Shell E&P Ireland Limited

Shell E&P Ireland Limited
Corrib House
52 Lower Leeson Street
Dublin 2
Ireland
Tel +353 (0)1 669 4100
Fax +353 (0)1 669 4101

Office of Licensing and Guidance
Environmental Protection Agency
PO Box 3000
Johnstown Castle Estate
Co. Wexford

Attention: Mr. Frank Clinton

Our Ref.: COR-01-SH-GE-1342

24th March 2010

Dear Mr. Clinton,

Re: Application by Shell E&P Ireland Limited for a Review of the existing Integrated Pollution Prevention and Control Licence (IPPC Reg. No. P0738-01) pertaining to the Bellanaboy Bridge Gas Terminal, Bellagelly South, Co Mayo.

Shell E&P Ireland Ltd. hereby submit an Application for a review of the existing Integrated Pollution Prevention and Control (IPPC) Licence (P0738-01) for the Gas Terminal at Bellanaboy Bridge, Bellagelly South, Co. Mayo.

The relevant Classes of Activity for the facility under the First Schedule of the Environmental Protection Agency Acts 1992 to 2007, as specified in the existing Licence, are as follows:

9.3.1 The operation of a gas refinery (Main Activity)
2.1 The operation of combustion installations with a rated thermal input equal to or greater than 50 MW

The IPPC Licence Review Application principally relates to the proposed change of discharge point for treated produced water from the permitted outfall point just outside Broadhaven Bay, to the subsea manifold located on the seabed in the Corrib Gas Field in some 350m water depth.

This change followed discussions with the Erris Inshore Fishermens Association (EIFA) in 2008, during which SEPIL made a goodwill gesture by offering to use an alternative method of discharge for treated produced water, subject to statutory approval.

This Licence Review Application also reconciles, within the submitted documentation, changes which have occurred since the start of the IPPC licensing process in 2004. Many of the changes have been driven by the IPPC process, including the removal of the Heating Medium Fired Heater and inclusion of Waste Heat Recovery to provide process heat to the Terminal, and the inclusion of Selective Catalytic Reduction on the power generators to meet the limits for Oxides of Nitrogen (NOx) specified in the existing Licence. The location of sampling and monitoring points has also been reconciled to

Registered in Ireland Number 316588
Registered Office: Corrib House, 52 Lower Leeson Street, Dublin 2, Ireland
Directors: JG Egan, AM Hamilton, TJ Nolan

reflect their planned and as-constructed locations for the facility's operational phase. Surface and groundwater drains are also proposed to be monitored and controlled as separate systems.

This Licence Review Application also proposes to amend the emission limit value (ELV) for suspended solids in stormwater (rainwater) run-off from the site from 5mg/l to 30mg/l in line with Best Available Techniques guidance.

In accordance with Section 87(1)(a) of the Environmental Protection Agency Acts, 1992 to 2007 the Planning Authority (Mayo County Council) has been notified of the intention to apply for a review of the existing Licence.

Enclosed with this Application is the following:

- 3 hardcopies of the Application (1 signed original and 2 copies);
- 2 electronic copies of the Application on CD-Rom;
- One electronic copy of the geo-referenced drawing files on CD-Rom; and
- The Licence Review Application fee of €22,854.

I confirm that the electronic files submitted with the Application are true copies of the hardcopies of the Application.

If you have any further queries in relation to this application please do not hesitate to contact myself or Seán Dillon.

Yours sincerely

P.P. Seán Dillon

Mark Carrigy
Terminal Operations Manager

Encl.

APPLICATION FOR REVIEW OF IPPC LICENCE

SHELL E&P IRELAND LTD

2010

Integrated Pollution Prevention and Control (IPPC) Licensing

Application Form

EPA Reg. N°:
(Office use only)

Environmental Protection Agency
P.O. Box 3000, Johnstown Castle Estate, Co. Wexford
Lo Call: 1890 335599 Telephone: 053-9160600 Fax: 053-9160699
Web: www.epa.ie Email: info@epa.ie

CONTENTS

ABOUT THIS APPLICATION FORM

This form is for the purpose of making an application for an Integrated Pollution Prevention and Control (IPPC) Licence under the Environmental Protection Agency Acts, 1992 and 2003. There are separate application forms for licensees who wish to apply for a review of existing licences and for Pig & Poultry sector applicants.

The Application Form **must** be completed in accordance with the instructions provided in the *IPPC Licensing Application Guidance Note.* The Guidance Note gives an overview of IPPC Licensing, outlines the licence application process (including number of copies required) and specifies the information to be submitted in the application. The Guidance Note and application forms are available to download from the IPPC Licensing pages of the EPA's website at www.epa.ie. A valid application for an IPPC licence must contain the information prescribed in the Environmental Protection Agency (Licensing) Regulations, 1994 to 2004. Article 10 of the Regulations sets out the statutory requirements for information to accompany a licence application. The application form is designed in such a way as to set out these questions in a structured manner and not necessarily in the order presented in Article 10. In order to ensure a legally valid application in respect of Article 10 requirements, please complete the Article 10 Checklist provided in Annex 2.

This Application Form does not purport to be and should not be considered a legal interpretation of the provisions and requirements of the Environmental Protection Agency Acts, 1992 and 2003 and the Environmental Protection Agency (Licensing) Regulations 1994 to 2004. While every effort has been made to ensure the accuracy of the material contained in the Application Form, the EPA assumes no responsibility and gives no guarantees, undertakings and warranties concerning the accuracy, completeness or up-to-date nature of the information provided herein and does not accept any liability whatsoever arising from any errors or omissions.

Should there be any contradiction between the information requirements set out in the Application Form and any clarifying explanation contained in the accompanying Guidance Note, then the requirements in this Application Form shall take precedence.

SECTION A: NON-TECHNICAL SUMMARY

A non-technical summary of the application is to be included here. The summary should identify all environmental impacts of significance associated with the carrying on of the activity/activities, and describe mitigation measures proposed or existing to address these impacts. This description should also indicate the normal operating hours and days per week of the activity.

The following information must be included in the non-technical summary:

A description of:

- the installation and its activities,
- the raw and auxiliary materials, other substances and the energy used in or generated by the installation,
- the sources of emissions from the installation,
- the environmental conditions of the site of the installation (e.g. soil and groundwater, air, noise, surface water),
- the nature and quantities of foreseeable emissions from the installation into each medium as well as identification of significant effects of the emissions on the environment,
- the proposed technology and other techniques for preventing or, where this is not possible, reducing emissions from the installation,
- where necessary, measures for the prevention and recovery of waste generated by the installation,
- further measures planned to comply with the general principles of the basic obligations of the operator i.e.

  (a) all the appropriate preventive measures are taken against pollution, in particular through application of the Best Available Techniques (BAT);
  (b) no significant pollution is caused;
  (c) waste production is avoided in accordance with Council Directive 75/442/EEC of 15 July 1975 on waste; where waste is produced, it is recovered or, where that is technically and economically impossible, it is disposed of while avoiding or reducing any impact on the environment;
  (d) energy and other resources are used efficiently;
  (e) the necessary measures are taken to prevent accidents and limit their consequences;
  (f) the necessary measures are taken upon definitive cessation of activities to avoid any pollution risk and return the site of operation to a satisfactory state.

- measures planned to monitor emissions into the environment.

Supporting information should form **Attachment Nº A.1**

Answer:

A.1 Background

The existing IPPC licence (Licence Register No. P0738-01) was issued by the EPA to Shell E&P Ireland Limited (SEPIL) on 12th November 2007.

SEPIL wish to seek a review of the existing IPPC licence in respect of proposed changes to the method and location of discharges of treated produced water from the Bellanaboy Bridge Gas Terminal.

The proposed new arrangement involves the discharge of most of the produced water through spare cores in the main control umbilical to the subsea manifold located on the seafloor at the Corrib gas field some 65km offshore (c. 92Km along the pipeline route from the terminal) and in 350m depth of water. To prevent corrosion and restrictions within the cores due to biological growth, a small quantity of biocide will be added to the treated produced water. A small amount of produced water will need to be removed offsite by a licensed waste contractor (c. 4-5 trucks per week), but this will not be required in later years when produced water volumes decline. Discharged produced water will remain treated to the emission limit values conditioned under the current IPPC licence. Surface water run off from process areas on site will be treated and discharged as permitted under the current IPPC licence.

Since the original application was made in 2004 a number of changes have taken place to the scheme. The changes have largely been driven by the IPPC process and have now been reconciled into the application document. These include the addition of waste heat recovery on the sales gas compressor turbines, and removal of the heating medium fired heater, plus the addition of selective catalytic reduction equipment on the power generators to provide NOx reduction to meet the IPPC limit of 250mg/Nm^3.

Drainage through the emergency holding tank (EHT) has been reconfigured to allow the separate management and control of the groundwater drains and the uncontaminated surface water drains.

This licence review application also proposes to bring the emission limit value for suspended solids (fine inert particles of soil and stone) in stormwater (rainwater) run-off in line with BAT guidance. This will mean increasing the limit from 5mg/l to 30mg/l of suspended solids. 5mg/l may not be achievable in times of heavy rainfall. The proposed limit is less than the current limit imposed for construction. Further details are provided F.1.4 of the application.

Infrastructural conditions required by the existing licence have also been incorporated. The location of monitoring points, samplers and analysers are also updated in the application.

A.2 Introduction

Shell E&P Ireland Limited (SEPIL) is a member of the Royal Dutch Shell Group of Companies. SEPIL propose to construct and operate the Bellanaboy Bridge Gas Terminal to process natural gas extracted from the Corrib Field for export to the Bord Gáis transmission network. The Terminal will monitor and control the operation of the entire Corrib Field facilities (onshore Terminal, onshore pipeline) and offshore sub-sea facilities) such that gas production meets demand and to ensure that operations are conducted in a safe and environmentally sound manner.

The Corrib Field is a gas field located below the seabed in the Atlantic Ocean ca. 65km off the Mayo coastline and at ca. 350 metres water depth. The Bellanaboy Bridge Gas Terminal is located in Bellanaboy Bridge, Bellagelly South, Co. Mayo.

The following drawings are included in Attachment A.2.
- Site Location Plan
- Terminal Layout Plan

The total site area at Bellanaboy Bridge is ca. 160 hectares, the footprint of the Terminal itself will occupy an area of ca. 13 hectares within the total site area. The site was formerly part of the Peatland Experimentation Station, Glenamoy, established by the Department of Agriculture in 1955 which was developed with the primary aim of finding suitable methods to reclaim and fertilise blanket bog for agricultural and forestry use. The site was administered by the Soils Division of An Foras Taluntais (the agricultural institute, now Teagasc) from 1959 and was wound down towards the late 1970s – early 1980s.

Planning permission for the construction of the gas terminal was granted by Mayo County Council in October 2004.

The initial task before construction began was site preparation. This involved the excavation of approximately 650,000m^3 of peat, rock and soil in order to create a construction platform on which to build the terminal. Of this, approximately 450,000m3 was transported by road to a cutover peatland at Srahmore which is owned and operated by Bord na Mona. Approximately 200,000m3 of excavated material was re-used on the site. The construction of the terminal is now approximately 85% completed.

The Terminal will operate on a 24-hour, 365-day per year basis. The Terminal will employ a total of ca. 50 full-time staff during operation and will be manned on a 24-hour basis. A further 50 to 70 personnel will be engaged when security personnel, contractors and support staff at the Bellmullet office are included. SEPIL will commence operations at the Terminal on receipt of the necessary licences and consents.

The processes to be used in the Terminal for processing of the gas stream are well proven and utilise 'best available techniques' (BAT) and will be operated using 'best available practice'. In particular, the technologies and systems used to minimise and control environmental emissions can be considered BAT.

A.3 Outline of the main alternatives to the Terminal studied by SEPIL

A.3.1 General

The final location of the Terminal was arrived at following a detailed review of alternative options. The alternatives were presented in detail in the original IPPC licence application and the EIS that accompanied it.

A.4 Terminal Operations

The Terminal has been designed to receive, process and export natural gas. Gas from the Corrib Field reservoir contains no hydrogen sulphide and is therefore termed sweet gas. It contains a small amount of hydrocarbon condensate, which is a naturally occurring fluid, which will have characteristics comparable with gasoline when it is condensed out of the gas in the Terminal. Condensate production is expected to be in the range of 0.05 to 0.5 barrels per million standard cubic feet but is anticipated to be closer to the bottom end of the range. The natural gas also has a very low water content. The Corrib Field sub-sea facilities will extract natural gas from the Corrib Field and feed it to the onshore Bellanaboy Bridge Gas Terminal for processing.

Gas (and other production fluids) will be transported from the sub-sea facilities to the Terminal in a gas pipeline. An umbilical cable running between the Terminal and sub-sea facilities will provide an electrical power supply, data transmission, hydraulic fluid and chemicals injection (anti-freeze agent, corrosion inhibitor) to the sub-sea facilities and will allow the operation of the sub-sea facilities to be monitored and controlled from the Terminal

The Terminal will process and treat the gas to meet Bord Gáis specification prior to export to the distribution network. The Terminal is designed to process and treat up to 350 million standard cubic feet (9.9 million standard cubic metres) of natural gas per day from the Corrib Field.

The primary functions of the Terminal will be to:

- monitor and control the operation of the entire Corrib Field facilities (onshore and offshore) such that gas production meets demand and to ensure that operations are conducted in a safe and environmentally sound manner;
- remove liquids from the Corrib gas stream so that it meets the transmission specification;
- meter and odourise the gas prior to export to the transmission network;
- recover the hydrocarbon condensate from the gas stream and export it offsite
- inject methanol and other chemicals for use in the sub-sea facilities and recover methanol for re-use; and
- treat the water removed from the natural gas stream prior to discharge to sea.

The current IPPC license allows the discharge of all treated produced water and treated surface water to an outfall located 12.7km offshore along the pipeline route from the landfall site at Dooncarton at a point approximately 2km north of Erris Head in approximately 68m water depth.

In this application for a review of the IPPC licence, it is proposed to amend the method of discharge of produced water from the Bellanaboy Bridge Gas Terminal. The proposed new arrangement involves the discharge of most of the produced water through spare cores in the main control umbilical to the central manifold located at the Corrib gas field some 65km offshore (~ 92km along the pipeline length) and in 350m depth of water. A small amount of produced water will need to be removed offsite by a licensed waste contractor, (ca. 15-20m^3/day) but this will not be required in later years when produced water volumes decline.

There follows a brief summary of the process unit operations and principal supporting utilities / ancillary equipment at the Terminal. A simplified process overall flow schematic of the Terminal operations is included in Attachment A.4.

A.4.1 Control of Terminal Operations

The whole Corrib Field development (Terminal and offshore sub-sea facilities) will be controlled from the onshore Terminal control room. The Corrib Field offshore sub-sea facilities will be controlled and monitored via an electro-hydraulic remote control system. Electrical power, control and data signals, along with hydraulic control and chemical injection fluids (methanol and corrosion inhibitor) will be carried in an umbilical cable between the Terminal and the Corrib Field. Manning levels in the control room will be based in the philosophy that is sufficient for safe operation of the Terminal and the Corrib Field. The Terminal control room will be provided with all the necessary information to safely control the offshore facility, gas and liquid processing at the onshore terminal and gas export to the national grid. The control system will provide for the continuous processing and production requirements of the facility on a 24 hour, 365 days per year basis.

A.4.2 Process Unit Operations

Inlet and Reception Facilities

The Inlet and Reception Facilities will receive the fluids from the Corrib Field and remove entrained water and liquid hydrocarbons. The fluids from the Corrib Field that are received at the Terminal will be mainly gas, but some liquid will also be present.

The liquids consist primarily of:

Aqueous phase:

- Water: Water of Condensation (present in the gaseous form within the Corrib Field which condenses out from the gas as its temperature and pressure fall) and Formation Water (present in the liquid form within the reservoir). Formation Water, if it occurs, is only expected later in the field life. Water of Condensation and Formation Water are referred to as Produced Water.
- Methanol (injected from the Terminal to prevent freezing in the sub-sea equipment and pipeline).
- Corrosion inhibitor injected into the sub-sea system to prevent corrosion

Liquid Hydrocarbon phase:

- Condensate (hydrocarbons that exist in vapour phase in the gas reservoir and condense from the gas as the temperature and pressure fall)

The production fluids will arrive at the Terminal generally as a very fine mist but with intermittent "slugs" of liquids also arriving at the Terminal. The liquids in the pipeline will tend to run back along the pipe particularly at times of low gas flow and will collect at low-points, or dips, in the pipeline. As liquids build up at these low points, it will be picked up by the fast-flowing gas and will arrive in varying quantities or 'slugs'. If required, the build up of liquids in the pipeline can be cleared by running a sphere (known as a pig) through the pipeline.

On entry to the Terminal, the incoming fluids are passed through a slugcatcher. This is an arrangement of large pipes in which the incoming production stream is calmed by substantially reducing its velocity and the two liquid phases are separated from the gas by gravity. The condensate and water/methanol that separate out from the gas stream pass to the condensate and methanol recovery systems respectively. The gas stream flows to the Inlet Separator which separates finer drops of liquid from the gas stream before it passes to the gas conditioning stage.

Gas Conditioning

The Corrib Field gas can be considered a very pure gas and therefore the conditioning required to meet export gas specification is very simple. The gas conditioning process will firstly remove any trace mercury (if present) which will be absorbed onto the removal bed and converted into a stable chemical compound. The gas conditioning process will then dry the gas stream (by lowering the dew-point) and remove any residual liquids. This is achieved by feeding the gas to a pressure-letdown valve where it is allowed to expand. This has the effect of cooling the gas and condensing out any remaining traces of condensate, methanol and water.

Gas Compression and Export

Before the conditioned gas stream can be exported to the transmission network it will be compressed to the required export pressure by compressors which are powered by gas turbines. The gas will then be metered and an odourant will be added prior to export to the transmission network.

Condensate Recovery and Stabilisation

Hydrocarbon condensate recovered in the inlet and reception facilities, and conditioning stage will be stabilised by a series of pressure reductions and heating. It is then cooled and any trace mercury (if present) in the condensate stream will be removed by a mercury removal bed and converted into a stable chemical compound in the process. The condensate is then transferred to storage tanks prior to being exported off-site. Licensed waste hauliers will remove the condensate from the site. It is anticipated that the exported condensate will be used as a fuel. Any gas flashed from the process will be used in the Low Pressure (LP) Fuel Gas system.

Methanol Recovery, Regeneration and Chemical Injection

Methanol essentially acts as an antifreeze agent and is used to prevent freezing (hydrate formation) within the off-shore and on-shore facilities. Methanol that is injected to the offshore facilities (via the umbilical cable) is recovered from the production fluids entering the Terminal and regenerated for re-use. The methanol recovered from the gas has a high water content and it is separated from the water by distillation in the methanol still. Corrosion inhibitor will be injected into the methanol system for transfer to the off-shore facilities to prevent corrosion in the off-shore facilities.

Treatment of Produced Water

Produced water will be treated as described in the previous application previous and will be discharged in line with the emission limit values set out in the existing licence.

As part of the recovery of natural gas from the reservoir, some fluids will also arise in the form of water of condensation and formation water, which comes from the rock reservoir in which the gas occurs. The condensed water often contains traces of organic compounds and some metals. The formation water, should it occur will contain natural salts and minerals which have leached from the rock in which the water has been resident over geological time. The actual composition will vary from location to location (well to well) and over time. Indications of the likely constituents have been determined from industry experience and from the testing of the water recovered from the exploration wells.

The water that is removed from the natural gas stream (referred to as produced water) will be treated prior to discharge to sea. The majority of treated produced water will be

discharged through spare cores in the umbilical to the subsea manifold located at the Corrib gas field some 65km offshore (~ 92km along the pipeline length from the terminal) and in 350m depth of water. Any surplus treated produced will be removed offsite by a licensed waste management contractor. To control biological growth in the umbilical cores a small amount of biocide will be added to the treated produced water prior to being discharged. The biocide will be added for a period of 2 hours per day. Annual usage of biocide will be less than 0.395m^3. On discharge, produced water will be rapidly diluted and dispersed and the chosen biocide will rapidly biodegrade and undergo additional degradation via hydrolysis. Consequently the environmental impact will be negligible.

