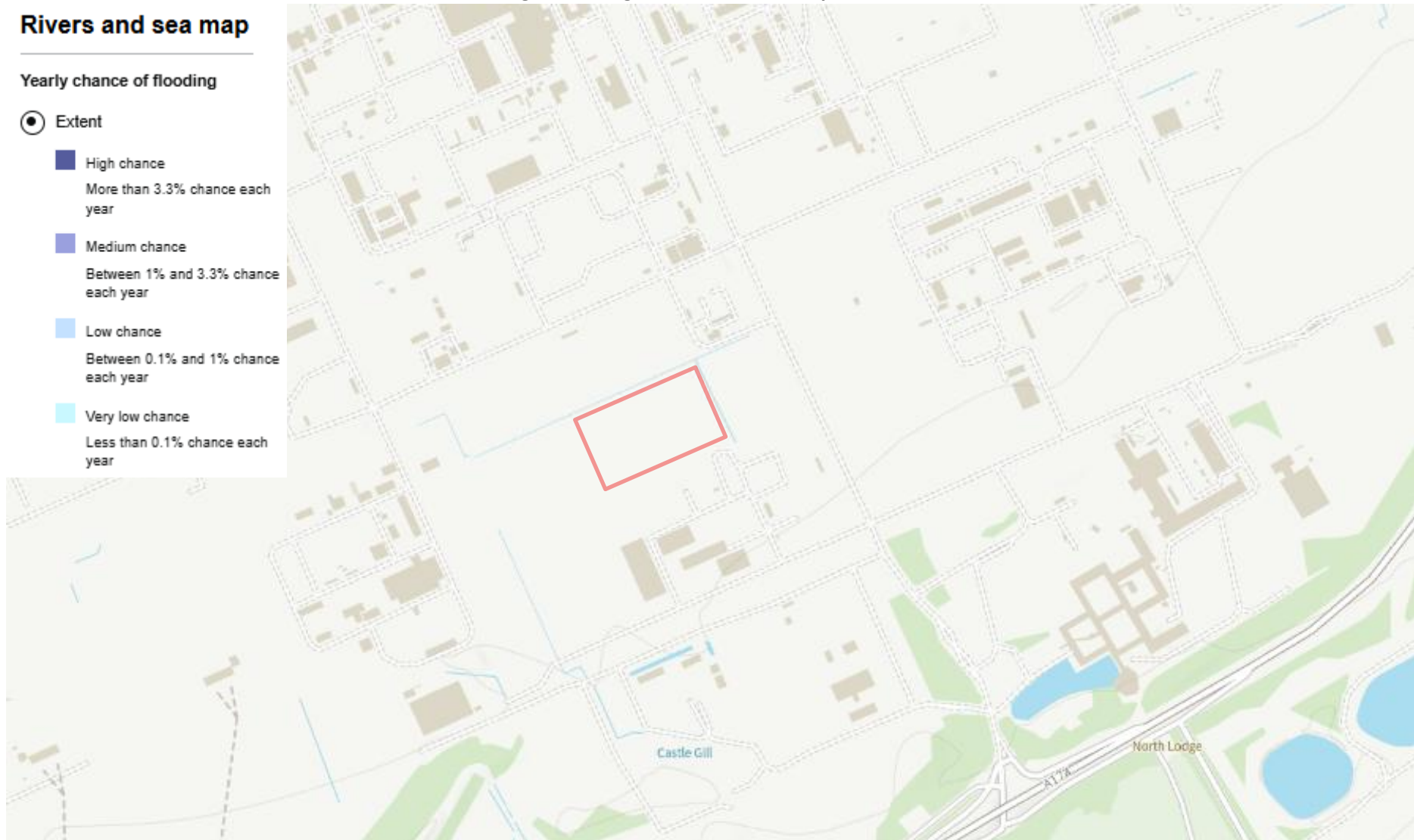


Figure 5: Long Term Flood Risk Map – Surface Water



3. IDENTIFICATION OF THE RISKS

3.1. Amenity Risks

3.1.1. Taking into account the nature of the activities that will be undertaken at the Installation, the main amenity risks identified are as follows:

- point source emissions to air;
- fugitive emissions to air;
- fugitive emissions to surface water and groundwater; and
- noise.