The produced water treatment plant is a multi stage treatment system, which includes:

- a Corrugated Plate Interceptor,
- Ultrafiltration,
- Nano Filtration,
- Granular Activated Carbon Bed
- Ion-Exchange Units
- pH adjustment.

Treatment of Surface Water Runoff (from process areas)

Rainwater falling on process areas included bunded areas on site will be collected in the potentially contaminated drain system on site (oily water system). The water will be treated in the surface water treatment plant and will be discharged via the permitted outfall located ca. 12.7 km offshore from the landfall location.

The surface water treatment plant is also a multi stage treatment system, which includes:

- a Corrugated Plate Interceptor,
- a Multimedia Filter
- an Ultrafiltration unit.

Both treatment systems will share common sludge treatment facilities (Precipitation, Coagulation, Flocculation, Filter Press equipment).

Uncontaminated surface water and ground water

Rainwater that falls on non process areas on site will be collected in the perimeter surface water drain system. The water will be directed through the emergency holding tank (EHT) where it is continuously monitored for TOC/TC as a precautionary measure. In the event of a confirmed fire or if contamination is detected, the isolation valve in the EHT will automatically close thus preventing surface water from leaving the site. Water can be returned to the open drain sump for treatment and disposal via the permitted outfall. Further details are given in F.1.4.

A.4.3 Utilities

Fuel Gas System

Natural gas that is used as a fuel in the Terminal is referred to as Fuel Gas. The Fuel Gas system will use some of the natural gas extracted from the Corrib Field as a fuel supply for the Terminal operations. High Pressure (HP) fuel will be used as a fuel in the sales gas compressor turbines. Low Pressure (LP) fuel gas will be used as a fuel in the power generators.

Heating Medium System and waste Heat Recovery
An aqueous solution of 40%wt Triethylene Glycol (TEG)/Water mixture is used as a heating medium to provide heating to various Terminal process operations. The use of a 40 %wt TEG solution avoids potential freezing at minimum ambient temperature. The heating medium is circulated through Waste Heat Recovery Units that are attached to the exhaust ducts of the gas turbines. These units heat the heating medium fluid. The requirement for waste heat recovery is a condition in the existing IPPC licence (Condition 3.7). The heating medium fluid will then be transferred to the process users (Inlet Heater, Cold Condensate Heater, Condensate Heater, Methanol Reboiler).

Utility Gases
A nitrogen generation package will supply nitrogen to be used in blanketing / purging of tanks, process vessels and pipework for safety purposes. The use of nitrogen ensures an inert atmosphere (absence of oxygen) and prevents the occurrence of potentially flammable / explosive atmospheres.

The Instrument Air Package will supply clean, dry, compressed air for instrumentation and plant use (as required).

Potable and Service Water Systems
The local authority water supply (sourced from Carrowmore Lake) will undergo treatment at the Terminal prior to use as a supply of potable water. The local authority supply will also be used if necessary, for manual make-up of firewater in the firewater pond.

Power Generation
The Terminal will be self-sufficient in power generation. Three gas compression engines (2 Duty/1 Standby) fuelled by LP fuel gas will generate power for the Terminal. A diesel driven emergency generator will be used to provide emergency power to critical users on loss of the normal power supply. Depending on Operational and Commercial requirements, a small percentage of overall load will be taken from the grid supply. The primary use of the grid supply is to provide a backup power supply to the firewater transfer sumps.

A.4.4 Safety Systems

Flaring
Flare systems are provided at the Terminal for depressurisation of the plant for maintenance purposes and during emergency situations. The ground Maintenance Flare System will primarily be used to safely depressurise sections of the Terminal's gas systems for maintenance. During emergency situations, gas from high pressure (HP) and low pressure (LP) sections of the plant can be flared through the HP and LP flares respectively.

Firewater
The firewater system provides water for fire-fighting purposes and supplies water to hydrants, monitors, deluge systems, foam systems and hose reels at the Terminal. Firewater is stored in the Firewater Pond. The Used Firewater Pond will collect potentially contaminated firewater in the event of a fire.

Nitrogen Blanketing
Nitrogen will be used in blanketing and purging of tanks, process vessels and pipework for safety purposes (Refer to Section A.4.3 on Utility Gases).

A.4.5 Laboratory

There will be an on-site laboratory located within the main Terminal buildings complex. The laboratory will contain specialised analysis and test equipment, which will be used for quality and environmental testing purposes and to ensure that the plant continues to perform to specification.

A.5 Raw Materials and Product

Natural gas is the raw material and will be the only 'product' of the Terminal. The Terminal will be designed to produce 350 million standard cubic feet of (MMSCF) of natural gas per day from the Corrib Field for export to the Bord Gáis transmission network.

All other materials at the Terminal will be either materials utilised in the operation of the Terminal or by-products from the treatment of the natural gas. These are largely unchanged from the original IPPC licence application and are detailed in Tables G(i) and G(ii).

A.6 Emissions to Atmosphere

A.6.1 Point Source Emissions

A summary list of emission points to atmosphere is provided in Table A.1.

TABLE A.1 SUMMARY OF EMISSION POINTS TO ATMOSPHERE

Reference No.	Source	Description
A2-1	Gas Turbine A (Sales Gas Compressor A)	Main
A2-2	Gas Turbine B (Sales Gas Compressor B)	Main
A2-4	Power Generator A	Main
A2-5	Power Generator B	Main
A2-6	Power Generator C	Main
A3-1	Maintenance Ground Flare	Minor
A3-2	Emergency Generator	Minor
A3-3	Firewater Pump Engine A	Minor
A3-4	Firewater Pump Engine B	Minor
A3-5	Firewater Pump Engine C	Minor
A3-6	Firewater Pump Engine D	Minor
A3-7	Laboratory Fume Hood	Minor
A3-8	High Pressure (HP) Flare Stack - Cold Venting	Minor
A3-9	Low Pressure (LP) Flare Stack - Cold Venting	Minor
A3-10	Sales Gas Compressor A Seal Gas Vent	Minor
A3-11	Sales Gas Compressor B Seal Gas Vent	Minor
A4-1	High Pressure (HP) Flare	Potential
A4-2	Low Pressure (LP) Flare	Potential

The main emissions to atmosphere are emissions from the gas compressors turbines and emissions from the gas engine driven power generators. The gas turbines are fitted with low NOx (Oxides of Nitrogen) burners, which will reduce the formation of NOx during the combustion process. Control of the combustion process will also help to minimise the formation of CO and unburnt hydrocarbons.

Emissions from the Gas Turbines will comply with the Emission Limit Values (ELV's) specified in the existing IPPC license. Selective Catalytic Reduction (SCR) has been fitted to the exhaust of each of the 3 power generators and will ensure compliance with the ELVs in the existing licence.

The gas turbines will have Waste Heat Recovery Units (E-5002 A/B) installed. The Waste Heat Recovery Units will use surplus heat of exhaust gases from the gas turbines to heat the heating medium for the terminal.

The Emergency Generator and Firewater Pump Engines will only be used for emergency situations and testing to confirm availability. This equipment will be fired on low sulphur diesel, which will minimise emissions of SO_2.

The use of the Maintenance Flare will be limited and will primarily be used prior to maintenance of equipment during planned shutdowns.

As part of normal operation, very occasionally it will be necessary to cold vent gas from certain high pressure and low pressure sections of the plant through the High Pressure (HP) and Low Pressure (LP) flare stacks respectively. A small amount of gas will be vented during the start-up (very infrequent – typically once every 3 months) of a compressor following a shut down of the other compressor. Additionally a small amount of seal gas from one of the sales gas compressors (duty/standby) will be vented on a continuous basis to a local vent.

In emergency situations to allow depressurisation of equipment for safety reasons, it may be necessary to flare gas from the Terminal using the HP and LP Flares. The HP and LP flares will also be used for testing during the commissioning phase and thereafter only used in emergency situations. The flares will be continuously purged with nitrogen to ensure no build up of flammable atmosphere. Only natural gas will be flared. Vendor information indicates that the flare stacks have an efficiency of 98%. Ignition of each flare will be by a pilot but the pilot will only be ignited during flare use. Fuel gas ignition with back-up from propane cylinders has been selected from an emissions and safety risk perspective. The flares will be equipped with low emission, low noise flare tips.

A.6.2 Fugitive Emissions

Fugitive emission sources are limited to minor leakages from connections, isolation and control valves, relief valves, rotating equipment seals and analysers. This type of emission is small but unavoidable in this type of installation. The Terminal has been designed to minimise the number of potential sources of fugitive emissions by minimising the numbers of components from which minor leakages could occur. The use of low-leak equipment (valves, pumps, etc.) in the Terminal will further reduce the potential for fugitive emissions. Good housekeeping practices, including preventative maintenance and routine monitoring of equipment on site, will minimise the potential for any equipment leaks. The tanks in the bulk storage area tank farm will be fitted with either floating roofs or conservation vents to minimise any fugitive emissions during storage of materials. Standard operating procedures will be followed to minimise any fugitive emissions during road tanker unloading. Nitrogen helium leak testing will be carried out prior to the introduction of hydrocarbons, this will ensure fugitive emissions are kept to an absolute minimum level for all flanges and shaft seals.

A.6.3 Assessment of Impact of Atmospheric Emissions

Air dispersion modelling has been carried out for the main emission sources and emergency use of the flares at the Terminal to predict the maximum ground level concentrations (GLCs) of pollutants (NO_X, CO) likely to occur as a result of atmospheric emissions from the Terminal. The maximum predicted GLCs are below all applicable statutory Air Quality Standard (AQS) limit values, which have been set to protect human health and the environment. As the maximum predicted GLCs of pollutants occurring as a result of emissions from the Terminal are well below the AQS limit values, emissions from the Terminal should not have any significant adverse impact on human health and the environment and the existing ambient air quality. Furthermore modelling predicts a reduction in GLC's through inclusion of Selective Catalytic Reduction on the power generators.

A.7 Emissions to Waters

A.7.1 General

There will be three discharge points to surface waters from the Terminal. These are summarised in Table A.2.

Table A.2 Summary of Discharge Points to Surface Waters

Emission	Emission Ref	Proposed Discharge Location
Treated Surface Water Runoff (from process areas)	SW1	Sea outfall ca. 12.7 km offshore from landfall location (no change)
Uncontaminated surface water runoff from Terminal	SW2	R314 Road Drainage Ditch to south-west of site (no change)
Treated Produced Water	SW3	65 km offshore at subsea manifold in 350m water depth

In addition to the emission points SW1 and SW3, there will be minor emissions to sea from the valve assemblies (referred to as "Christmas Trees") on the gas wellheads in the Corrib field. The gas flow from each well is controlled by a christmas tree and the valves on the christmas tree are actuated by hydraulic fluid (50:50 water:glycol mixture) pumped in the umbilical from the Terminal. The hydraulic fluid used to operate the valves will be discharged to the sea however the quantities will be small and the fluids are assessed to be PLONOR (Poses Little on No Risk to the environment).

The different sources of water and their associated drainage systems at the Terminal have been segregated to minimise the unnecessary treatment of less contaminated / uncontaminated systems. The treatment systems for produced water and surface water runoff (from areas where there is potential for contamination) are treated in a multi stage treatment system prior to discharge to sea. The produced water and surface water streams will be treated in separate treatment systems before being discharged at separate locations.

Surface water runoff from non-process area on site that cannot normally be contaminated with oil or other pollutants is considered clean and is discharged to a minor watercourse in the vicinity of the Terminal (SW2). Prior to leaving the site the water passes though the emergency holding tank (EHT) where it is monitored for contamination as a precautionary measure. In the unlikely event of contamination being detected the isolation valve will automatically close preventing surface from leaving the

site. After passing through the EHT the water combines with groundwater and flows to the settlement ponds.

Groundwater is collected beneath the site to prevent the groundwater level rising within the fill and to ensure a stable platform for the terminal. Groundwater is directed to the perimeter groundwater drains and converges in groundwater manhole 26 in the south west corner of the site. As a precautionary measure groundwater is continuously monitored for TC/TOC (Total Carbon / Total Organic Carbon). A manually operated penstock is located at the outlet of the manhole 26. In unlikely event of detection of contamination in the groundwater, the penstock valve can be closed and the water pumped back to the open drain sump for treatment and disposal via the permitted outfall.

Groundwater and surface water converge in manhole 27 and the combined flow is conveyed to the settlement ponds.

The settlement ponds are as described in the previous application. The settlement ponds will retain the oil retention barrier previously referred to as an oil skimmer as an additional precautionary measure. The drainage system, including the settlement ponds, has been very conservatively designed and will provide buffering storage capacity during high rainfall events and will assist in retarding flow velocity, diffusing the water discharge intensity and preventing scouring / erosion of the existing watercourse. The water is sampled and monitored in accordance with the conditions in the existing licence and discharged to the road drainage ditch, which feeds in to the Bellanaboy River and ultimately Carrowmore Lake.

A.7.2 Assessment of Impact of Emissions to Waters

Treated Produced Water (SW3)

With respect to produced water discharge; due to the small volume and level of treatment of produced water, plus the dilution and dispersion available at the discharge point and taking into account the rapid biodegradation characteristics of the chosen biocide it is predicted that no observable environmental impacts will occur due to the discharge in the Corrib Field.

In relation to the impacts of biocide specifically; dilution to the product's 'no-effect' concentration and break-down of the biocide's active component limits the potential for marine life to be exposed to harmful effects. So the discharge is not expected to cause a negligible environmental impact.

Treated Surface Water from Process Areas (SW1)
Previous dispersion modeling in support of the IPPC application in December 2004 assessed the impact of the combined treated produced water and surface water at the outfall outside Broadhaven Bay. These studies showed that given the level of treatment the discharge will have a negligible impact on water quality. Given that produced water will now not be discharged via the outfall, the determination that there would be negligible impact in this area is still valid, moreover the potential for impact would be reduced.

With respect to minor discharges of glycol to sea from the operation of the wellheads; approximately 14 litres of a 50:50 glycol:water mixture would be discharged in order to fully open and close the valve. It is estimated that a maximum of 1,344 litres of the glycol mixture will be discharged per year (based on all valves being operated monthly on each well), this is equivalent to 672 litres of glycol. The glycol:water mixture is an environmentally benign hydraulic fluid of low toxicity, high biodegradability and low

bioaccumulation potential (which is classified under OSPAR as a chemical which Poses Little or No Risk to the Environment (a PLONOR substance)). The discharge will therefore have negligible impact upon the water quality.

With respect to the discharge of uncontaminated surface and groundwater water from the Terminal to a local watercourse in the vicinity of the Terminal (SW2), no significant impact is anticipated.

It is proposed to increase the Suspended Solids Limit in the existing IPPC licence from 5mg/l to 30mg/l. An increase of the suspended solids concentration to 30mg/l, associated with periods of heavy rainfall, will not give rise to any additional impact over that which has been experienced during the construction phase of the Project and which has been determined to not have a significant impact on the Bellanaboy River or Carrowmore Lake. The suspended solids limit imposed by the Planning Authority for the construction phase of the project is 35mg/l of suspended solids. Further details are given in Section F1.4 and I.2.2 of the application.

A.8 Emissions to Ground

There will be only one emission point to ground (SL1) from the Terminal. Domestic sewage consisting of wastewater from staff facilities (Toilets, Showers, Canteen etc.) will be treated in a septic tank and Bord na Móna Puraflo system before being discharged to a 300 m^2 percolation area on site. The Puraflo system will treat the effluent to a very high standard prior to discharge to the percolation area where further polishing of the effluent can be expected to occur.

Various containment measures (including bunding and kerbed areas) have been incorporated into the design of the Terminal to contain any accidental releases and so prevent impact on ground or groundwater quality.

An aquifer vulnerability assessment of the site rated the aquifer beneath the site as being a Poor Generally Unproductive Aquifer (Pu) based on Geological Survey of Ireland (GSI) guidelines. Based on the thickness and type of overburden cover, the aquifer vulnerability for the majority of the site (including the percolation area and Terminal footprint) is considered moderate (M) using GSI Guidelines for aquifer protection.

Taking into account the relatively small volume and the high standard of treated effluent from the Puraflo system and that the fact that the underlying aquifer is considered a Poor Aquifer with moderate vulnerability (majority of site), the discharge of the treated effluent to the percolation area is not predicted to have any significant adverse impact on the underlying soils, bedrock or hydrogeology at the Terminal site.

A.9 Noise Emissions

Noise will comply with the limits set out in the IPPC licence (P0738-01). There will be various noise generating equipment associated with the normal operation of the Terminal. There will also be noise generating equipment which, other than for testing purposes, will only be used in emergency situations (e.g. emergency generator).

The main new sources of noise in relation to this IPPC Review Application include four additional pumps to facilitate treated produced water discharges, and the selective catalytic reduction equipment fitted to the gas engine exhausts.

The minimisation of noise has been an integral part of the Terminal design and noise level criteria have been specified for all equipment to ensure that operation of the Terminal has minimal impact on any noise sensitive receptors (e.g. residential dwellings) in the vicinity of the Terminal. Various noise control measures have been

incorporated into the design of the Terminal including the siting of equipment within the Terminal, housing of equipment within buildings, acoustic insulation of equipment and pipework and the specification of stringent noise levels for each item of equipment.

The Terminal has been designed so that during normal operation the noise contribution from the Terminal does not exceed the following noise levels as assessed at the nearest noise sensitive property (i.e. residential dwelling) under free field conditions:

- Daytime (07:00 - 23:00) 45 dB L_{Aeq} 30 minutes
- Night-time (23:00 - 07:00) 35 dB L_{Aeq} 30 minutes

In addition the Terminal has been designed so there will be no tonal or impulsive noise audible at noise sensitive locations.

The design levels specified above are extremely stringent and are some 10 dBA lower than is generally recommended in the EPA Guidance Note for Noise in Relation to Scheduled Activities. Noise modelling has been carried out to predict the noise contribution from the Terminal at noise sensitive locations. The modelling has shown that the noise contribution from the Terminal will not exceed these stringent levels.

The operation of the HP and LP flares would cause the normal operational noise limits to be exceeded; however the only times the HP/LP flares will operate will be for testing and thereafter only in emergency situations. Therefore following commissioning the HP/LP flares will only be used rarely. Cold vented releases from compressor changeovers will be vented (not ignited) through the HP flare, which is not anticipated to cause any noise disturbance and will comply with the noise limits set out in the existing licence.

In summary the noise generated during normal operation of the Terminal is not predicted to have any significant impact on ambient noise levels or noise sensitive receptors in the vicinity of the Terminal. Only in emergency situations and if the HP and LP flares used would the normal operation noise limits be exceeded.

A.10 Waste

The Terminal will not generate significant quantities of solid waste and most of the waste will be generated on an intermittent basis. Minimisation of waste was one of the criteria considered during the selection and design of equipment/ processes at the Terminal.

The additional waste stream arising in this application for a review of the licence, is surplus treated produced water, which cannot be disposed of via the spare cores during the first few years of operation.

A waste storage area will be used to store waste prior to its removal off-site. A Waste Management Plan will be implemented to ensure the proper handling, segregation, storage, labelling, and record keeping of waste on site and the proper transport and treatment / disposal of waste off site. The Waste Management Plan will have regard to the waste management hierarchy (prevention, minimisation, re-use, recycling, recovery, disposal) in determining how waste streams are treated. The Waste Management Plan will form a key part of the Environmental Management System to be implemented at the Terminal.

A.11 Sampling and Monitoring

Monitoring of emissions to the environment will be carried out as required to ensure that all control / treatment systems continue to perform to specification and that

emission limit values are not exceeded. Provision for monitoring, sampling and analyses of environmental emissions, has been incorporated into design of the Terminal. Monitoring will be provided for the main emission points to atmosphere, for all discharges to surface waters, and for the emission to ground. In addition ambient monitoring will be carried out on air quality, surface water quality, groundwater quality and noise levels to demonstrate the operation of the Terminal is not having any significant impact on the surrounding environment.

A.12 Energy Efficiency

The Terminal will be self-sufficient in power generation with three power generators (2 Duty / 1 Standby) each capable of supplying half the maximum power demand of the Terminal. . The principal fuel users at the Terminal will be the power generators and the two gas turbines (Duty/Standby) used to power the sales gas compressors. The power generators and gas turbines will be fired on natural gas, which is an efficient fuel.

The original design of the plant included a fired heater for the Plant Heating Medium system, which would use fuel gas as the primary fuel and hydrocarbon condensate when available. A decision was made not to use condensate as fuel and this led to a comprehensive review of the energy efficiency of the plant. The result of this review was a decision to install Waste Heat Recovery (WHR) on the gas compressor turbines. Condition 3.7 of the current IPPC licence requires SEPIL to recover heat from the gas turbines. It is estimated that the WHR units installed in the exhausts of the gas turbines will recover 5.5MW of heat energy, which is sufficient to meet the heat demand for normal operations.

A load management system on the power generators will optimise energy supply. Energy demand will be optimised using high efficiency electrical drives on equipment (e.g. pump motors). Regular servicing and maintenance of equipment will ensure that all equipment continues to perform to specification. Insulation has been incorporated into building structures and equipment at the Terminal to minimise heat losses. An Energy Management System will form part of the Environmental Management System (EMS) to be implemented at the Terminal to ensure the continual efficient use of energy. A grid supply has also been provided to primarily provide back to the firewater transfer pumps

A.13 Containment of Accidental Spillages

All surface water runoff from process areas and bunded areas of the Terminal which could potentially be contaminated, will drain to the Open Drains Sump and will be treated in the Surface Water Treatment System prior to discharge.

Bulk chemical and fuel storage tanks at the Terminal will be bunded to contain at least 110% of the volume of the largest single tank or 25% of the volume of the total tankage within the bund (whichever is greater). Valving exterior to the bund wall(s) will isolate the bund contents to contain any spillages and to control the discharge from the bund(s) to the Open Drains Sump. Any rainwater that accumulates in the bund(s) will be removed at regular intervals and regular checking and emptying (after rainfall events) of bunded areas will ensure their capacity is not reduced. Overfilling protection will be provided on bulk storage tanks.

Dosing, injection and cleaning chemicals will be stored in small quantities and any spillage will be contained locally in bunding or drip trays for re-use or disposal. Any other potential sources of spillage (e.g. pumps, sample points, level gauges, etc.) will be provided with local shelter and collection trays, sumps or interceptors as appropriate.

Good housekeeping practices, including preventative maintenance and routine monitoring of tanks and equipment, will minimise the likelihood of leaks/spills occurring and ensure that any leaks are quickly detected and controlled.

With respect to the drainage system for uncontaminated surface water runoff (i.e. surface water from non-process areas), the Terminal perimeter drainage system will incorporate an emergency holding tank. In the unlikely event of contaminated surface water entering the perimeter drainage system it would be contained within the system and pumped back from the EHT to the open drain sump for subsequent treatment in the oily water treatment system.

A conservatively designed Used Firewater Pond is provided to contain firewater or rainwater runoff, which could become contaminated in emergency situations and thus prevent any discharge of contaminated water to the environment.

A.14 Emergency Response

The Terminal will qualify as a "Lower Tier" site under the European Communities (Control of major Accident Hazards Involving Dangerous Substances) Regulations 2006 (S.I. No. 74 of 2006) ("Seveso II").

A Major Accident Prevention Policy (MAPP) will be in place for the site in accordance with the Regulations. The MAPP will be implemented by the Safety Management System at the Terminal and will include the following elements:

- Identification, evaluation and prevention of major accident hazards
- Emergency planning and emergency response to minimise the consequences of any accidents on human health and the environment

Hazard identification and prevention has been a key component of the Terminal design and will minimise the risk of accident / hazardous and emergency situations arising during the operation of the Terminal. The Emergency Plan to be prepared for the Terminal will be regularly tested and reviewed and will detail the emergency response including the organisation and facilities in place and the measures to be taken to minimise the consequences of any accident/emergency situations on human health and the environment.

Hazard detection and monitoring equipment has been incorporated into the Terminal design so that any potentially hazardous situations arising will be detected at the earliest possible moment. In the event of a hazard being detected, the aim is to prevent escalation by isolating the affected section of plant and depressurising safely to flare (removing the gas inventory) as rapidly as possible. All control and shutdown systems have been designed to default to a safe condition in the event of failure. In particular, the Emergency Shutdown (ESD) system at the Terminal will ensure the safe isolation and shutdown of equipment under fault or fire conditions and will provide a basis for the safe and efficient shutdown of process operations and the isolation of flammable / toxic materials within the facilities.

In summary, hazard identification and prevention has been a key component of Terminal design and will minimise the risk of accident and emergency situations arising during operation. In the unlikely event of an accident / emergency situation arising, the detection and control / response systems to be employed at the Terminal will minimise any consequences on human health and the environment.

A.15 Environmental Management

The Terminal Manager will have overall responsibility for Environmental, Health & Safety matters. The Health, Safety and Environmental (HSE) Advisor will be responsible for providing training, advice and independent monitoring of working practices and conditions at the Terminal and ensuring that all staff understand the importance of, and are committed to working safely and without risk to the environment. There will be a staff consultative committee (comprising the Terminal manager, HSE Advisor and elected HSE representatives from the workforce), which will meet on a regular basis and will be an open forum for reviewing HSE performance and addressing any HSE concerns of staff.

An Environmental Management System (EMS) certified to the international standard ISO:14001, will be implemented at the Terminal. This will provide a formal structure for environmental management, ongoing assessment of environmental performance and continual improvement at the Terminal.

A.16 Decommissioning

The life of the Corrib Field is predicted to be between 15 and 20 years, based on modelling carried out by SEPIL. The Bellanaboy Bridge Gas Terminal has a minimum (design) life of 30 years. Decommissioning of the Terminal is expected to take place after 2032.

The Petroleum Lease for the Corrib Field was granted on 15th November 2001, by the (then) Minister for Communications, Marine and Natural Resources pursuant to the terms of the Petroleum and Other Minerals Development Act (1960). The Petroleum Lease contains stringent provisions to ensure that the Corrib Field facilities, including the Bellanaboy Bridge Gas Terminal, are decommissioned in a timely and appropriate manner.

The scope of work for decommissioning the Terminal will be assessed approximately five years prior to the predicted date of decommissioning. SEPIL will prepare a Best Practical Environmental Option Study, which will comparatively assess the technical, cost, health, safety and environmental aspects of each option. An environmental impact assessment will be undertaken to identify any specific impact on the local environment. Any mitigation measures / environmental controls identified that are necessary to protect the environment will be implemented. The Terminal will be decommissioned in accordance with the relevant national and international law in force at the time and in accordance with best practice. A Decommissioning Plan for the Terminal will be prepared which will be subject to the approval of the Environmental Protection Agency, the relevant Government Department responsible for Natural Resources, Mayo County Council, and any other relevant organisations. These measures will ensure the Terminal will be decommissioned in an environmentally sound manner and that after Terminal operations cease there will be no significant residual impact on human health or the environment.

SECTION B: GENERAL

B.1. Owner/Operator

Name*:	Shell E&P Ireland Limited
Address:	Corrib House
	52 Lower Leeson Street
	Dublin 2
Tel:	01 6694100
Fax:	01 6694101
e-mail:	mark.carrigy@Shell.com

* This should be the name of the applicant which is current on the date this IPPC Licence Application is lodged with the Agency. It should be the name of the legal entity (which can be a limited company or a sole trader). A trading/business name is not acceptable.

Name and Address for Correspondence
Only application documentation submitted by the applicant and by the nominated person will be deemed to have come from the applicant.

Name:	Mark Carrigy
Address:	Shell E&P Ireland Ltd
	Corrib House
	52 Lower Leeson Street
	Dublin 2
Tel:	01 6694100
Fax:	01 6694101
e-mail:	mark.carrigy@Shell.com

Address of registered or principal office of Body Corporate (if applicable)

Address:	Shell E&P Ireland Ltd
	Corrib House
	52 Lower Leeson Street
	Dublin 2
Tel:	01 6694100
Fax:	01 6694101
e-mail:	info@corribgas.com

If the applicant is a body corporate, the following information must be attached as **Attachment B1**:

a) a Certified Copy of the Certificate of Incorporation.
b) the Company's Registration Number from the Companies Registry Office.
c) Particulars of Registered Office of the Company.

Name and address of the proprietor(s) of the Land on which the Activity is situated (if different from applicant named above):

Shell E&P Ireland Limited purchased the Bellanaboy Bridge terminal site from Coillte Teoranta on 21 December 2004

Proprietor's Name:
Address:
Tel:
Fax:
e-mail:

Name and address of the owner(s) of the building and ancillary plant in which the activity is situated (if different from applicant named above):

Name:
Address:
Tel:
Fax:
e-mail:

B.2. Location of Activity

Name:	Bellanaboy Bridge Gas Terminal
Address*:	Bellanaboy Bridge
	Bellagelly South
	Co Mayo
Tel:	097 27100 (Tel No of Belmullet Office)
Fax:	
Contact Name:	Mark Carrigy
Position:	Terminal Manager
e-mail:	mark.carrigy@Shell.com

* Include any townland.

National Grid Reference (12 digit 6E,6N)	086425E, 333125N

Location maps (≤A3), appropriately scaled, with legible grid references should be enclosed in **Attachment B.2.** The site boundary must be outlined on the map in colour.

Geo-referenced digital drawing files (e.g. AutoCAD files) in Irish Grid projection of the site boundary and overall site plan, including labelled emission, monitoring and sampling points, are also required. This data should be provided to the Agency on a separate CD-Rom containing sections B.2, E.6 and F.3.

Name of geo-referenced digital drawing files	IPPCL-003,006,011,012,019,020,021,022,023,024
Name of CD-Rom with digital drawing files	P0738-01 – Geo-referenced Digital Drawings

B.3. Class of Activity

Identify the relevant activities in the First, Third or Fourth Schedule of the PoE Act 2004 to which the activity relates:

Schedule	Class	Description[Note 1]
First	9.3.1	The operation of a gas refinery
First	2.1	The operation of combustion installations with a rated thermal input equal to or greater than 50MW.

Note 1: In order to give a precise identification **select only those words** from the description of the class or classes that best describes the nature of the activity for which the licence is being applied for.

B.4. Employees / Capital Cost

Give-

(i) In the case of an established activity, the number of employees and other persons working or engaged in connection with the activity on the date after which a licence is required and during normal levels of operation, or

(ii) In any other case, the gross capital cost of the activity to which the application relates.

Number of Employees (existing facilities):	100 to 120 (this includes 50 permanent staff at terminal and contractors, security personnel and support staff at Bellmullet office)
Gross Capital Cost (new proposals) €	+€300 million

B.5. Relevant Planning Authority

Give the name of the planning authority in whose functional area the activity is or will be carried out.

Name:	Mayo County Council
Address:	Aras an Chontae
	The Mall
	Castlebar
	Co Mayo
Tel:	(094) 902 444
Fax:	N/A

Planning Permission relating to this application:

has been obtained	√	***is being processed***	
is not yet applied for		***is not required***	

Local Authority Planning File Reference Nº:	Planning Register Reference Number: P03/3343 An Bord Pleanála Reference Number: PL 16.207212

Attachment B.5 should contain all planning permissions, including a copy of ***all*** conditions, and the required copies of any EIS should also be enclosed. For existing activities, **Attachment Nº B.5** should also contain all licences and permits past and present in force at the time of submission.

Answer:

An Bord Pleanala who granted planning permission (with conditions) for the Terminal on 22nd October 2004. Since then there have been a number of planning amendment applications.

The following information is included in Attachment B.5.

(a) Grant of planning permission by An Bord Pleanala in October 2004
(b) Copies of planning amendment permissions to date
(c) Consent to Construct a Generating Station and Generation Licence from CER
(d) Existing IPPC Licence (P0738-01)
(e) GHG Permit

B.6. Relevant Sanitary Authority.

In the case of a discharge of any trade effluent or other matter to a sewer of a sanitary authority, give the name of the sanitary authority in which the sewer is vested or by which it is controlled. **Not Applicable**

Name:
Address:
Tel:
Fax:

In the case of a discharge of any trade effluent or other matter to a sewer not vested by a sanitary authority, the applicant must supply as **Attachment Nº B.6**; (a) the name and address of the owner(s) of the sewer and the waste water treatment plant to which the sewer discharges and who are responsible for the quality of the treated effluent discharging to waters and (b) a copy of the effluent regulations and the agreement between the applicant and the aforementioned. **Not Applicable**

Name:
Address:
Tel:
Fax:

B.7. Relevant Health Board Region

The applicant should indicate the Health Board Region where the activity is or will be located.

Name:	Western Health Board
Address:	Merlin Park Regional Hospital
	Galway
Tel:	091 751 131
Fax:	091 752 644

B.8 Site Notice, Newspaper Advertisement and Planning Authority Notice.

Attachment Nº B.8 should contain a copy of the text of the site notice, a map (no larger than A3) showing its location on site (in accordance with Article 7 of the Regulations) and a copy of the newspaper advertisement. A copy of the notice given to the Planning Authority should also be included.

Answer:

The following is presented in Attachment B.8:

- Text of Site Notice
- Drawing showing location of Site Notices
- Copy of Newspaper Advertisement
- Copy of notification letter to Mayo Co Council
- Copy of letter from Mayo Co Council re EIA

B.9 Seveso II Regulations

State whether the activity is an establishment to which the EC (Control of Major Accident Hazards involving Dangerous Substances) Regulations (S.I. No. 74 of 2006) apply.

If yes, outline how the process comes under these regulations.

Supporting information should be included in **Attachment Nº B.9**.

Answer:

The Terminal constitutes an establishment to which the European Communities (Control of major Accident Hazards Involving Dangerous Substances) Regulations 2006 (S.I. No. 74 of 2006) apply. The Terminal will constitute a "Lower Tier" site under the Regulations.

The quantity of individual substances and the total quantity of all substances stored on site will not exceed any of the qualifying thresholds for "Upper Tier" sites specified in Column 3 (Article 9) in Part 1 (Named substances) and Part 2 (Categories of substances and preparations not specifically named in Part 1) of the First Schedule of the Regulations.

The quantity of methanol stored on site will equal approximately 3629 tonnes (2856 tonnes of raw methanol (approximately 35% of which is methanol and 65% is water) and 773 tonnes of product methanol). This qualifies the Terminal as a "Lower Tier" site as it exceeds the thresholds specified in Column 2 (Articles

6 & 7) in Part 1 (Named substances) and Part 2 (Categories of substances and preparations not specifically named in Part 1) of the First Schedule of the Regulations which are:

Part 1:	Methanol	500 tonnes
Part 2:	Toxic Substances	50 tonnes

A formal notification has been submitted to the Health & Safety Authority (HSA) by SEPIL in accordance with the European Communities (Control of Major Accident Hazards Involving Dangerous Substances) Regulations, 2006. (S.I. No. 74 of 2006).

A Major Accident Prevention Policy (MAPP) is under development for the site in accordance with the Regulations. The MAPP will be implemented by the Safety Management System at the Terminal and will include the following elements:

- Identification, evaluation and prevention of major accident hazards
- Emergency planning and emergency response to minimise the consequences of any accidents on human health and the environment

B.10 IPPC Directive

Specify whether the activity is a category of industrial activity referred to in Annex I of the IPPC Directive (96/61/EC) and if yes specify the category.

Supporting information should be included in **Attachment Nº B.10**.

Answer:

The Terminal falls under the following categories of industrial activity referred to in Annex I of IPPC Directive (96/61/EC):-

1.2 Mineral oil and gas refineries

1.1 Combustion installations with a rated thermal input exceeding 50 MW

SECTION C: MANAGEMENT OF THE INSTALLATION

C.1 Site Management & Control

Details should be provided on the management structures for the activity. Organisational charts and all relevant environmental management policy statements, including provisions for on-going assessment of environmental performance, are required.

Answer:

At steady state operation, the total number of personnel associated with the Gas Terminal will range from ca. 100 to 120. This comprises of circa 50 permanent staff at the Terminal plus contractors at the terminal, support staff based at the Bellmullet Office and security personnel. The staffing at the terminal will comprise terminal management and administration, operations and maintenance staff, HSE personnel and security personnel. An organisational chart for the Terminal operation is included in Attachment C.1.1.

The Terminal Manager will have overall responsibility for Environmental, Health & Safety matters. The Terminal Manager will report directly to either the Managing Director of SEPIL and/or to an Asset Manager. The Health, Safety and Environmental (HSE) Advisor will be responsible for providing training, advice and independent monitoring of working practices and conditions at the Terminal and ensuring that all staff understand the importance of, and are committed to working safely and without risk to the environment. The HSE Advisor will be part of the Terminal Management team and will report directly to the Terminal Manager. There will be a staff consultative committee (comprising the Terminal manager, HSE Supervisor and elected HSE representatives from the workforce), which will meet on a regular basis and will be an open forum for reviewing HSE performance and addressing any HSE concerns of staff. There will also be a HSE representative forum, which will meet regularly to review HSE issues.

The operations team will be responsible for the safe and efficient operation of all Terminal process facilities, safety systems and utilities. Each shift will consist of a Production Shift Supervisor supported by a team of production operators who will be responsible for the control and management of Terminal and sub-sea control systems. The maintenance team will be responsible for ensuring that work programmes and plans are carried out safely, and efficiently, to provide system reliability and equipment integrity. The maintenance team will consist of a maintenance supervisor supported by a team of multidisciplinary (mechanical, electrical and instrumentation/control) technicians.

It is essential that competent personnel are employed to operate the Terminal. To this end, there will be a job specification for each position at the Terminal. The job specification will identify the responsibilities of the job and the reporting relationships associated with the job. The qualifications and experience required for each job will be documented as will the methodology that will be used to assess the competence of personnel for each position at the Terminal. Recruitment of personnel has been conducted with reference to job specification and competence.

Generic and job specific training will be provided for all personnel. A Training Strategy document will be created to support the objective of training personnel and contractors to enable safe and efficient operation of the Terminal and sub-sea facilities. This is also designed to instill a high awareness of environmental and safety issues and ensure that personnel are assessed to be capable of performing their given function by satisfying training objectives and are shown to be competent in the workplace. Part of this strategy will be to provide ongoing training, following commencement of operations, to ensure that safety awareness and competence are maintained, while at the same time broadening the knowledge and enhancing the capabilities of personnel. Training of personnel in relation to environmental matters and in particular those personnel whose activities could have an impact on the environment will also form a key part of the Environmental Management System to be implemented at the Terminal.

Management and Control of Abatement / Treatment Systems

The responsibility for management and control of abatement and treatment systems lie with the Terminal Line Management. Overall responsibility and single point accountability for the performance of abatement and treatment systems lie with the Terminal Manager who is accountable to the SEPIL Managing Director for delivery of Terminal performance including compliance with all consents and licences.

Responsibility for the safe and efficient operation of the control and abatement systems lies with the Production Coordinator who is directly accountable to the Terminal Manager for the performance of all the terminal process and utility systems.

Roles, Responsibilities and Competencies

The roles and responsibilities of the Terminal staff described above are clearly defined in job descriptions which are regularly reviewed to ensure the main responsibilities are correct.

A competence assurance process is used to ensure that all job holders can fulfil these responsibilities. The system ensures that training needs analysis is conducted and personal development and training plans are established and implemented to ensure staff have the required competencies to fulfil their role.

C.2 Environmental Management System (EMS)

Indicate whether an Environmental Management System has been developed for the installation. If yes, specify which standard and include a copy of the accreditation certificate.