3.1.2. Fugitive releases to land and surface water will be prevented by conducting all operations in areas sealed with an impervious barrier to prevent a pathway for migration to land. Consequently, no further assessment has been undertaken.

3.1.3. There are no point source emissions to surface water, nor land. Consequently, no further assessment has been undertaken.

3.2. Accident Risks

3.2.1. The main potential accident risks have been identified as:

- fire;
- loss of containment of potentially polluting materials;
- loss of power/system failure; and
- human error or vandalism.

4. ASSESSMENT OF RISKS

4.1. Methodology

4.1.1. The risk assessments have been undertaken using the following approach for amenity and accident risks:

- identification of hazards associated with the risk that have the potential to cause harm;
- identification of potential receptors i.e. what is at risk (for the purposes of this assessment, typical potential receptors have been identified?);
- pathway i.e. how can the hazard get to the receptor?;
- risk management measures employed to reduce the risk to an acceptable level;
- probability of exposure i.e. how likely is this contact?;
- consequence i.e. what is the harm that can be caused?; and
- assessment of overall risk.

4.1.2. The assessments for the amenity and accident risks identified above are presented in Tables 3 and 4 respectively.

Table 3: Amenity Risk Assessment

Hazard	Receptors	Pathway	Risk Management	Probability of Exposure	Consequence	Overall Risk
Emissions to Air						
<i>Point Source Emissions to Air</i>						
Point source emissions from proposed emission points A1-3 (hydrogen) and A4-A18 (oxygen ("O ₂ "))	Ecological and human sensitive receptors in surrounding area (see Section 2.2 and 2.3 of this ERA).	Release to Air.	Neither oxygen nor hydrogen are considered to be pollutant gases. Consequently, only risk associated with potential ignition has been considered Low pressure H₂ is continuously vented, via emission points (A1-3), at a rate of 0.8kg/h from each electrolyser as part of the process. There are strict controls in place to ensure that in the event of an emergency, where both hydrogen and oxygen have to be vented at the same time (e.g. emergency shut down), the hydrogen is vented at a safe distance from the oxygen to avoid the risk of mixing and ignition. As oxygen is released directly into the air after being produced, in case of an emergency, the production is stopped immediately and no oxygen is further released.	Low Risk management measures should prevent unauthorised releases from reaching the identified receptors.	Air Pollution.	Not significant if risk management measures are strictly adhered to.
<i>Fugitive Emissions to Air</i>						
Fugitive emissions from hydrogen and nitrogen ("N ₂ ")	Ecological and human sensitive receptors in surrounding area (see Section 2.2 and 2.3 of this ERA).	Release to Air.	There are a number of fugitive emission points as follows: • vent for the pipeline; • vent for the gas dehydration; and • a vent in each water treatment train (currently 3 trains). Fugitive emissions of H₂ would only arise should there be a leak in any pipework. Quantities of H₂ within the H₂ Plant are limited as the H₂ produced is transferred directly to drying and then off site It should be noted that elemental nitrogen is also occasionally used to purge the system in very low quantities Fugitive releases of H₂ are not located in close proximity to the O₂ release point, consequently there is no risk of mixing and ignition.	Low Risk management measures should prevent unauthorised releases from reaching the identified receptors.	Air Pollution.	Not significant if risk management measures are strictly adhered to.

Table 3: Amenity Risk Assessment (cont.)