Answer:

Shell E&P Ireland Ltd. (SEPIL) is a member of the Royal Dutch/Shell Group of Companies. SEPIL aligns its HSE policy with that of the corporate company. A copy of Shell's commitment and policy on health, security, safety, the environment and social performance is included in Attachment C.2.1

An Environmental Management System (EMS) certified to the international standard ISO:14001 will be implemented at the Terminal. This will provide a formal structure for environmental management, ongoing assessment of environmental performance and continual improvement at the Terminal.

As part of the EMS an annual HSE plan will be prepared which will detail the HSE targets for the Terminal and how they will be achieved. Staff will be issued with a copy of the plan, will familiarise themselves with the plan and will participate in implementing the plan. To ensure commitment to meeting the targets in the plan, HSE performance will form part of each person's annual appraisal, with good performance being rewarded accordingly.

The EMS will align with the corporate Shell requirements for HSE Management Systems and specific procedures therein relating to environmental management.

C.3 Hours of Operation

Provide details of the hours of operation for the installation, including:
(a) Proposed hours of operation.
(b) Proposed hours of construction and development works and timeframes.
(c) Any other relevant hours of operation expected.

This information should form **Attachment Nº C**.

Answer:

The Terminal will be a 24 hour manned operation utilising a five shift system. It is envisaged that most of the Terminal support operation, including maintenance, service activities and administration will be carried out during the day shift period and that night shift work will primarily consist of a process supervisory nature with some additional minor maintenance tasks being undertaken.

SECTION D: INFRASTRUCTURE & OPERATION

D.1. Operational Information Requirements

Describe the plant, methods, processes, ancillary processes, abatement, recovery and treatment systems, and operating procedures for the activity, to include a copy of such plans, drawings or maps, (site plans and location maps, process flow diagrams), and such other particulars, reports and supporting documentation as are necessary to describe all aspects of the activity. Maps and drawings must be no larger than A3 size.

A development and operational history of the site should be included here.

Attachment Nº D should contain a list of all unit operations (processes) to be carried out, including flow diagrams of each with any relevant additional information.

Answer:

The main change being sought relates to the discharge arrangement for treated produced water. Details of the proposed changes to the produced water discharge arrangement are covered in detail in Section E & F and associated attachments. The following section largely repeats information presented in the 2004 IPPC Licence application but includes references to the addition of Selective Catalytic Reduction (SCR) to meet the ELV of 250mg/Nm^3 for NOx for the gas engines in the existing licence (P0738-01). Also the opportunity is taken to reconcile in the documentation, the removal of the heating medium fired heater and the incorporation of waste heat recovery on the gas compressor turbines exhaust to provide heat to the heat medium system.

D.1.1 Terminal Operations

The Corrib Field is a gas field located in the Slyne Trough off the County Mayo coastline. The gas in the Corrib Field contains no hydrogen sulphide and is therefore termed a sweet gas. It contains a small amount of hydrocarbon condensate with an expected condensate yield of between 0.05 and 0.5 barrels per million standard cubic feet. Actual anticipated yield will be closer to 0.05 barrels per million standard cubic feet. The natural gas also has a very low water content. The Corrib Field subsea facilities will be located in 350 meters water depth ca. 65 km off the Mayo coastline (92km along the pipeline route from the Terminal) and will extract natural gas from the Corrib Field to the onshore Bellanaboy Bridge Gas Terminal for processing.

Production fluids will be transported from the subsea facilities to the Terminal in a 20 inch (nominal) diameter pipeline constructed of high grade heavy wall carbon steel. The pipeline will be laid on the seabed for most of the offshore route but will be buried in a trench as it reaches the landfall location and will remain buried for the onshore route to the Terminal. A 6 inch (approx.) diameter umbilical cable will be buried in the sea bed for most of the offshore route but will be laid adjacent to the pipeline for the onshore route to the Terminal. The umbilical cable will comprise a number of electrical cables, super-duplex steel hydraulic tubing and super-duplex steel tubing for chemicals (methanol, corrosion inhibitor). The umbilical will provide an electrical power supply, data transmission, hydraulic fluid and chemical injection to the subsea facilities and will allow the Terminal to control and monitor the sub-sea facilities. The majority of treated produced water will be discharged through spare

cores in the umbilical to the subsea manifold located at the Corrib gas field some 65km offshore (~ 92km along the pipeline length from the terminal) and in 350m depth of water. Any surplus treated produced will be removed offsite by a licensed waste management contractor

The Terminal will process and treat the gas to meet Bord Gáis specification prior to export to the distribution network. The Terminal is designed to produce up to 350 million standard cubic feet (9.9 million standard cubic metres) of natural gas per day from the Corrib Field.

The primary functions of the Terminal will be to:

- Monitor and control the operation of the entire Corrib Field facilities (onshore and offshore) such that gas production meets demand and to ensure that operations are conducted in a safe and environmentally sound manner.
- Remove liquids from the Corrib gas stream so that it meets the Bord Gáis network transmission specification.
- Compress, meter and odourise the gas prior to export to the Bord Gáis transmission network.
- Recover the hydrocarbon condensate from the gas stream and export it off-site.
- Inject methanol and corrosion inhibitor for use in the sub-sea facilities and recover methanol for re-use.
- Treat water removed from the natural gas stream prior to discharge to sea.

The principal process unit operations at the Terminal and the utilities / ancillary equipment which will support these operations are summarised as follows:

Process Unit Operations

- Inlet and Reception Facilities.
- Gas Conditioning.
- Gas Compression and Export.
- Condensate Recovery and Stabilisation.
- Methanol Recovery, Regeneration and Chemical Injection.

Utilities and Treatment Systems

- Fuel Gas System.
- Waste Heat Recovery and Heating Medium System.
- Utility Gases.
- Potable and Service Water Systems.
- Power Generation
- Produced and Surface Water Treatment

Safety Systems

- Flaring.
- Firewater.
- Nitrogen Blanketing.
- Emergency Shutdown and Depressurisation (ESD) system

There will be an on-site laboratory located within the main Terminal buildings complex. The laboratory will be used for product quality and environmental testing purposes and to assist with process troubleshooting if required. The laboratory will contain appropriate equipment to carry out these tests.

An Overall Plot Plan showing the location of the unit operations within the Terminal and a simplified process flow diagram of the Terminal operations are included in Attachment D.

Attachment D to the IPPC Application also contains process descriptions and simplified process flow diagrams (where appropriate) for the process unit operations, utilities, treatment systems, abatement systems and safety systems listed above including a description of the control system at the Terminal.

The Produced and Surface Water Treatment Systems are detailed in Section E and F and associated Attachments Application Form.

D.1.2 Commissioning

When the offshore and onshore pipeline systems are available, hydrocarbon gas will be introduced into the Terminal to permit final commissioning and initial start up of the gas treatment facilities. Final hand-over of the Terminal to SEPIL by the project management team will follow successful start-up of the Terminal and the completion of the defined performance testing / verification programme.

D.2 Development and Operational History of the Site

D.2.1 Development History

The site was previously part of the Peatland Experimentation Station, Glenamoy established by the Department of Agriculture in 1955 with the following objectives:

- "to find suitable methods of reclaiming and fertilising blanket bog for agricultural and forestry"; and
- "to develop suitable animal and crop husbandry systems for peatland".

The site was administered by the Soils Division of An Foras Taluntais (the Agricultural Institute, now Teagasc) from 1959 and was wound down towards the late 1970s – early 1980s. During that time, a research programme was developed aimed at determining "the best and cheapest methods of reclaiming western blanket peat" (Glenamoy Review Group Report, 1978). A number of areas were investigated at the research station including: drainage, soil fertility and grassland, arable crops, shelterbelts, horticultural and industrial crops. One of the key areas of investigation was fertiliser application in relation to soil fertility.

Much of the Terminal site area was used for grass productivity trials, which was subject to drainage and substantial applications of fertiliser. The grass was sown directly on to the virgin blanket bog that existed before the station and the bog was further modified by the introduction of a land drainage system. The dominant vegetation types, conifer plantations and shelterbelt species present today reflect past management practices but the more open areas of the site have been colonised by grasses and ruderal vegetation with occasional areas of scrub vegetation. Coillte have been managing the site for forestry purposes in recent years.

D.2.2 Construction of Gas Terminal

Planning permission for the construction of the gas terminal was granted by Mayo Co Council in October 2004. The terminal site lies within a 160 hectare (ha) partially wooded area. The existing mature coniferous trees and planned landscaping provide visual screening for the terminal plant. The terminal footprint occupies an area of approximately 13ha. A further 1ha has been used to accommodate temporary construction facilities during the construction phase of the terminal.

The initial task completed before construction began was site preparation. This involved the excavation of approximately 650,000m^3 of peat, rock and soil in order to create a construction platform on which to build the terminal. Of this, approximately 450,000m3 was transported by road to a cutover peatland at Srahmore which is owned and operated by Bord na Mona. Approximately 200,000m3 of excavated material was re-used on the site. The construction of the terminal is now approximately 85% completed.

SECTION E: EMISSIONS

E.1. Emissions to Atmosphere

E.1.A. Details of all point emissions to atmosphere

Details of all point emissions to atmosphere should be supplied. Complete Table E.1(i) for Boiler Emissions and Table E.1(ii) and E.1(iii) for all other main emission points. Complete Table E.1(iv) for minor emission points.

A summary list of the emission points, together with maps and/or drawings (no larger than A3), and supporting documentation should be included as **Attachment Nº E**. Plans of emission elevations, relevant roof heights, etc., should also be included, as should detailed descriptions and schematics of all abatement systems.

The applicant should address in particular any emission point where the substances listed in the Schedule of S.I. 394 of 2004 are emitted.

For emissions outside the BAT guidance limit, a full evaluation of the existing abatement/treatment system must be provided. A planned programme of improvement towards meeting upgraded standards is required. This should highlight specific goals and a time scale, together with options for modification, upgrading or replacement as required to bring the emissions within the limits as set out in the BAT guidance note(s). These notes can be found on the EPA website at www.epa.ie.

Answer:

E.1.A.1 Point Emissions to Atmosphere

A summary list of emission points to atmosphere is provided in Table E.1 below. The location of these emission points is shown on in the drawings in Attachment E.1.A.

There are no changes to the list of emissions sources to atmosphere.

TABLE E.1- SUMMARY OF EMISSION POINTS TO ATMOSPHERE

Reference No.	Source	Description
A2-1	Gas Turbine A (Sales Gas Compressor A)	Main
A2-2	Gas Turbine B (Sales Gas Compressor B)	Main
A2-4	Power Generator A	Main
A2-5	Power Generator B	Main
A2-6	Power Generator C	Main
A3-1	Maintenance Ground Flare	Minor
A3-2	Emergency Generator	Minor
A3-3	Firewater Pump Engine A	Minor
A3-4	Firewater Pump Engine B	Minor
A3-5	Firewater Pump Engine C	Minor
A3-6	Firewater Pump Engine D	Minor
A3-7	Laboratory Fume Hood	Minor
A3-8	High Pressure (HP) Flare Stack – Cold Venting	Minor
A3-9	Low Pressure (LP) Flare Stack – Cold Venting	Minor
A3-10	Sales Gas Compressor A Seal Gas Vent	Minor
A3-11	Sales Gas Compressor B Seal Gas Vent	Minor
A4-1	High Pressure (HP) Flare	Potential
A4-2	Low Pressure (LP) Flare	Potential

E.1.A.2 Boiler Emissions

There will be no boilers and therefore no boiler emissions from the Terminal.

E.1.A.3 Main Emissions

There will be 5 No. Main Emission points to atmosphere as summarised in Table E.1.

Each of the two sales gas compressors is driven by a gas turbine firing on fuel gas. The two sales gas compressors and therefore the two gas turbines will operate on a duty / standby basis. The gas turbines will operate in simple cycle with waste heat recovery, each having a dedicated exhaust stack. Each turbine will have a rating / duty of 7.7 MW and a maximum net rated thermal input of 25.7 MW.

The 3 No. Power Generators will be fuel gas-fired spark ignition engines incorporating Selective Catalytic Reduction units for NOx reduction. During normal operating conditions the power requirement of the Terminal will be supplied by two of the generators running at equal load, with the third unit on standby. Each generator will have a dedicated exhaust stack. Each generator will have a rating / duty of 1.32 MW and a maximum net rated thermal input of 3.22 MW.

E.1.A.4 Minor Emissions

There are no changes to minor emissions sources from the previous application.

There will be 11 No. Minor Emission points to atmosphere, as summarised in Table E.1.

The Maintenance Ground Flare will discharge through an 11.1 metre high stack (height above grade) and will be used to flare gas from equipment (depressurisation) prior to maintenance activities. Ignition of the flare is by a pilot which burns fuel gas, with propane from cylinders being available as back up. The pilot is only ignited during flare use. The use of the Maintenance Ground Flare will be infrequent and limited during normal operating conditions (used during planned shutdowns). The flare has a maximum capacity of 10 MMSCFD (million standard cubic feet per day).

The Emergency Generator will be a diesel (low sulphur content) fired compression ignition engine. The generator will have a rating / duty of 0.65 MW and a maximum net rated thermal input of 1.9 MW. The generator will discharge through a 3 metre high stack (height above grade). The generator will only be used to provide emergency power to critical users on loss of the normal power supply. The Emergency Generator will be run for 1 hour per week to confirm availability.

The 4 No. Firewater pump engines will be diesel (low sulphur content) fired compression ignition engines. Each engine will have a rating / duty of 0.275 MW and a maximum net rated thermal input of 0.8 MW. Each engine will discharge through an individual 5.8 metre high stack (height above grade). The pumps will only be used in emergency situations to pump fire-fighting water and therefore their use will be limited. One firewater pump will be run for one hour each week to confirm availability and pumps will be tested out on a rotating basis to ensure each of the four pumps is tested once per month.

The laboratory at the Terminal will be equipped with a laboratory fumehood, which will vent via an appropriate exhaust to atmosphere.

<u>Cold Venting and flaring of compressors changeover releases</u>
As part of normal operation, very occasionally it will be necessary to cold vent gas from certain high pressure and low pressure sections of the plant through the High Pressure (HP) and Low Pressure (LP) flare stacks respectively.

Very infrequently, a small amount of gas will be vented during the start-up of a compressor following a shut down of the other compressor. During purging of the compressor being started, the composition of the vented gas progressively changes from essentially that of air to natural gas (primarily methane) with each purging cycle.

The compressor being started will go through a purge cycle for each start sequence. The quantity of gas vented per start is approximately 240kg. This is based on three attempts of 10-16 seconds duration at a rate of 5kg/seconds to start the compressor. Purged gas will be vented through the HP flare stack.

Assuming a highly conservative scenario of twelve compressor changeovers per year, the quantities to be released are in the range of 600-2,880 kg per year.

Compressor Seal Gas: The export compressors have mechanical seals on their rotating shafts, which are designed to contain the gas within the compressor casing and prevent leakage to the outside environment. However, there is a small amount of gas that continually leaks past the rotating shaft in a compressor. This is because between the rotating parts there are small clearances, which prevent the parts rubbing and generating excess heat. These gaps allow the gas to escape in a controlled and safe manner. Nitrogen is applied to the atmospheric end of the seal and acts as a buffer gas. As the nitrogen flows along the shaft towards the process gas, which is travelling along the shaft from the compressor side they are commingled and vented safely to the LP flare. The mixture routed to the flare is approximately 80% nitrogen and 20% hydrocarbon gas which represents c.13,060 kg per year of hydrocarbons gas vented. This mixture is not combustible..

Total cold vented releases

Compressor changeovers	2.88 t
Compressor Turbine fuel gas vent	1.15 t
Compressor skid vent (purge)	0.30 t
Compressor skid vent routine operation (seal gas)	13.06 t
Total cold vented releases per year	17.39 tonnes

E.1.B. Fugitive and Potential emissions

Give summary details of fugitive and potential emissions in Table E.1(v).

In relation to activities listed in the Schedule of Council Directive 1999/13/EC on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations;

- specify the relevant category of activity in the Schedule
- specify how the requirements in relation to fugitive emissions will be met.

Full details and any supporting information should form **Attachment E.1.B**

Answer:

E.1.B.1 Sources of Fugitive Emissions

The principal potential sources of fugitive emissions from the Terminal will comprise the following:

- Minor leaks from connections, valves, rotating shafts, analysers etc.
- Breathing and working losses from liquid storage tanks
- Emissions during loading and unloading operations

Fugitive emissions of volatile organic compounds (VOCs) from the waste water treatment plant are predicted to be negligible as the wastewater treated in the plant will not contain significant levels of VOCs.

Process Plant

The amount of fugitive emissions consisting of minor leaks from equipment is small but unavoidable in this type of installation. By minimising the number of potential sources, fugitive emissions can be reduced significantly. The United Kingdom Offshore Operators Association (UKOOA) guidelines have been used to estimate the amount of gas expected to be released through such leakages (there are no equivalent Irish guidelines). The UKOOA guidelines are a generic method for estimating fugitive emissions and are not site / project specific. The fugitive emissions have been assumed to be composed entirely of process gas. The estimate of fugitive emissions from the Terminal based on UKOOA guidelines are detailed in Table E2.

Table E2: Predicted Fugitive Emissions from Equipment Leaks

Component	Number in Terminal	Emission Factor (kg/component/yr)	Total Annual Release (kg/yr)
Connections	4,800	2.4	11,520
Valves	2,386	33.9	80,886
Rotating Shafts	43	101	4,343
Analysers	9	-	15,079
Other	50	42.7	2,135
TOTAL			**113,960**

The estimate of annual fugitive emissions of process gas (natural gas) is not considered significant for the type of installation and relative to the quantity of natural gas produced on a daily basis.

Tanks

Fugitive emissions from storage tanks have been estimated based on the predicted amount of condensate and wet methanol to be processed during the Corrib field life. The bulk storage area is comprised of the following:

- 2 No. Internal floating roof nitrogen blanketed stabilised condensate tanks
- 1 No. Fixed roof nitrogen blanketed off-specification condensate tank
- 3 No. Internal floating roof nitrogen blanketed raw methanol tanks
- 2 No. Internal floating roof nitrogen blanketed product methanol tanks

The UKOOA guidelines have been used to estimate tank emissions as a result of breathing and working losses which are summarised in Table E3.

Table E3: Predicted Fugitive Emissions from Tank Breathing and Working Losses (Year 3)

Source	Total VOC (kg/yr)
Fixed Roof Condensate Tanks	835
Floating Roof Condensate Tanks	1323
Floating Roof Raw Methanol Tanks	420
Floating Roof Product Methanol Tanks	1031
Total	**3609**

Table E3 has been revised. An error in information presented in Table 5 of the original application was discovered following the licence review process. Best emission estimates based on vendor data are now provided. The potential for emissions from the storage tanks have been mitigated by the application principles of Best Available Techniques on the storage tanks. Details of storage tanks construction are provided in RFI Di submitted to the Agency on 4/4/06.

E.1.B.2 Control of Fugitive Emissions

The Terminal has been designed to minimise the number of potential sources of fugitive emissions by minimising the numbers of components from which minor leakages could occur. The use of low-leak equipment (valves, pumps etc.) in the Terminal will further reduce the potential for fugitive emissions. Good housekeeping practices including preventative maintenance and routine monitoring of equipment on site will minimise the potential for any equipment leaks.

All of the liquid storage tanks in the bulk storage area will be fitted with internal floating roofs which will minimise any fugitive emissions, with the exception of the offspec condensate tank.

The offspec condensate will not be used as a storage tank during normal operations. It is only intended to be used as a contingency during process upsets as a temporary buffer tank to allow rerouting of offspec condensate back to the condensate stabilization process. This will be very infrequent. Given that the tank will be primarily empty, an internal floating roof is not considered required. A very conservative estimate of fugitive emissions arising from use of the offspec condensate tank for 5% of the time is presented in Table E3. The offspec tank will always be kept under a nitrogen blanket.

Principles of Best Available Techniques have been incorporated into the design of the bulk storage tanks to ensure fugitive emissions are kept to a minimum.

Standard operating procedures will be followed during road tanker loading (e.g. import of methanol) to minimise any fugitive emissions occurring.

The gas odourisation package will inject an odourant comprising a mixture of Tertiary Butyl Mercaptan (80%) and Di-Methyl Sulphide (20%) into the sales gas stream prior to export for safety / detection purposes. The gas

odourisation package is completely sealed and is specified as 'zero discharge' during operation and loading. It includes activated carbon filters on both the instrument cabinet and storage tank. Any fugitive emissions of odourant generated during maintenance will be neutralised by a hand held spray deodorizer used by the maintenance contractor. Therefore there should not be any malodorous fugitive emissions generated.

The amount of fugitive emissions from the Terminal are not predicted to be significant and therefore are not predicted to have a significant impact on the surrounding environment. The Terminal should not generate any fugitive emissions which are malodorous in nature.

E.1.B.3 Potential Emissions

The main sources of potential emissions are flaring and cold venting.

Flaring and Venting Systems

There are three flare systems on the terminal: Ground (Maintenance), High Pressure (HP) and Low Pressure (LP) flares. The HP and LP flares are 40m high and mounted on the same structure whereas the Maintenance flare is 11.1m high and has its own supporting structure. There will be no flaring of hydrocarbon gas from any of the flares as part of normal operations with the ground flare isolated when not in use and the LP and HP flares purged with nitrogen. The primary reason for the flare systems not being normally lit with a pilot is to minimise release of hydrocarbons and minimise visual impact.

Reasons for Flaring and Venting

Safety related:

Pressure Protection. In the event that there is a pressure rise within any section of the plant this may result in a pressure relief valve diverting the excess pressure to the flare. This gas will be vented or flared depending on the flowrate of the gas.

Fire Protection. If there is a confirmed fire or gas release within the terminal the process systems are depressurised to the flare system and ignited. This is to prevent fire escalation by reducing the available fuel (hydrocarbon) inventory.

Product specification. A small amount of gas will be flared during a start up until the export gas composition meets the required Bord Gáis specification.

Maintenance. Periodically equipment has to be taken out of service for maintenance work. When this work is intrusive and requires internal access, the equipment has to be isolated, depressurised, normally to the ground (maintenance) flare and purged with nitrogen. The equipment is then ready to be safely worked on.

Ignition of the Flare Systems

The HP flare will automatically ignite when its flare meter registers a flowrate sufficient to warrant the ignition of the pilot system. This flowrate is a combination of hydrocarbons and nitrogen, which is used as the constant flare system purge.

The LP flare operates in the same manner with a signal from its flare meter also causing the pilot system to ignite.

The use of the maintenance flare is always for a planned activity. This flare is normally isolated from all process systems and only lined up to a process system when maintenance work requiring internal access to equipment is to be carried out. The maintenance flare is ignited on every occasion it is used.

E.2 Emissions to Surface Waters

Tables E.2(i) and E.2(ii) should be completed.

A summary list of the emission points, together with maps/drawings (no larger than A3) and supporting documentation should be included as **Attachment Nº E.2**.

The applicant should address in particular any emission point where the substances listed in the Schedule of S.I. No. 394 of 2004 are emitted.

Details of all List I and List II substances listed in the Annex to EU Directive 76/464/EEC (as amended), contained in any emission must be presented. All surface water runoff and storm water drains discharging to surface water bodies must be included. A National Grid References (12 digit, 6E, 6N) must be given for all discharge points. The identity and type of receiving water (river, ditch, estuary, lake, etc.) must be stated.

For emissions outside the BAT guidance limit, a full evaluation of the existing abatement/treatment system must be provided. A planned programme of improvement towards meeting upgraded standards is required. This should highlight specific goals and a time scale, together with options for modification, upgrading or replacement as required to bring the emissions within the limits as set out in the BAT guidance note(s).

Answer:

E.2.1 Treated Produced Water and Treated Surface Water (oily water)

SEPIL are proposing to amend the method of discharge of produced water from the Bellanaboy Bridge Gas Terminal. The proposed new arrangement involves the discharge of most of the produced water through spare cores in the main control umbilical to the subsea manifold located at the Corrib gas field some 65km offshore (~ 92km along the pipeline length) and in 350m depth of water. A small amount of produced water will need to be removed offsite by a licensed waste contractor (approximately 15-20m^3/day for the first 4 years of production), but this will not be required in later years when produced water volumes are predicted to decline.

Surface water run off from process areas on site will be treated and discharged via the permitted outfall pipe 12.7 km from landfall in line with the existing licence.

Discharged treated produced water and treated surface water from process areas on site will continue to meet the emission limit values conditioned under the existing IPPC licence (P0738-01).

A summary of the proposed discharges is given in Table E.4 on the following page:

Table: E.4 Summary of Proposed Discharges to Surface Waters

Emission	Emission Ref	Proposed Discharge Location	Emission Sampling Location Ref	Grid Reference for Emission Source / Monitoring Point
Treated Surface Water Runoff (from process areas)	SW1	Sea outfall ca. 12.7 km offshore from landfall location (no change)	SW1-S	54° 19.72′ N 09° 59.46′ W
Uncontaminated surface water runoff from Terminal	SW2	R314 Road Drainage Ditch to south-west of site (no change)	SW2-S	08598 E 33236 N (ING)
Treated Produced Water	SW3	65 km offshore at well manifold in sea	SW3-S	54° 20.34′ N 11° 03.51′ W

A detailed description of the amended proposal for treated produced water discharges is given in Section F.1.2 and associated attachments.

Uncontaminated surface water runoff from Terminal
Further details in relation to discharges of uncontaminated surface water are given in Section F.1.4.

E.2.2 Other Emissions

There will be minor emissions to sea from the valve assemblies on the gas wellheads in the Corrib field. The subsea facilities are designed to accommodate up to eight gas producing wells in the Corrib Field. Each wellhead will have a valve assembly or "Christmas Tree" which is a collection of valves mounted on a common structure. The christmas tree controls gas flow from each well and in turn each tree is controlled via the umbilical from the onshore Terminal. The valves on the christmas tree are actuated by hydraulic fluid pumped in the umbilical from the Terminal. The hydraulic fluid comprises a 50:50 water:glycol mixture. In order to fully open or close all the valves on one christmas tree, approximately 14 litres of the fluid will be discharged to sea. It is estimated that a maximum of 1,344 litres of hydraulic fluid will be discharged per year (all valves operated monthly on each well), equivalent to 672 litres of glycol. Taking into account the minor quantity emitted, the benign nature of the hydraulic fluid, the number of valves, and that it will not be possible sample/monitor the emission, for the purposes of the IPPC Application it is not proposed to designate this as another emission point(s).

Discharges of glycol and produced water at the Corrib field will be also permitted under the Petroleum Lease for the Corrib Field Development and under the Permission to Use and Discharge Chemicals (PUDAC) permitting system administered by the Department of Communications, Energy and Natural Resources.

The different sources of water and their associated drainage systems have been segregated to minimise the unnecessary treatment of less contaminated / uncontaminated systems.

There are also a number of systems on site which do not discharge to surface waters and which are summarised as follows:

- **Closed Drains System**: Operational and maintenance drainage from the process and utilities system is collected via a piped closed drain collection network and drains to the Closed Drains Drum. This will normally be pumped back to the plant for processing.

- **Chemical Drains**: A chemical drain is provided to collect spent chemicals from the on-site laboratory with a local sump for off-site disposal. Dosing, injection and cleaning chemicals will be stored in small quantities at the site. Any spillage will be contained locally in bunding and/or drip trays for re-use/disposal.

In the event of a fire firewater run off will be collected in the open drains system and routed to the Used Firewater Pond.

An overall site drainage plan for the Terminal together with drawings showing the locations of the discharge points to surface waters are included in Attachment E. The collection and treatment of the discharges to surface waters is described in detail in Section F.1.2 – F1.4 of the IPPC Application Form.

E.3 Emissions to Sewer

Tables E.3(i) and E.3(ii) should be completed.

A summary list of the emission points, together with maps and/or drawings (no larger than A3) and supporting documentation should be included as **Attachment Nº E.3**. Details of all List I and List II substances listed in the Annex to EU Directive 76/464/EEC (as amended), contained in any emission must be presented. All relevant information on the receiving sewer**,** including any effluent treatment/abatement systems, not already described, with schematics as appropriate should also be included in **Attachment Nº E.3**.

For emissions outside BAT guidance limit (where given), a full evaluation of the existing abatement/treatment system must be provided. A planned programme of improvement towards meeting upgraded standards is required. This should highlight specific goals and a time scale, together with options for modification, upgrading or replacement as required to bring the emissions within any limits set out in the BAT guidance note(s).

Answer:

Not applicable

E.4. Emissions to Ground

Describe the existing or proposed arrangements necessary to give effect to Articles 3,4,5,6, and 7 of Council Directive 80/68/EEC of 17 December 1979 on the protection of groundwater against pollution by certain dangerous substances.

The applicant should supply details of the nature and quality of the substance (agricultural and non-agricultural waste) to be landspread (slurry, effluent, sludges etc) as well as the proposed application rates, periods of application and mode of application (e.g., pipe discharge, tanker).

For emissions outside the BAT guidance limit, a full evaluation of the existing abatement/treatment system must be provided. A planned programme of improvement towards meeting upgraded standards is required. This should highlight specific goals and a time scale, together with options for modification, upgrading or replacement as required to bring the emissions within the limits as set out in the BAT guidance note(s).

Answer:

E.4.1 Emissions to Ground

There are no new emissions to ground.

There will be only one emission point to ground (SL1) from the Terminal. Domestic sewage consisting of wastewater from staff facilities (Toilets, Showers, Canteen etc.) will be treated in a Bord na Móna Puraflo system before being discharged to a 300 m^2 percolation area on site. Details on the emission are provided in Tables E.4(i) and E.4(ii). The location of the Puraflo treatment system and percolation area is shown on the Terminal Drainage Plan (Sheet 2 of 2) included in Attachment E.2.3. The treatment system is described in Section F.1.3 of the IPPC Application Form.

E.5 Noise Emissions

Give particulars of the source, location, nature, level, and the period or periods during which the noise emissions are made or are to be made.

Table E.5(i) should be completed, as relevant, for each source.

Supporting information should form **Attachment Nº E.5**

For emissions outside the EPA Guidance Note for Noise in relation to Scheduled Activities 2nd Edition (2006), a full evaluation of the existing abatement/treatment system must be provided. A planned programme of improvement towards meeting upgraded standards is required. This should highlight specific goals and a time scale, together with options for modification, upgrading or replacement as required to bring the emissions within the limits as set out in the Guidance Note.

Answer:

The revised modelling incorporates design changes that have taken since the 2004 application, which includes the addition of Waste Heat Recovery on the gas compressor turbines, Selective Catalytic Reduction on the power generation equipment, plus additional pumps required to facilitate the discharge of treated produced water through spare cores in the umbilical bundle serving the offshore wells. Based on the most up to date information on the Terminal design, the calculations undertaken demonstrate that when operational the Terminal is capable of meeting the IPPC licence noise limits.

To calculate noise emissions from the proposed terminal site, noise propagation has been calculated using algorithms provided in *ISO 9613 (Acoustics - Attenuation of sound during propagation outdoors - Part 1: Calculation of the absorption of sound by the atmosphere and Part 2: General method of calculation.'*)

The locations of all point sources of noise and grid co-ordinates are shown on Drawing No. 10159-22-DR-0005 in Attachment E.5.

Maintenance and HP/LP Flares

For maintenance operations the Maintenance Flare (at ground level) will be used intermittently which will comply with the normal operational noise limit at the nearest noise sensitive location (Daytime L_{Aeq} (30 minutes) = 45 dBA and Night-time L_{Aeq} (30 minutes) = 35 dBA). Noise from this Flare will be mitigated by ground absorption and low level screening.

In emergency and plant upset situations to allow depressurisation of equipment for safety reasons, it may be necessary to flare gas from the Terminal using the HP and LP Flares. The only times the HP/LP flares will operate (i.e. will be ignited) will be for testing during the commissioning phase and thereafter only in emergency situations. Noise levels generated by the Emergency Flares are not readily attenuated by any form of industrial noise control measures however low noise flare tips have been incorporated into the design.

Noise emissions during the following scenarios have been evaluated at the closest receptor location 'House A' to indicate the noise level and duration

which could be expected, along with a comment on the operator's estimate of the likelihood of each occurrence.

Plant startup (worst case)

This flare event would occur each time the plant is started up, which could be expected to occur up to once every two years, lasting for one hour. The resultant noise level would be up to 76dB(A) at house A for one hour.

Terminal site blowdown

This unplanned event would comprise flaring of terminal gas inventory in an emergency condition and involves the highest flare rate. The resultant noise level would be up to 83dB(A) at house A for approximately 9 minutes of the 15 minute sequence.

Noise levels during Compressor Purging (cold vent)

Scheduled compressor changeover will be carried out during daytime hours, within the daytime noise emissions regime. A compressor trip, however, would be an unscheduled event and therefore could occur at any time. It is estimated that compressor trips may occur 2 - 3 times per year. The predicted noise level from compressor purging is 14dB at the nearest residence. This will not be detectable over the normal operating noise levels of the Terminal and will therefore comply with the noise emission conditions in the existing licence.

In addition there are 2 highly unlikely scenarios involving depressurisation of the onshore and offshore pipelines, which are included for completeness.

Offshore pipeline depressurisation

Depressurising the whole pipeline (including both offshore and onshore sections) is described as a 'once in a lifetime' event, which could last 16 hours and would give rise to noise levels of up to 79dB(A) at house A for approximately 5 hours.

Onshore pipeline depressurisation

An event of similar likelihood, the shorter onshore pipeline would be depressurised at a slower rate, and for a shorter duration of 5½ hours. Noise levels of up to 69dB(A) would be expected to occur at house A for approximately 3 hours.

The above noise emissions figures are determined from published empirical methods on the basis of maximum gas flow rate, jet aerodynamics, density and calorific value of the constituent gas. Noise levels are initially steady at the stated maximum level as the maximum flow rate is maintained, followed by decrease as the remainder of the gas volume is released. The duration of exposure to the noise levels indicated above is the period for which the gas flow rate is above 50% of the peak flow rate.

The total volume of gas flared affects the duration of the flare event rather than peak noise level achieved, as this is limited by the process design and valves. Therefore, a variation of 10%, for example, in the gas volumes

flares for any of the events would not have a significant effect in the noise impact resulting from the release, and the durations indicated above have been described as approximate values.

Noise testing

Checks on some items may be made during commissioning if there is a requirement to identify any contingency mitigation at an early stage. When the terminal site is fully functional and all noise sources can be operated together on startup, a Startup Noise Audit will be undertaken, to include noise survey measurements at relevant times and under suitable weather conditions at the site boundary and nearest receptors, and an assessment of any noticeable impulsive or tonal plant noise emissions.

Preventative Maintenance
Regular preventative maintenance of all equipment will help to ensure that the equipment continues to perform to specification and minimise noise generation as a result of faulty / inadequately maintained equipment.

Environmental Management System
Noise awareness and minimisation will form a key part of the Environmental Management System to be implemented on the site.

E.6 Tabular Data on Emission Points

Applicants should submit the following information for each emission point:

Point Code	Point Type	Easting	Northing	Verified	Emission
Provide label ID's assigned in section E	A=Atmospheric SW=Surface Water SE = Sewer GW=Groundwater N = Noise SL=Soil/Ground WS=Waste	6E-digit GPS Irish National Grid Reference	6N-digit GPS Irish National Grid Reference	Y = GPS used N = GPS not used	e.g. SO_2, HCl, NH_3

An individual record (i.e. row) is required for each emission point. Acceptable file formats include Excel, Access or other upon agreement with the Agency. A standard Excel template can be downloaded from the EPA website at www.epa.ie. This data should be submitted to the Agency on a separate CD-Rom, containing sections B.2, E.6 and F.3.

SECTION F: CONTROL & MONITORING

Describe the proposed technology and other techniques for preventing or, where this is not possible, reducing emissions from the installation / facility.

F.1: Treatment, Abatement and Control Systems

Details of treatment/abatement systems (air and effluent emissions) should be included, together with schematics as appropriate.

For each Emission Point identified complete Table F.1(i) and include detailed descriptions and schematics of all abatement systems.

Attachment Nº F.1 should contain any supporting information.

Answer:

F.1.1 Emissions to Atmosphere

The main emissions to atmosphere are emissions from the gas compressors (A2-1, A2-2) and Emissions from electricity generators (A2-4, A2-5, A2-6).

The principal changes relating to the control and monitoring of air emissions in this application are

(a) the addition of Waste Heat Recovery Units on the gas compressors and

(b) the inclusion of Selective Catalytic Reduction (SCR) to the exhaust of each of the 3 power generators.

F.1.1.1 – Gas Compressors

A - Waste Heat Recovery

Following the decision to export condensate off site and to not use it as a source of fuel to generate heat for the Heating Medium System a review of energy usage on site was carried out. Waste Heat Recovery was identified as an alternative method to provide heat and increase the overall efficiency of energy usage on site.

The systems has been incorporated into the turbine exhausts to recover otherwise wasted heat energy, which can then be utilised for other terminal applications. The waste heat recovery systems will provide approximately 5.5 MW of heat energy to the terminals processes, which will be sufficient to satisfy the heat requirements of the Terminal. Inclusion of Waste Heat Recovery has saved the combustion of approximately 0.65 MMscf (million standard cubic feet) per day of fuel gas in the heating medium heater and will reduce CO2 emissions from the site by approximately 10,000 tonnes per year.

A pictorial figure showing location of the waste heat recovery units is included in Attachment F.1.1.1.

B – Low NOx Burners

The gas turbines are fitted with low NO_x emission technology. The concentration of pollutants in the exhaust gas will comply with the Emission Limit Values (ELVs) specified in the existing IPPC licence (P0738-01).

C- Measurement of Exhaust Gas Flowrate from Gas Turbines

An air flow meter is required under Schedule C1.2 of the existing licence for the measurement of exhaust gas flow from the sales gas compressor turbines. The recommended installation requirements for an air flow meter would require a significant increase in stack heights of the gas turbines which would have associated Planning and visual impacts. The alternative approach that is set out in this application will be calculated based on continuous measurements of other parameters:

- Fuel gas flowrate (gas turbine fuel flow meter)
- Fuel gas composition (sales gas gas chromatograph)
- Exhaust gas oxygen content (CEMS)

The exhaust gas flow rate can then be calculated from these data by mass balance using algorithms in the process control system Data Historian. This is consistent with the *mass balance* approach in BREF for monitoring (Sections 3.14.4 and 4.3.1).

The calculated exhaust gas flowrate will therefore be used to demonstrate compliance with the hourly and daily volumes stated in Section B.1 of the IPPC licence. This calculation supersedes the intention to continuously monitor exhaust velocity by means of an air flow meter as listed in schedule C1.2. of the current IPPC licence.

F.1.1.2 – Power Generators

A – Selective Catalytic Reduction Systems

The addition of SCR systems to the exhaust of each of the three main electrical power generators (G-8801A/B/C) is a new initiative. The reason for installing the SCR systems is to reduce the emissions of the exhaust gas from the main electrical power generator engines and thus ensure that emissions are within the emission limit values set down in current IPPC licence. The SCR process equipment is located in a new building, which is an annex building to the main generation building and is installed with Fire & Gas detection equipment.

The SCR process is a catalytic process based on the selective reduction of nitrogen oxides with ammonia or urea in the presence of a catalyst.
The process chosen by SEPIL will use urea as the reducing agent, and will have a dedicated catalyst system for each gas engine. The process is illustrated in Attachment F.1.1.2.