Hazard	Receptors	Pathway	Risk Management	Probability of Exposure	Consequence	Overall Risk
Emissions to Water						
<i>Fugitive Emissions to Water – Surface Water</i>						
Fugitive releases of raw materials, and/or contaminated surface water	Controlled waters.	Via internal site drainage and surface water drainage system.	The activities undertaken by the H₂ Plant are conducted in a controlled manner. Hard standing is present all around the site which acts as an impermeable barrier. Bunds (to 110% capacity) are also present around the raw materials (water treatment chemicals, diesel and maintenance fluids) to help minimise any fugitive emissions. Any spillages at the H₂ Plant will be subject to the Installation's Emergency Plan which includes spill response. This will prevent any potentially polluting materials from entering the Installation's drainage network. In addition, surface water aspect of the combined drainage network for the Installation will benefit from an interceptor and penstock valve to help minimise and control any pollution leaving the site. External examinations of all storage vessels will be undertaken by a qualified engineer on an annual basis and any actions undertaken in accordance with the engineer's recommendation. All plant and equipment will be subject to regular maintenance and servicing as per the Planned Maintenance Plan contained within the Installation's Environmental Management System ("EMS"). Additionally, any evidence of spillage/loss of containment and inspection of the site infrastructure is inspected weekly. If remedial action is required, this will be reported immediately, and the issue rectified as soon as possible.	Low	Contamination of controlled waters.	Not significant if risk management measures are strictly adhered to.

Table 3: Amenity Risk Assessment (cont.)

Hazard	Receptors	Pathway	Risk Management	Probability of Exposure	Consequence	Overall Risk
Noise						
Noise emissions from site operations	Ecological and human sensitive receptors in surrounding area (see Section 2.2 and 2.3 of this ERA).	Release to Air. Installation is close enough to human sensitive receptors for noise to be potentially audible	The H₂ Plant is located within an industrial setting and is surrounded by other site activities. The site operations are conducted within a building, thus helping to mitigate and attenuate any noise generated by the site's activities. A noise assessment has been undertaken (which has been submitted as an Appendix to H2EE.02.01/EPTR submitted with this application), the results indicate that, the proposed plant would likely contribute to the existing low-level hum audible below road traffic at quiet periods but is unlikely to pose a significant intensification. Within the context of the existing industry in the area the impact of this is unlikely to be significant. The maintenance requirements of site equipment will be contained in the site's EMS. The maintenance regime will be devised in accordance with the manufacturer's handbook and recommendations to ensure all plant and equipment is in good working order. In the event of elevated noise being experienced at the Installation, the Incident Report Form will be completed. An investigation will be undertaken to establish the root cause and implement corrective actions. The relevant risk assessment will also be updated where necessary.	Low/Medium The risk management measures should prevent noise reaching the identified receptors	Possible noise nuisance	Not significant if risk management measures are strictly adhered to

Table 4: Accident Risk Assessment

Hazard	Receptors	Pathway	Risk Management	Probability of Exposure	Consequence	Overall Risk
Fire						
Fire at the site.	Ecological and human sensitive receptors in surrounding area (see Section 2.2 and 2.3 of this ERA).	Release to air – windblown dispersion in atmosphere.	MorGen will have an Emergency Response Plan in place which details the procedures to report and effectively manage incidents and potential emergency situations including fire. Emergency drills will be undertaken annually to ensure all staff are aware of the emergency procedures. Any findings and actions will be documented. Fire extinguishers will be located in strategic locations and inspected and maintained periodically. All employees are made aware of the location of fire-fighting equipment and are conversant with their appropriate usage. General fire-prevention and protection measures are implemented in accordance with the Installations Safety Management System. Preventative maintenance on all equipment will be undertaken to prevent any faults occurring as detailed in the manufacturer's manual and handbook. Designated smoking areas are in place away from the proposed activities.	Low The risk management measures should prevent any release from reaching the identified receptors.	Combustion gases (smoke) and localised nuisance.	Not significant if risk management measures are strictly adhered to.

Table 4: Accident Risk Assessment (cont.)

Hazard	Receptors	Pathway	Risk Management	Probability of Exposure	Consequence	Overall Risk
Fire (Cont.)						
Releases of potentially contaminated firewater.	Ecological and human sensitive receptors in surrounding area (see Section 2.2 and 2.3 of this ERA).	Via drainage network or overland flow.	Depending on the location of the fire and following advice and instruction from the Fire Rescue Service, drain mats and firewater booms, for example, will be provided and deployed by site personnel to prevent any firewater entering the drainage system and leaving site. Additionally, the surface water aspect of the combined drainage network for the Installation will benefit from an interceptor, retention basin to control flow and penstock valve to help minimise and control any pollution leaving the site.	Low Risk	Contamination of controlled waters.	Not significant if risk management measures are strictly adhered to.
	Controlled waters.		The contained potentially contaminated firewater will be tested prior to disposal off-site to an appropriately licenced facility or installation.	management measures should prevent any release from reaching the identified receptors.		