The urea will be imported to the terminal as a 32.5%wt aqueous solution (optionally 40%). It will be stored in a $10m^3$ bunded bulk storage tank, which will provide for 50 days consumption at full load. Duty and standby transfer pumps will be provided to fill 3 x 0.5 m3 day-tanks, each of which is dedicated to one of the gas engines. Each day-tank will then feed an injection unit, which will dose urea into an injection nozzle, upstream of a mixing device inside the gas engine exhaust duct. This ensures that the urea solution mixes thoroughly with the exhaust gas and the urea is

converted to ammonia before the mixture contacts the catalyst. The urea hydrolyses at the discharge temperature from the gas engines to release ammonia and carbon dioxide by means of the following reaction:

$(NH_2)_2\ CO + H_2O \rightarrow 2NH_3 + CO_2$

NO_X conversion then takes place on the SCR catalyst surface by one of the following reactions:

$4NO + 4NH_3 + O_2 \rightarrow\ 4N_2 + 6\ H_2O$

$6NO2 + 8NH3 \rightarrow 7N_2 + 12\ H_2O$

Control and monitoring

The urea dosing system will be configured to ensure the emission limit values for Nox are consistently met under varying engine load conditions and to ensure the correct amount of urea is injected at all times.

This will be done 2 ways:

1. Establishing a Urea Solution Injection Curve. Depending on engine load, the quantity of urea injected will be set to a predefined value. When the engine load changes the amount of urea injected will be immediately adjusted so the injection curve always follows engine load. The control of urea with respect to engine load means the system can react immediately to engine load and does not rely on the response time from the Nox analyser to adjust the quantity of urea.
2. Depending on the actual Nox content of the gas, as determined by the continuous on-line analyser, the system is capable of automatically adjusting the amount of urea injected to +/- 5% of the predefined load setting. The Nox analyser will ensure that under minor load variations and stable load conditions, variations in Nox levels can be determined and the urea dosing adjusted accordingly.

Independent sampling and analysis of exhaust gas will be conducted on a quarterly basis for reporting in line with Schedule C.1.2.

Ammonia
An oxidation catalyst is provided downstream of the SCR catalyst to convert carbon monoxide in the engine exhaust to carbon dioxide. This catalyst will also oxidise any residual ammonia back to nitrous oxides. SEPIL requests an ELV of 10 mg/Nm^3 for NH3. The SCR systems will supplement the low NOx burners on the power generators.

B- Lean Burn Engines
The three power generators at the Terminal will be fuel gas fired compression engines, which will be high efficiency 'clean burn' engines. Selective Catalytic Reduction will be used to minimise emissions of NO_x. The concentration of pollutants in the exhaust gas from the generators will comply with the Emission Limit Values (ELVs) specified in the existing IPPC licence (P0738-01).

F.1.1.3 Minor and potential emissions to atmosphere

Both the emergency generator and the firewater pump engines will be fired on low sulphur diesel, which will minimise emissions of SO_2.

Flare stacks vendor information indicates that they will have an efficiency of 98%. Ignition of each flare will be by a pilot but the pilot will only be ignited during flare use. Fuel gas ignition with back-up from propane cylinders has been selected from an emissions and safety risk perspective. The flares will be equipped with low emission, low noise flare tips.

F.1.2 Treatment / Abatement of Produced Water

Water that is discharged to sea will comprise the following:
(a) Treated Produced water which will be discharged at the subsea manifold via the umbilical cores – SW3
(b) Treated Surface water runoff from process areas which will be discharged at the outfall outside Broadhaven Bay – SW1

The produced water from the Corrib field has been analysed and is considered to present a conservative view of the water composition, which provides a robust basis for the design of the water treatment facilities. The nature of natural gas production is such that it is considered prudent to design facilities for a typical range of inlet concentrations and that this be evaluated on an ongoing basis.

As part of the recovery of natural gas from the reservoir some water will arise. Water which exists in liquid form in the rock reservoir where the gas occurs, is normally called formation water and occurs lower in the reservoir below the gas-water contact level. Water which exists in vapour form in the reservoir but which is condensed out of the gas during the production process is normally termed water of condensation.

It is expected that the water, which will be produced from the Corrib Field, (referred to as Produced Water) will consist mainly of 'water of condensation'. It is expected that 'formation water', if it occurs, will only occur in very small quantities. This has been supported by reservoir simulation work, which predicts that only very small quantities of formation water, which is likely to occur in one well after several years of production. It should be noted that any excessive water production from a well in the later stages of field life is likely to lead to shut-in of the particular well, as the pressure loss due to the presence of free water will significantly increase the pressure drop in the production system.

Water of condensation condenses out during the gas production process as the temperature and pressure of the hydrocarbon gas decreases. This water is produced with the gas from first production, and it arrives in the gas stream. The volume of water of condensation produced is governed by the reservoir pressure, temperature and the gas production rate. Water of condensation is likely to contain only traces of organic compounds and some metals.

Formation water, should it occur, is likely to contain natural salts and minerals from the rock formation in which the water has been resident over geological time. The actual composition will vary from location to location (well to well) and over time. Indications of the likely constituents have been determined from industry experience and from testing of water recovered from the exploration and appraisal wells.

Taking the above into account, and on the basis of field and general industry data, the water treatment plant for the Terminal is designed on the basis that the Produced Water will contain low levels of naturally occurring salts, solids and metals. It is also designed to accommodate the presence in the produced water of small quantities of hydrocarbon condensate as well as dosing chemicals (methanol and corrosion inhibitor) injected to the sub-sea facilities to aid in the production of the gas.

Reservoir modelling has been used to predict the flowrates of Produced Water arising over the 20 year operational life of the Terminal. The predicted water production profile is summarised in Table F.1 below:

Table F.1 Predicted flow rates of Produced Water from the Corrib Field (average on a per year basis)

Year	Condensed Water m^3/hr	Formation Water m^3/hr	Total Produced Water m^3/hr	Total Produced Water m^3/day
1	3.2	0	3.2	76.8
2	3.3	0	3.3	79.2
3	3.2	0	3.2	76.8
4	2.6	0	2.6	62.4
5	2.1	0	2.1	50.4
6	1.7	0	1.7	40.8
7	1.4	0	1.4	33.6
8	1.2	0	1.2	28.8
9	1.0	0	1.0	24
10	0.9	0	0.9	21.6
11	0.8	0	0.8	19.2
12	0.7	0.1	0.8	19.2
13	0.7	0.1	0.8	19.2
14	0.6	0.2	0.8	19.2
15	0.6	0.2	0.8	19.2
16	0.5	0	0.5	12
17	0.4	0	0.4	9.6
18	0.4	0	0.4	9.6
19	0.3	0	0.3	7.2
20	0.3	0	0.3	7.2
21	0.2	0	0.2	4.8

As can be seen from the table above, the throughput of produced water is predicted to peak at 3.3 m^3/hr (c. 80 m^3/day) in the early years of operation, but is significantly lower for the majority of field life.

The Produced Water Treatment System has a design throughput capacity of 6 m^3/hr. This is excluding any recycled streams (e.g. filtrate) which will also be processed by the system. The multi stage treatment system has been designed to reduce the maximum concentrations of metals, salts and other constituents of the produced water prior to discharge to sea such that the emission limit values set out in the licence P0738-01 are met which are equivalent to 1997 EQS values for the listed parameters prior to discharge.

A detailed description of the Produced Water Treatment System, including a simplified process flow diagram and process schematic diagram, are included in Attachment F.1.2.

Proposed changes to discharges of treated Produced Water (SW3)

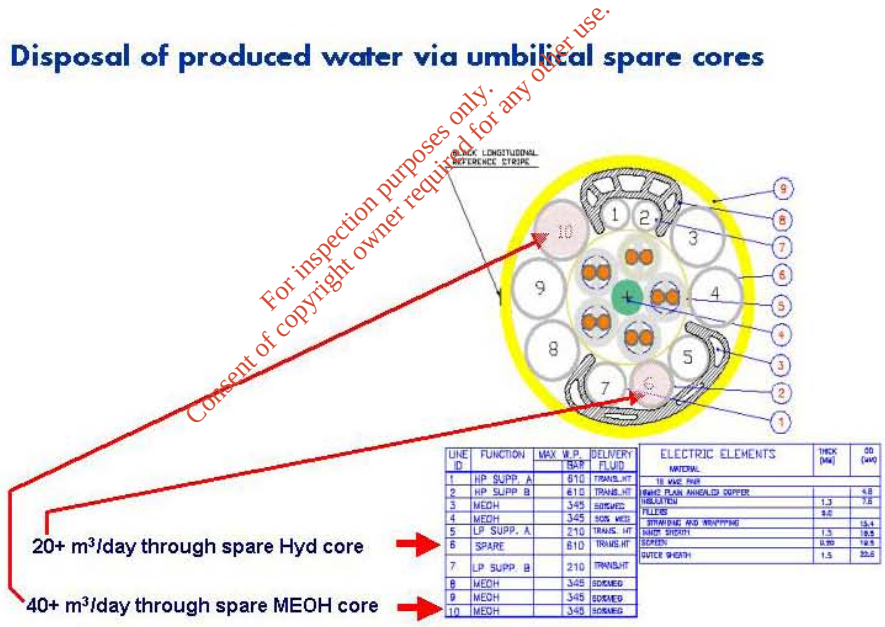
As mentioned previously the proposed new arrangement involves the discharge of most of the produced water through spare cores in the main control umbilical to the subsea manifold located on the seafloor at the

Corrib gas field some 65km offshore (~ 92km along the pipeline length) and in 350m depth of water. A small amount of produced water will need to be removed offsite by a licensed waste contractor, but this will not be required in later years when produced water volumes decline.

Umbilical Use

The control umbilical is used to control the subsea wells by providing hydraulic and electrical power as well as the injection of production chemicals into the pipeline to protect against corrosion and the limitation of gas hydrates. Two spare cores in the main umbilical have been identified for produced water disposal, one chemical spare (25.4mm ID) and one hydraulic spare (19mm ID) constructed of Superduplex stainless steel). Hydraulic and metallurgy studies undertaken by SEPIL demonstrate that the cores are suitable for discharges of produced water. The modifications are entirely reversible should the cores be required for chemical or hydraulic duty. A cross section of the main umbilical showing the cores identified for the disposal of produced water is shown below. The two lines will terminate under the manifold protection cover where the water will be discharged.

Fig. F.1 Umbilical Cores



Produced water volumes

As discussed in the previous section the produced water flow rate will vary with gas production and possible formation water breakthrough. The maximum annual average daily predicted rate is ca. 80 m^3/day. Although the produced water treatment system is conservatively designed to treat a maximum of 144m^3/day.

Hydraulic studies carried out have indicated that ca. 40 - 43 m^3/day of water can be discharged via Core 10 (spare chemical core). A further ca. 20+ m^3/day of water can be discharged via Core 6 (spare 19 mm hydraulic core). Thus a total of 60-65 m^3/d can be discharged through the

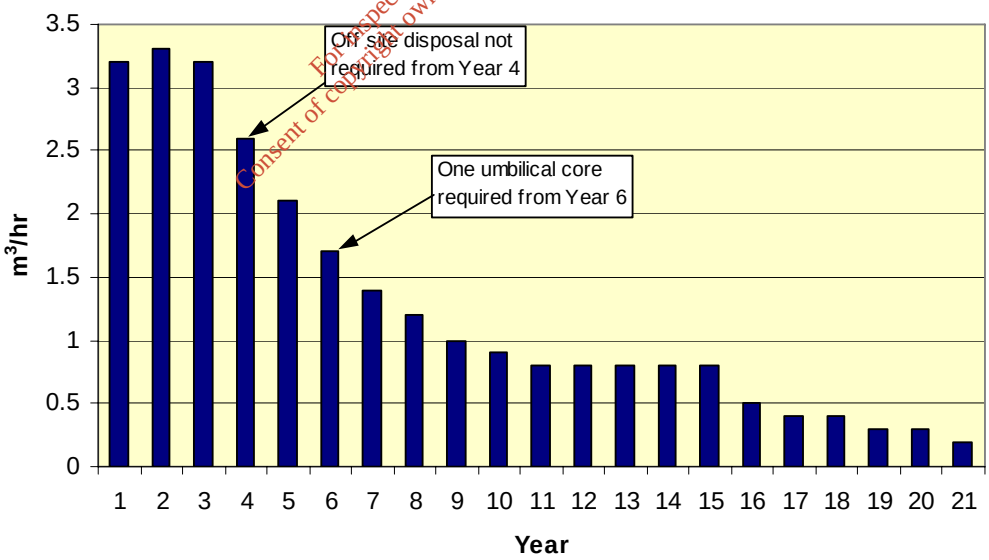
umbilical cores. This leaves a surplus of ca. 15-20 m^3/day which will need to be removed offsite by truck (4-5 trucks movements per week). Due to the nature in the way gas is produced from the wells it is also anticipated that there will be times when no water be will be required to be removed off site by road tanker.

There is some uncertainty in predicting the actual discharge capacity of the umbilical cores, this is limited by tolerances in the diameter, the surface roughness and frictional losses within the cores, hence the actual discharge capacity will not be known until it is tested. Therefore in the event that it is possible to discharge more than the initial calculations suggest SEPIL wish to retain the flexibility to do so in the revised licence. Therefore a daily maximum discharge of 80 m^3/day is sought.

After year 4, produced water is expected to decrease by approximately 20% which may eliminate the need to dispose of surplus water off-site. After year 6 produced water is projected to decrease by ca. 50%, at which point only Core 6 (25.4mm ID core) should be required to dispose of the produced water.

Studies have shown that formation water may occur later in field life, if this occurs it is likely to be from one well. If formation water does occur however, production from this well can be shut in. The strategy will be to reduce the amount of produced water requiring offsite disposal. The predicted produced water production profile is shown in the graph below (data taken from in the 2003 Terminal EIS).

Fig. F.2 Predicated Produced Water Profile



Enabling measures and infrastructure required for discharge of produced water.

The following measures will be incorporated into the new arrangements to facilitate the operation:

- Biocide Addition: It will be necessary to incorporate intermittent Biocide dosing into the treated produced water discharge to prevent fouling in the Umbilical cores. An additional flow proportional sampler will also be installed at the treated Produced Water Sump (T-8302B)
- A new transfer line will be installed to transfer the treated produced water from the Treated Produced Water Sump (T-8302B) to the umbilical Onshore Terminal Termination Unit (OTTU) and into umbilical cores.
- A 75mm flexible hose will be employed to transfer surplus treated produced water to the road tanker utilizing the current treated Produced Water Discharge Pump (P-8302B)
- 4 additional pumps will be required to facilitate discharges of produced water

The OTTU is the termination unit for the umbilical on the Terminal site.

Treated water sump segregation and reconfiguration.
In the currently permitted scheme, water leaving the produced water treatment system enters the treated produced water sump (144m^3 volume) and is then fed to the outfall discharge sumps which incorporate 2 no. 105m^3 interconnected sumps. The discharge sumps also receive treated surface from the surface water treatment system.

In the proposed new arrangement, in order to ensure segregation of the treated produced water and treated surface water, the connection between the two outfall sumps will be removed. This will provide a dedicated sump for discharges of treated surface water via the sea outfall and discharges of treated produced water via the umbilical cores.

Treated produced water from the water treatment plant first enters the Treated Produced Water Sump. If the quality of the water complies with the required specification as indicated by online analysis the water will be pumped to the Produced Water Discharge Sump. From here it will be transferred into the umbilical Cores for final discharge. Any surplus water will be disposed of off-site, by a licensed waste contractor. If treated produced water fails to meet the treatment targets, it will be re-circulated back through the produced water treatment plant.

Treated surface water will enter the Surface Water Discharge Sump (T-8302A) and if it meets the treatment targets it will be discharged to the sea via the permitted outfall. If the water fails to meet specifications, it will be re-circulated through the surface water treatment system again.

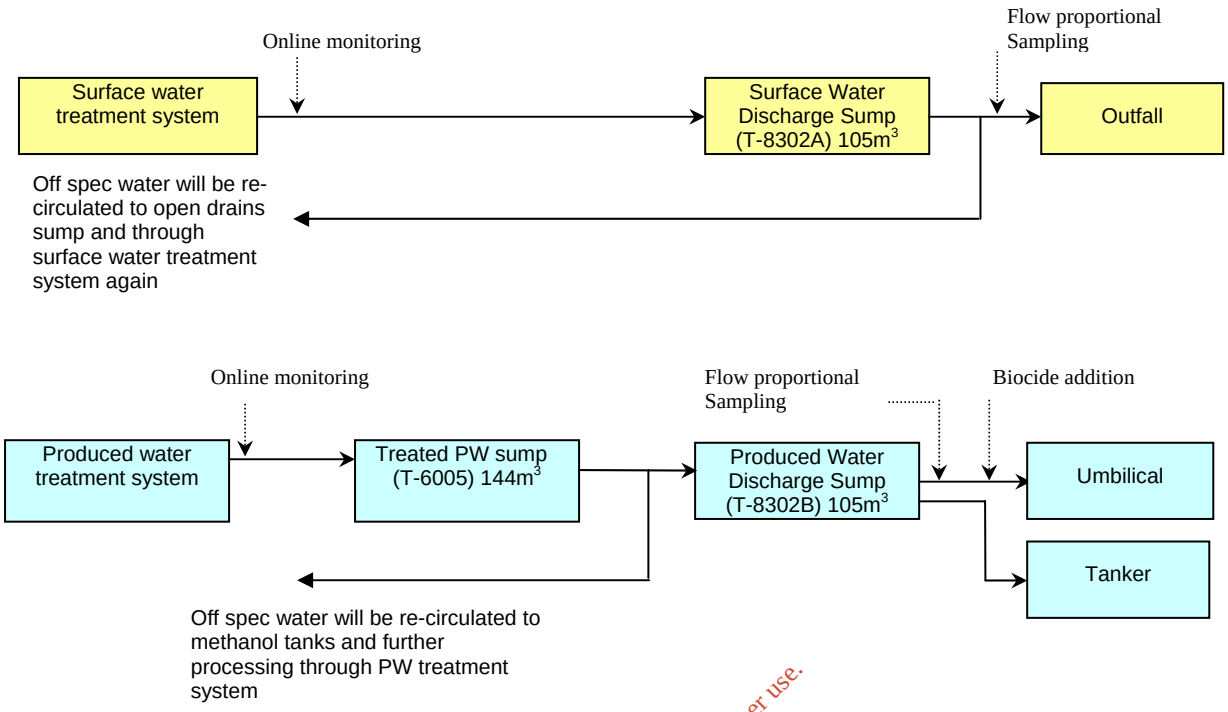


Figure F.3: Treated Produced Water and Treated Surface Water

Sampling and Monitoring of Treated Produced Water and Treated Surface Water

Treated water from the water treatment plants will be continuously monitored using a combination of online measurements such as flow, pH, conductivity and periodic lab analysis. Conductivity and pH have been selected as the most reliable indicator of treatment performance. Water exceeding defined threshold indicating the treatment targets are not being met will be recycled through the surface water treatment system or the produced water treatment system.

As well as online measurements and periodic grab sampling, 24 hour flow proportional composite sampling of both discharges will take place as required by the licence. The samples will be analysed as required under Schedule C2.2 Monitoring of Emissions to Water.

Biocide Application to Treated Produced Water – SW3

The treated produced water from the produced water treatment process will have a significant potential for biological growth in the form of bacteria, as opposed to fungal or algal growth. The biological growth in the form of biofilm has the potential to block or restrict the umbilical cores. In addition, biological growth could induce corrosion (microbially induced corrosion – MIC), if biofilm becomes established. MIC normally takes the form of pitting corrosion that can rapidly penetrate pipe walls. Therefore it will be necessary to introduce biocide application to prevent this.

There is limited ability to monitor biological growth, core restriction and corrosion within the system. Therefore a strategy to prevent biological growth is essential. Single point sterilisation technology, such as UV water treatment, will not prevent biological growth in the umbilical. There would be a significant potential for biological growth to become established downstream of the single point treatment location and to proliferate unchecked. As a consequence, application of biocide is considered the most appropriate measure for biological control.

Further information on biocide application and alternatives considered is given in Attachment F.1.5. An assessment of environmental impact associated with produced water discharge is given in Section I and attachment I.2.1

F.1.3 Treatment/Abatement of Surface Water – SW1

Discharges of treated surface water from process areas are as described in the previous application and will comply with the limits set out the IPPC Licence (P0738-01). Rainwater falling on process areas on site is collected in the Open Drain Sump and is treated in the potentially contaminated surface water system (oily water system). The only difference is the segregation of treated produced water and treated surface water (oily water), and the discharge of solely treated surface water via the permitted outfall 2km off Erris Head.

As required under 3.12.5 of the IPPC Licence (P0738-01) the Open Drain Sump incorporates a duty and standby pump for the transfer of contaminated water and firewater to the Used Firewater Pond. Both pumps are independently plumbed and are capable of simultaneous operation. In the event of failure of power generation at the Terminal both pumps are capable of being driven from mains electricity.

F.1.4 Discharge of Uncontaminated Surface Water runoff -SW2

Uncontaminated Surface Water (or "storm water") is runoff from the Terminal's non-process areas and roofs, but excludes bunded areas, which drain to the potentially contaminated surface water system. The Stormwater water is collected in the perimeter surface water drains and is routed via an Emergency Holding Tank (EHT) to the settlement ponds. Discharge from the settlement ponds is commingled through a discharge channel designed to permit flow proportional sampling, after which the runoff enters the local peat ditch system and ultimately the drainage ditch that runs alongside the R314 road to the southwest of the Terminal.

Condition 6.15.2 requires an on line TOC meter and recorder to continuously monitor TOC concentration in "storm water" discharge from the installation. This will be achieved by the installation of a continuous TOC (total organic carbon) analyzer and a TC (total carbon) analyzer that will monitor the flow of water through the EHT. The TC monitor has been specified in addition to the TOC meter as it provides a more rapid response to potential contaminants in the runoff than the TOC meter.

The EHT is fitted with an isolation valve (MOV-8201) to prevent contaminated runoff, indicated by an alarm on the TC analyzer, from flowing into the settlement ponds in the event of fire or spillage on the site. On confirmation of contamination the retained water will be pumped

from the EHT to the Open Drains Sump for treatment in the Surface Water Treatment System (oily water). The EHT will be equipped with a duty and standby pump for this purpose, and each is independently plumbed and capable of simultaneous operation. This is compliant with Condition 3.12.4.

The instrumentation associated with the TOC and TC facilities are provided with an uninterruptible power supply (UPS) and will therefore continue to function in the event of a site wide power outage. The EHT isolation valve would also still be operable under these circumstances as it can draw power from the National Grid via the Terminal's emergency power distribution board.

Groundwater

As described in the previous application documentation a drainage blanket has been installed beneath the Terminal. This is a 300mm thick layer of graded stone laid under the fill section of the Terminal. It is constructed with falls towards the perimeter groundwater drains, and is designed to direct groundwater that may arise in the fill to these drains and so ensures the stability of the Terminal platform.

The perimeter groundwater drains consist of 2 branches (north / west branch, and the south / east branch) that drain towards the south west corner of the Terminal, where they converge in manhole 26 (MH26). Manhole 26 incorporates continuous online monitoring of TOC and TC and a manually operated penstock valve. Downstream of MH26 the groundwater flow commingles with the uncontaminated surface water drains discharge from the EHT in manhole 27 (MH27) and then flows via the main carrier drain to the settlement ponds.

The groundwater drains are at extremely low risk of contamination, and it has therefore been decided more appropriate to operate them as a separate system from the uncontaminated surface water system.

In the event of contamination detected in the groundwater system at MH26 or in the surface water drains at the EHT, either system can be independently isolated from discharging into the settlement ponds. Retained water from either system can be pumped back to the Open Drain Sump for subsequent onsite treatment. Maintaining the systems segregation of groundwater and surface water in this way has the benefit of minimizing the quantity of water that would be required to be managed and treated in the event of confirmed contamination.

<u>Settlement Ponds</u>
The settlement ponds are as described in the previous application. The settlement ponds will retain the oil retention barrier (previously referred to as an oil skimmer as an additional precautionary measure).

24 hour flow proportional sampling will be carried out in compliance with IPPC License requirements on the water leaving the settlement ponds. A concrete channel will be installed to ensure laminar flow for this purpose. This arrangement is detailed on drawings IPPCL 017 in Attachment E2.6. This arrangement will be subject to a planning application.

The final discharge point for uncontaminated surface water and groundwater is SW2 discharging to the R314 road drainage ditch. This

drain feeds into the Muingingaun River which is a tributary of the Bellanaboy River which ultimately discharges into Carrowmore Lake.

A rip-rap was proposed at the construction stage of the project, the purpose of the was to retard flows entering the local drainage network. The rip-rap was intended to feed water over the open peat ground and eventually discharged to the road drainage ditch.

Experience gained during the construction phase indicates that the rip-rap arrangement will not be suitable for long term operation. It is therefore proposed to use the open ditch arrangement. As the size of catchments for the operation phase are considerably smaller than the construction phase, the flows through the open ditches to SW2 will be reduced commensurately. No significant disturbance is therefore expected to the local watercourses with this arrangement.

Drawings showing the Terminal perimeter surface water drainage system, the perimeter groundwater system and the location of the settlement ponds and discharge point (SW2) are included in Attachment E.2.

Suspended Solids Emission Limit Value

An emission limit value of 5mg/l of suspended solids was placed on the discharge of uncontaminated surface water (stormwater) from the site (SW2) in the existing licence (p0738-01). Emission Limit Values are generally set to ensure an emission does not lead to an excedance of the water quality standard of the receiving water body. There are also generally applied discharge limits for stormwater discharges in various guidance documents to ensure protection to the receiving water bodies. In any case, excedance of the water quality standard should not take place.

Table F.3 below shows relevant regulations and guidelines for suspended solids with respect to surface waters bodies and surface water discharges.

Table F.3 Regulations and Guidelines for Suspended Solids with Respect to Surface Waters Bodies and Surface Water Discharges

	IPPC ELV P0738-01 (SW2)	EC (Quality of Salmonid Waters) Regulations 1988 S.I. 293/1988	EC (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, 1989 S.I. 298 -1989	Mayo County Council Limit imposed for Construction of the Terminal	BREF Mineral Oil and Gas Refineries 2003 note 4
Suspended Solids (mg/l)	5 note 1	25 note 2	50 note 2,3	35 note 1	30 note 1
Note 1 Applies at the point of discharge prior to any mixing.					
Note 2 Applies to the concentration in the receiving water body. For S.I 293/ 1988 it refers to an annual average.					
Note 3 Above this concentration more onerous treatment is required.					
Note 4 BREF Mineral Oil and Gas Refineries 2003, Chapter 10 Table 10.15, pg 454.					

The settlement ponds have been designed and constructed to remove peat from the drainage water run-off during construction. During the earthworks phase problems were experienced in the levels of suspended solids and total Aluminium in runoff water from the site. An electro-flocculation treatment plant (Axonics) was installed to deal with this issue. After the completion of construction it is anticipated that levels of suspended solids will be considerably lower than that experienced during the earthworks phase and thus it is not proposed to retain the Axonics treatment plant.

Sources of suspended solids during operations phase

Rainwater falling on non process areas on site or Stormwater will be largely clean water. During heavy to moderate rainfall, fine material (fines from crushed and graded rock, largely comprising mica schist which underlies the area), may be; washed off the graded rock, may be re-suspended in the perimeter drains, or be entrained in the drainage blanket due to the increased velocity. The properties of the mineral fines mean it is very difficult to settle them out via conventional methods. While the levels of suspended solids are expected to be relatively low and are anticipated to comply with the normally applied stormwater emission limit values 25-35 mg/l, achieving 5mg/l under all flow conditions may not be possible.

It is therefore proposed that the BREF limit of 30mg/l be adopted as the appropriate emission limit value for stormwater emissions at SW2.

Impact to the Bellanaboy River and Carrowmore Lake

No impact is anticipated to the Bellanaboy River or Carrowmore Lake. Currently the limit set on surface waters at the site is 35mg/l. Over the last number of years several biological monitoring programmes have been undertaken by Mayo County Council in the Bellanaboy River upstream and downstream of the site. These have shown that the Bellanaboy River has remained a healthy aquatic environment. Therefore adopting a similar limit for the operation phase would seem appropriate and suggests that water will be maintained in a good status. Further details are given in Section I.2.2.

F.1.5 Emissions to Ground

There is no change in emissions to ground as was previously described in the 2004 application. The location of the Puraflo system has changed and was subject to a planning amendment application.

The location of the Puraflo system and percolation area is shown on the Terminal Drainage Plan (Sheet 2 of 2) included in Attachment E.2.3

Detailed vendor documentation from Bord na Móna on the Puraflo system was provided in the original application.

The sanitary effluent treatment system was assessed against the following Environmental Protection Agency Water Treatment Manuals:

- Environmental Protection Agency – Water Treatment Manuals - Filtration
- Environmental Protection Agency – Water Treatment Manuals - Disinfection
- Environmental protection Agency – Water Treatment Manuals – Coagulation, Flocculation & Clarification

F.2: Emissions Monitoring and Sampling Points

Identify monitoring and sampling points and outline proposals for monitoring **emissions**.
Table F.2(i) should be completed (where relevant) for air emissions, for emissions to surface waters, for emissions to sewers, for emissions to ground, and for waste emissions. Where **ambient** environment monitoring is carried out or proposed, Table F.2(ii) should be completed as relevant for each environmental medium.

Include details of monitoring/sampling locations and methods.

Attachment Nº F.2 should contain any supporting information.

Answer:

F.2.1 Emissions Monitoring and Sampling Points

Shell E&P Ireland Ltd. (SEPIL) will comply with the emissions monitoring regime specified by the Environmental Protection Agency as part of the IPPC licence. The Terminal will employ the appropriate technology and control systems to ensure that all processes continue to perform to specification and that any process upsets (e.g. environmental control systems) are quickly detected and rectified. SEPIL propose a programme of monitoring and sampling to ensure that environmental emissions from the Terminal comply with emission limit values specified by the Agency and do not have any significant impact on the environment.

In summary it is proposed that monitoring will be carried out on:
- Emissions to atmosphere
- Emissions to surface waters
- Emission to ground
- Noise levels

A continuous noise meter will be installed on the site in order to monitor noise levels prevailing in the vicinity of the terminal. The location of the meter is shown in drawing IPPCL-023 in attachment F.2.

The following ambient monitoring will be carried out:

- Air
- Surface Water
- Groundwater
- Noise

Attachment F.2 presents a series of drawings showing the monitoring and sampling points for emissions. These include:

- Location of Main Air Emissions and Monitoring/Sampling Locations (IPPCL-020)
- Monitoring and Sampling Points within Terminal for Emissions to Surface Waters and to Ground (IPPCL-021)
- Monitoring/Sampling Points for Ambient Air, Ambient Surface Water and Discharge of Uncontaminated Surface Water (IPPCL-022)
- Location of Ambient Noise Monitoring Points and Weather Station (IPPCL-023)
- Location of Ambient Groundwater Monitoring Points (IPPCL-024)

Where ambient monitoring is proposed at private properties, agreement will be sought prior to undertaking the work. In the event access is not possible the monitoring will be undertaken at the nearest accessible public location.

Ambient monitoring of marine waters.

Ambient monitoring is no longer proposed for the outfall location off Erris Head. Only treated rainwater falling on process areas on site will be discharged at this location. The water will go through a very comprehensive treatment process and will be discharged in line with the emission limit values set out in the existing licence. Given the volume and level of treatment of discharge no impact is anticipated.

Similarly ambient monitoring in the vicinity of the subsea manifold is also not proposed. As detailed in Section I, no observable environmental impact is anticipated from the discharge. Given the very small volume and high level of treatment of water discharged, plus the rapid degradation of biocide to harmless products that do not have the potential to bio-accumulate or bio-magnify, and taking into account the virtually infinite dilution and dispersion afforded at the point of discharge; no observable impact is anticipated. It is SEPIL's view that the focus of water quality monitoring and biocide usage at the Terminal should be the main controlling factors that will limit any potential for environmental impact of the discharge.

The undertaking of ambient monitoring at the filed would also require entry into the safety exclusion zone extending 500m around the subsea infrastructure and would present an unjustifiable risk to subsurface gas production facilities and surface vessels involved in sampling activities.

It is therefore proposed that conditions 6.13, 6.14 and schedule C6 be removed from the existing licence.

F.3: Tabular Data on Monitoring and Sampling Points

Applicants should submit the following information for each monitoring and sampling point:

Point Code	Point Type	Easting	Northing	Verified	Pollutant
Provide label ID's assigned in section F3	M=Monitoring S=Sampling	6E-digit GPS Irish National Grid Reference	6N-digit GPS Irish National Grid Reference	Y = GPS used N = GPS not used	e.g. SO_2, HCl, NH_3

An individual record (i.e. row) is required for each monitoring and sampling point. Acceptable file formats include Excel, Access or other upon agreement with the Agency. A standard Excel template can be downloaded from the EPA website at www.epa.ie. This data should be submitted to the Agency on a separate CD-Rom containing sections B.2, E.6 and F.3.

Point source monitoring/sampling refers to monitoring from specific emission points (e.g. from a boiler stack or outlet from a wastewater treatment plant). Examples of ambient monitoring includes monitoring of ambient air quality (e.g. boundary or off-site) or monitoring of river quality upstream/downstream of an effluent discharge.

Answer:

F.3.1 Tabular data on Monitoring and Sampling Points

The grid references for all monitoring and sampling points, is provided on an Excel spreadsheet (template provided on EPA website). This is provided on a separate CD-Rom with this Application.

SECTION G: RESOURCE USE AND ENERGY EFFICIENCY

G.1 Give a list of the raw and ancillary materials, substances, preparations, fuels and energy which will be produced by or utilised in the activity.

The list(s) given should be very comprehensive, all materials used, fuels, intermediates, laboratory chemicals and product should be included.

Particular attention should be paid to materials and product consisting of, or containing, dangerous substances as described in the EU (Classification, Packaging, Labelling and Notification of Dangerous Substances) Regulations 1994 [SI 77/94]. The list must classify these materials in accordance with Article 2 of these Regulations, and must specify the designated Risk Phrases (R-Phrases) of each substance in accordance with Schedule 2 of the Regulations

Tables G.1(i) and G.1(ii) must be completed. Copy as required.
Supporting information should be given in **Attachment Nº G.**

Answer:

G.1.1 Raw Materials and Product

Details on the principal materials that will be used (and produced) at the Terminal are given in Tables G.1(i) and G.1 (ii). These tables have been updated since the original submission to reflect a number of additional materials and their properties.

The properties of the various materials summarised in Tables G.1(i) and G.1 (ii) is based on information taken from Supplier Safety Data Sheets some of which contain limited information which is reflected in the data presented for some of the materials.

Natural gas will be the only 'product' of the Terminal. The Terminal will be designed to produce 350 million standard cubic feet of (9.9 million cubic metres) of natural gas per day from the Corrib field for export to the Bord Gáis distribution network. All other materials at the Terminal will be either materials utilised in the operation of the Terminal or by-products from the treatment of the natural gas.

The Corrib field contains a dry sweet (no H_2S) gas with an expected condensate yield of less than 0.5 barrels per million standard cubic feet (0.08 cubic metres per 28,317 cubic metres). The typical composition of the natural gas stream to be extracted (based on samples taken during appraisal and exploration drilling in the Corrib Field) is summarised in Table 9 overleaf.

Table G.1 Results of Gas Analysis from a typical Corrib Well Test

Component	% by weight of sample
Hydrogen	0.00
Hydrogen Sulphide	0.00
Carbon Dioxide	0.83
Nitrogen	4.52
Methane	88.61
Ethane	5.22
Propane	0.37
i-Butane	0.17
Others	0.28
No other individual hydrocarbon was more than 0.08% by weight	

G.1.2 Fuel and Energy Consumption

There will be two principal users of gas fuel at the Terminal:

- Power Generators (2 Duty/1 Standby) firing on Natural Gas (Fuel Gas)
- Sales Gas Compressor Turbines (Duty/Standby) firing on Natural Gas (Fuel Gas)

An emergency generator running on diesel will be used during emergencies or black-starts.
The terminal is connected to the ESB electrical grid.

The original design of the plant included a fired heater for heating the Plant Heating Medium. The Fired Heater was designed to burn gas as the primary fuel as well as excess condensate not exported off-site. This has been removed from the design and replaced with waste heat recovery on the compressor gas turbines, with a consequent reduction in CO_2 emissions and improvement in overall plant energy efficiency. The requirement for waste heat recovery was a condition in the current IPPC licence (Condition 3.7).

Estimates of the average annual consumption of fuel (and energy equivalent) for the power generators and sales gas compressor turbines are given in Table 10. The figures in Table 10 exclude diesel usage for the emergency generator and firewater pumps as this equipment will only run intermittently for testing purposes during normal operation.

Table G.2 Annual Fuel and Energy Consumption

User	Fuel Consumption (tonnes)	Energy Equivalent (GJ)
Power Generators	2,217	104,933
Sales Gas Compressor Turbines	9,369	442,198

G.1.3 Water Usage

Estimates of water usage at the terminal are presented in the Table 11 below:

Table G.3 Water Usage

Description	Usage	Quantity/yr
Water	Potable	2,455
Water	Service	35,347

G.2 Energy Efficiency

A description of the energy used in or generated by the activity must be provided. Outline the measures taken to ensure that energy is used efficiently and where appropriate, an energy audit with reference to the EPA Guidance document on Energy Audits should be carried out**.**

G.2.1 Energy Efficiency

The Terminal will be self-sufficient in power generation with three power generators (2 Duty / 1 Standby) each capable of supplying half the maximum power demand of the Terminal. The equipment ratings, maximum net rated thermal inputs and efficiencies of the principal fuel users at the Terminal based on normal operation are summarised in Table 12.

Table G.4 Efficiency of principal fuel users at the Terminal during normal operation

User	Equipment Rating (MW)	Thermal Input (MW)	% Efficiency	Thermal output (MW)	% Overall Efficiency
1 No. Gas Turbine	7.7	25.7	30	5.5	51
2 No. Power Generators	2.64	6.44	41	0	41
Totals	**10.34**	**32.14**	**32**	**5.5**	**49**

This system comprising individual power generation units and gas turbines combined with waste heat recovery was chosen over alternative systems because of the specific requirements of the Terminal and because it will require a lower total thermal input and thus result in lower emissions to atmosphere.

The original design of the plant included a heater for the Plant Heating Medium, which would use fuel gas as the primary fuel and hydrocarbon condensate when available. A decision was made not to use condensate as fuel and this led to a comprehensive review of the energy efficiency of the plant. The result of this review was a decision to install Waste Heat

Recovery (WHR) on the gas compressor turbines. It is estimated that the WHR units installed in the exhausts of the gas turbines will recover up to 5.5MW of heat energy, which is sufficient to meet the design heat demand of the terminal.

The power output of the sales gas compressor turbines is in the range 2.0 to 8.9 MW, depending on compressor duty and ambient temperature. The WHR units are designed for 5.5 MW with a Process design duty of 4.4 MW.

It is estimated that WHR will save the combustion of approximately 0.65 MMscf (million standard cubic feet) per day of fuel gas in the heating medium heater and reduce CO2 emissions from the site by approximately 10,000 tonnes per year.

Heat integration solutions with a contribution up to 8 MW have already been included in the current Corrib plant design to decrease process heat requirements. These solutions are:

- E-2004 Gas / Gas Exchanger (7.127 MW (Max))
- E-4001 Methanol Feed / Bottoms Exchanger (1.145 MW)

The primary fuel used at the Terminal will be natural gas, which is a very clean fuel and high efficiency combustion equipment will be employed at the Terminal. A load management scheme will manage the operation of the three power generators and will be designed to match load and demand thereby optimising energy supply. Energy demand (utilisation) will be optimised using high efficiency electrical drives on equipment (e.g. pump motors).