Table 4: Accident Risk Assessment (cont.)

Hazard	Receptors	Pathway	Risk Management	Probability of Exposure	Consequence	Overall Risk
Spillage of Potentially Polluting Substances						
Loss of containment during unloading and storage of maintenance/ water treatment chemicals.	Controlled waters.	Via site drainage network or via overland flow.	The Installation benefits from impermeable surfacing to prevent any downward migration of potentially pollution substances entering the ground or groundwater. Site Staff and the delivery driver are responsible for ensuring the supervision of deliveries and unloading at all times and storage vessel levels are checked prior to unloading to prevent overfilling. Bunds are present around the material storage areas providing 110% capacity of the largest container or 25% of the total contents within the bund, whichever is greater to help minimise any loss of containment. A spill management procedure is in place as part of the Installation's EMS. All staff are trained in the spill management procedure and the appropriate deployment of spill kits contents.	Low Risk management measures should prevent any release from reaching the identified receptors.	Contamination of controlled waters.	Not significant if risk management measures are strictly adhered to.
Fuel leak from delivery vehicles.						

Table 4: Accident Risk Assessment (cont.)

Hazard	Receptors	Pathway	Risk Management	Probability of Exposure	Consequence	Overall Risk
Loss of Power						
Major system failure/loss of process control.	Ecological and human sensitive receptors in surrounding area (see Section 2.2 and 2.3 of this ERA).	Release to air.	The process equipment benefits from alarms and controls which enable any malfunctions to be identified immediately. The Installation is capable of identifying, holding and preventing the release of any materials should equipment fail. Low pressure H₂ is continuously vented, via emission point (A1-3), at a rate of 0.8kg/h from each electrolyser as part of the process. There are pressure relief valves which can be used to vent H₂ in case of overpressure. The system / operators will take corrective measure to bring the plant back to normal operating conditions and the pressure relief valves will automatically close again. N₂ will be vented for only short periods of time during purging and on rare occasions such as emergencies. Fugitive releases of H₂ are not located in close proximity to the O₂ release point, consequently there is no risk of mixing and ignition. The documented planned maintenance regime will detail the required maintenance and inspection of all process equipment to ensure good working order to reduce the risk of complete system failure. All operations are designed to possess fail-safe mechanisms (for example, should a major system failure or loss of power occur). Faults will be addressed, and repairs undertaken where necessary using specialist contractors. Competent personnel will then check all areas prior to recommencing operations.	Low Risk management measures should prevent any release from reaching the identified receptors.	Air pollution	Not significant if risk management measures are strictly adhered to.

Table 4: Accident Risk Assessment (cont.)

Hazard	Receptors	Pathway	Risk Management	Probability of Exposure	Consequence	Overall Risk
Vandalism						
Any of the above.	Any of the above.	Any of the above.	The Installation is secured by perimeter fencing and, via closed-circuit television ("CCTV. In addition, the site is also monitored by alarms 24/7. In addition, the Industrial Estate main access has security gates and a guardhouse to control access. All visitors must sign in and staff are trained in site security procedures and are encouraged to report unidentified or unknown visitors.	Low Risk management measures should prevent any release from reaching the identified receptors.	Any of the above.	Not significant if risk management measures are strictly adhered to.

5. SUMMARY

5.1. Results of the Assessment

- 5.1.1. The results of both the amenity and accident risk assessments (Tables 3 and 4) indicate that none of the risks relating to proposed variation will be significant if the Installation is operated and managed in accordance with the risk management measures detailed.

5.2. Conclusion

- 5.2.1. The risks in terms of accident and amenity risk can be considered not significant providing all risk management measures are implemented and strictly adhered to.