Regular servicing and maintenance of equipment will ensure that all equipment continues to perform to specification. Insulation has been incorporated into building structures and equipment at the Terminal to minimise heat losses. An Energy Management System including energy auditing and consumption reporting will form part of the Environmental Management System (EMS) to be implemented at the Terminal to ensure the ongoing efficient use of energy. Energy use and efficiency within the Terminal will be benchmarked against similar installations and this will be used as a driver for continual improvement.

SECTION H: MATERIALS HANDLING

H.1 Raw Materials, Intermediates and Product Handling

All materials should be listed in Tables G.1(i) and G.(ii) of **Section G**.

Details of the storage conditions, location within the site, segregation system used and transport systems within the site should be outlined here. In addition, information relating to the integrity, impermeability and recent testing of pipes, tanks and bund areas should be outlined.

Answer:

H.1.1 Raw Materials, Intermediates and Product Handling

The largest quantities of materials stored at the Terminal will be methanol and hydrocarbon condensate, which will be stored in atmospheric tanks located in the bulk liquid storage area at the Terminal.

In the initial application it was intended to use Condensate as a fuel for the Heating Medium Heater. The Heating Medium Heater is now removed, and it is now proposed to export Condensate off-site as a by-product. The characteristics of the Condensate are given in Table G.1(i) and G.1(ii). (Refer to section G.1). The Condensate is being treated as a by-product from the process and will be taken off-site by a licensed waste contractor. It is envisaged that the appointed contractor will examine the feasibility of re-using the condensate as a waste fuel.

All other materials will be stored in much smaller quantities and will stored in a combination of tanks, Intermediate Bulk Containers (IBCs) and drums / containers. An appropriate level of bunding and/or secondary containment will be provided for all materials which could potentially impact on the environment through accidental spillages (refer to Section J of IPPC Application Form for further details on bunding / spill containment measures).

The storage, handling and transport of all materials will be in accordance with statutory requirements and/or best practice. All bunds, tanks and pipelines will be properly maintained, inspected and tested in accordance with statutory requirements, best practice and the requirements of the IPPC licence.

H.2 Describe the arrangements for the recovery or disposal of solid and liquid wastes accepted into or generated by the installation / facility.

For each waste material, give full particulars of:

(a) Name

(b) Description & nature of waste

(c) Source

(d) Where stored and integrity/impermeability of storage areas

(e) Amount (m^3) and tonnage

(f) Period or Periods of generation

(g) Analysis (include test methods and Q.C.)

(h) European Waste Catalogue Code

(i) Waste Category per EC Reg 1774/2002/EC where relevant

Where any waste would be classified as Hazardous Waste as defined in the Waste Management Acts, 1996 to 2003, this should be made clear in the information provided.

Summary Tables H.1(i) and H.1(ii) should also be completed, as appropriate, for each waste. The licence/permit register number of the waste collection agent or disposal/recovery operator should be supplied as well as the expiry date of the relevant permits.

Supporting information should form **Attachment Nº H.2**

Answer:

H.2.1 Waste Generated on Site

In this application for a Review of the IPPC Licence the principal changes relating to waste concern surplus treated produced water and condensate.

The proposal to dispose of treated Produced Water via the spare umbilical cores is described in Section F.2. During the initial 4 years of operation, not all of the treated Produced Water can be disposed of via the umbilical cores and some surplus treated Produced Water will need to be disposed of off-site using tankers. The surplus treated Produced Water has been added to the Table H.1(ii).

The Condensate is regarded as a by-product from the process and will be exported from the site using a licensed waste contractor. It is anticipated that the exported condensate might be suitable as a waste fuel. The Condensate is categorised as a hazardous waste and is included in Table H.1(ii).

H.2.2 Waste Management

All waste generated on site, both hazardous and non-hazardous, will be handled, stored, transported off-site and treated / disposed of in accordance with statutory requirements and in a manner that will eliminate or minimise any risk to persons and/or the environment.

A dedicated waste storage area will be used to store waste prior to its removal off-site. The waste storage area will drain to the Surface Water Treatment System.

A Waste Management Programme will be implemented during the operation of the Terminal to ensure the proper management of waste on

site. The Programme will form a key part of the formal Environmental Management System to be implemented on the site.

- In particular the programme will address:
- Waste minimisation and management of waste according to the waste management hierarchy (prevention, minimisation, re-use, recycling, recovery, disposal).
- Procedures to ensure the proper handling, storage & segregation, labelling and record keeping of waste on site.
- Roles and responsibilities for waste management on site.
- Regular auditing of waste management activities on site.
- The use of fully licensed waste contractors for transport and treatment / disposal of waste off-site and the auditing of these activities at regular intervals.

H.3 Waste disposal by on-site landfilling

For wastes to be disposed of by landfilling on-site, full details of the disposal site should be submitted (to include *inter alia*, site selection procedures, location maps, (no larger than A3) geology, hydrogeology, operational plan, containment, gas and leachate management, post-closure care).

Supporting information should form **Attachment Nº H.3.**

Answer:

Not Applicable.

SECTION I: EXISTING ENVIRONMENT & IMPACT OF THE ACTIVITY

Describe the conditions of the site of the installation.

Provide an assessment of the effects of any emissions on the environment, including on an environmental medium other than that into which the emissions are made.

Describe, where appropriate, measures for minimising pollution over long distances or in the territory of other states.

I.1.Assessment of atmospheric emissions
Describe the existing environment in terms of air quality with particular reference to ambient air quality standards.

Provide a statement whether or not emissions of main polluting substances (as defined in the Schedule of S.I. 394 of 2004) to the atmosphere are likely to impair the environment.

Give summary details and an assessment of the impacts of any existing or proposed emissions on the environment, including environmental media other than those into which the emissions are to be made.

Attachment Nº I.1 should also contain full details of any dispersion modelling of atmospheric emissions from the activity, where required. When carrying out dispersion modelling, regard should be had to the "Guidelines for the Preparation of Dispersion Modelling Assessments for Compliance with Regulatory Requirements – an Update to Royal Meteorological Society Guidance" or similar guidelines from a recognised authority.

I.1 Assessment of Atmospheric Emissions

I.1.1 Introduction

The existing environment is described in detail in the 2004 IPPC application and supporting EIS. Previous air quality assessment work carried out for the Terminal and submitted as part of the application process determined that air quality is very good in the vicinity of the Terminal and will remain so when the Terminal is operational.

I.1.2 Air Dispersion Modelling and Impact Assessment

A revised air dispersion modelling report has been prepared to take account of the improvements in environmental performance of the Terminal made since the 2004 IPPC licence application, such as addition of the SCR units on the power generating equipment, removal of the heating medium fired heater and consequential incorporation of waste heat recovery on the gas turbine exhausts. The revised air dispersion modelling includes several operational scenarios, including the worst-case operation of the Terminal at full output. No breaches of any of relevant air quality standard or guideline designated to protect human health, vegetation and ecosystems has been predicted at any location at or beyond the Terminal site boundary or at any sensitive receptor locations under any of the assessed operational scenarios.

Further details on the revised air dispersion modelling and assessment are included in Appendix I.1.

I.2. Assessment of Impact on Receiving Surface Water

Describe the existing environment in terms of water quality with particular reference to environmental quality standards or other legislative standards. Table I.2(i) should be completed

Provide a statement whether or not emissions of main polluting substances (as defined in the Schedule of S.I. 394 of 2004) to water are likely to impair the environment.

Give summary details and an assessment of the impacts of any existing or proposed emissions on the environment, including environmental media other than those into which the emissions are to be made.

Full details of the assessment and any other relevant information on the receiving environment should be submitted as **Attachment Nº I.2.**

I.2.1: Assessment of Impact on Receiving Surface Waters

Under the existing IPPC Licence Treated Surface Run-off Water and Treated Produced Water were to be discharged to the sea off Erris Head at Point SW1 approximately 12.7 km from the landfall location (2kms off Erris Head) in 68.5m water depth. The modelling carried out by Kirk-McClure Morton, based on the comprehensive treatment of the discharge, concluded that the proposal would not cause significant environmental impacts (see Section 7 of the 2003 Terminal EIS).

The updated application is to discharge only the Treated Surface Run-off Water at point SW1a, and to discharge the Treated Produced Water at the Corrib field manifold. The environmental impact from the discharge at Point SW1a that was already predicted to be insignificant, will therefore be further reduced.

The proposed Treated Produced Water discharge location (SW3) which will be located approximately 65 km offshore (92km along the pipeline route from the Terminal), in 350m water. The following text provides information on the background environment in the vicinity of the Corrib subsea manifold (SW3) and the potential impacts from the discharge on this area.

The environment around Point SW3

Point SW3 is located at the manifold in the Corrib Field, the manifold acts as the centre point in the gas field architecture, combining the flows from the wells before these enter the export pipeline, and distributing the chemicals and control features provided by the umbilical. The manifold is located in a depth of 350m of water, where residual currents flow towards the north east, and the general current conditions just above the seabed are presented in Table I.1 (and are fully described in the Wallingford modelling report for SW3 presented in Attachment I.2). During the summer months a thermocline develops in the area but only down to a depth of around 40-50m, and so well above the depth at which the discharge will be made.

Table I.1: Near-bed current conditions in the Corrib Field (data recorded over 1 year period (Metoc 2000))

Ambient current speed (m/s)	Percentage occurrence
0.05	42.4
0.15	52
0.25	5.4
0.35	0.2

Seawater analysis results are not available from the Corrib Field, however there have been two surveys (2007 and 2008) carried out around the permitted Erris Head discharge location which may have recorded conditions which are similar to those present in the Corrib Field itself. The ranges of trace metal concentrations recorded from 17 sites sampled in both 2007 and 2008 are presented in Table I.2 (i) in Annex 1 of the main application. The results from analysis of the water samples reflect the pristine nature of this area.

The seabed around Point SW3 comprises 70% fine or very fine sand and 30% of other fine (muddy) sediments. Analysis of sediment samples, presented in Attachment I2.3) from the area around Point SW3, found relatively low levels of contaminants. Surveys carried out in 2000 and 2008 characterise the seabed as providing habitat for a relatively large number of benthic taxa, many of which occur in low abundances. The benthic infauna is dominated by annelid polychaete worms and small bivalve molluscs. The benthic epifauna includes sea urchins, squat lobsters, sea stars, brittle stars and anemones. These organisms appear to contribute significantly to the physical structure of the sedimentary environment, by burrowing, feeding and moving. Catch statistics show that demersal fish (Hake, Monkfish, Ling, Megrim, Greater Forkbeard), pelagic fish (Blue whiting, Horse mackerel, Atlantic pomfret), crabs and rays are fished in the general area. Several whale, dolphin and porpoise species are likely to occur around the Corrib Field.

Water Quality Standards

The EU Dangerous Substances Directive, Water Framework Directive (WFD) Shellfish Water Directive (SWD) have required member states to set objectives and standards for water quality that represent levels of certain substances that can be present in the water without affecting biological communities. They relate to particular waters: e.g. the WFD refers to "surface waters" including all territorial waters (i.e. waters within 12 nautical miles from the coast) as far as chemical status is concerned; and the SWD refers to 'coastal waters'. Due to its distance offshore, these measures are not directly applicable to the Corrib Field area, but they can be used as a reference for assessing the water quality around the discharge point SW3 and the potential impact arising from the discharge of treated produced water.

Generally, objectives are set at concentrations an order of magnitude below the 'No Effect Concentration' for specific test species, so they give an indication of the 'safe' levels of contaminants that are extremely unlikely to cause an environmental impact.

OSPAR provide values for background levels of heavy metals in ocean waters that are taken to be representative of clean oceanic water. OSPAR The Scottish Environmental Protection Agency (SEPA) has also established Environmental Quality Objectives (EQO) for Scottish waters.

The WFD defines an Environmental Quality Standard (EQS) as "the concentration …(over a given time)… of a particular pollutant or group of pollutants in water, sediment or biota which should not be exceeded in order to protect human health and the environment."

Maximum concentrations of heavy metals in seawater samples taken off Erris Head in 2007 and 2008 are in line with the OSPAR figures for ocean waters, and within the respective environmental quality standards (EQS) (EPA, 1997). It is to be expected that at Point SW3, which is much further offshore than Erris Head, the ambient levels of heavy metals (including lead and zinc) would also be in line with concentrations for oceanic waters. It is notable that all levels set in the SWD are more onerous than those set in the Scottish Waters EQOs.

The original application for an IPPC licence included comparisons of the proposed discharge concentrations with the coastal waters EQS (EPA 1997) (as the discharge was originally proposed for discharge in such waters). With the proposed discharge location now changed, it is considered that the coastal EQSs represent concentrations of contaminants that are now in fact highly conservative values for a discharge into deep offshore waters such as at the Corrib Field. The EQS values are nevertheless used for comparative purposes throughout the remainder of this section.

Characteristics of the discharge

The Produced Water that is to be discharged at Point SW3 will be treated as a minimum to meet the emission limit values (ELVs) specified in the existing IPPC Licence. SEPIL expects however that the treatment in place will produce a discharge in which concentrations of several of the contaminants in the discharge are well below the ELVs stated, particularly regarding hydrocarbons.

The discharge will be a continuous operation. The hydraulic capacity of the umbilical has been calculated at 65m^3/day, which has therefore been used as the basis for the modelling and assessment of the potential impact of the treated produced water discharge. However a daily limit of 80m^3/day has been applied for in this application in the event that it is possible to discharge at a higher rate than indicated by the hydraulic capacity of the umbilical. This would also have the benefit in the first 1-4 years of operations of minimising the quantity of produced water than would need to be tankered offsite for onshore treatment and disposal. The findings of the assessment presented below indicate that the discharge of 80m3/day would have no significant additional impact above that predicted for 65m^3/day.

Produced water production is expected to decrease significantly after the first few years of operation, and after year 6 produced water is projected to decrease by ca. 50%, at which point only the 25.4mm core should be required to dispose of the produced water.

The cross-sectional area of the cores equates to around 7.9cm^2 (one core has a diameter of 2.54cm, while the second has a diameter of 1.9cm). The daily discharge of 65m^3 equates to an hourly discharge of 2.71m^3, and a discharge per second of 0.00075m^3, or 0.75 litres per second. Using the combined cross-sectional area and the discharge volume per second the speed of flow at the discharge point is calculated as 0.95m/s (these characteristics were used in the dispersion modelling).

Other observations from the HR Walingford modelling include:

- The discharge point is about 2m above the seabed;
- The discharge will be less dense than the ambient seawater and will rise from the point of discharge;
- The discharge will be ejected from a discharge aperture that points upwards, so water at the bottom of the discharge plume will have upward momentum in turbulent flow;
- The plume will disperse as it moves away from the release point, diluting the concentration of components in the discharge.
- The orientation of the plume and its rate of dispersal is a function of residual current speed and direction

The design of the produced water treatment plant is such that the EQS concentration (EPA, 1997) will be reached for all listed parameters in schedule B.2 of the existing licence prior to discharge.

An emission limit value is set to ensure the discharge does not result in increasing the ambient concentration of certain pollutants in a water body above the EQS limit within an acceptable distance from the discharge point. Given the volume of treated produced water; the level of treatment and the infinite dilution available at the discharge point the concentration of contaminants in the receiving waters will not be raised above the respective EQSs for each parameter.

Modelling has been carried out to predict how the water behaves once it leaves a representative discharge point in the Corrib Field.

Fate of the discharge

The fate of the discharge of the Treated Produced Water, and the rate at which it will be diluted has been predicted using the CORMIX model.

The CORMIX model predicted the distance the plume would travel upwards and laterally in a range of different current conditions to affect dilution that reduces the concentration of substances in the plume to a) 10% and b) 1% of the concentration at the point of release. Table I.1 shows that for 94.4% of the time the current speed is 0.15m/s or less, and that below this flow rate the model predicts the concentration would be reduced to 1% of the discharge concentration after moving 2.14m downstream and rising 3.38m in the water column. For 0.2% of the time, the current attains a speed of 0.35 m/s.

Table I.2: Distance to minimum dilutions of 10:1 and 100:1, for different current speeds

Ambient current speed (m/s)	Percentage occurrence	Distance (m) to minimum dilution			
		10:1		100:1	
		downstream	above bed	downstream	above bed
0.05	42.4	0.12	2.80	1.13	5.03
0.15	52	0.26	4.48	2.14	3.38
0.25	5.4	0.33	2.19	3.00	2.95
0.35	0.2	0.41	2.11	3.87	2.77

The HR Wallingford's *Produced Water Dispersion Assessment* (Jan. 2009) includes two tables (4.2a and 4.2b), which if read together indicate the dilution of the discharge at different spot distances from the source at various current speeds. In order to consider the dilution of the discharge against background concentrations, interpolation from curves generated by plotting HR Wallingford's data points has allowed the dilution factors for other spot distances from the source to be estimated. It can therefore be estimated that once the plume has moved away from the source to a distance of 500m, one litre of discharge would be diluted with about 55,000 litres of seawater at a current speed of 0.35m/s, and with about 132,000 litres of seawater at a current speed of 0.15m/s. Therefore, at a current speed of 0.15 m/s, the concentration of a pollutant at a point 500m downstream from discharge point SW3 would be about 1/132001 of the discharge concentration.

Tables I.3 and I.4 present the predicted concentrations of a range of discharge constituents at 500m from the discharge point, based on current speeds of 0.15m/s and 0.35m/s respectively. The tables also present:

- the background concentrations as used in the HR Wallingford report,
- the permitted discharge concentrations,
- the concentration of chemical constituents in the plume predicted at 500m from the source,
- the relationship between the background level and the concentration of chemical constituents predicted at 500m from the source,
- an Environmental Quality Objective value representing a desirable concentration in coastal water (EQO 2 set by Scottish Environmental Protection Agency, as cited in Water Quality Standards along the Montrose Coast, SEPA, 1999),
- a comparison of the predicted concentration at 500m and the EQO (expressed as a %),
- an Environmental Quality Standard value representing a concentration that will not harm the environment (EPA, 1997)
- a comparison of the predicted concentration at 500m and the EQS (expressed as a %).

It is clear from both tables that the dilution afforded within 500m of the discharge location is great enough to reduce the increases above the background

concentrations to extremely small levels for all components of the discharge. If treated produced water is discharged when the current speed is 0.35m/s, (which is predicted as a "worst-case" scenario, with such speeds only occurring for approximately 0.2% of the time)) the hydrocarbon concentration at 500m is 4.55% above the background level (more typically the current speeds are less than 0.15m/s (for 94.4% of the time), resulting in a hydrocarbon concentration 1.92% above background at 500m). However, in either 0.15m/s or 0.35m/s current conditions the resulting hydrocarbon concentration at 500m is still well below the EQS and EQO concentrations, so it can be concluded that there will be no environmental consequences from this increase. Additionally, it should be noted that the hydrocarbon concentrations predicted in the discharge are much lower than those that have been consented in the existing IPPC licence and modelled.

The situation with regard to phenol is similar to that for hydrocarbons, with the predicted discharge concentration now being approximately half of that consented and modelled.

When comparing the concentrations at 500m from the point of discharge it can be seen that discharging into a current of 0.35m/s results in higher concentrations at this distance compared to that predicted for currents of 0.15m/s. This phenomenon is due to the plume remaining more compact in the faster current, and therefore concentrations of components of the treated produced water remain higher for a greater distance from the discharge point. In the slower currents speeds, which occur for the great majority of the time, the discharge will mix with the water column more readily, resulting in lower concentrations at 500m from the discharge point.

Additionally, for all components the predicted concentrations at 500m are less than 41% of the EQS and EQO, again illustrating that the discharge will have no environmental consequences in either the fastest or slowest current conditions.

As the levels set in the Scottish Waters EQOs are lower than those set by the Shellfish Waters Directive, the percentage increases predicted at 500m for the different components of the discharge would be even lower if compared against the SWD.

Table I.3: Concentration of various contaminants at 500m from the discharge location in current speeds of 0.15m/s.

Metal	background metal conc (max)	IPPC ELV	Predicted concentration at 500m from discharge*	% increase above background at 500m	Scottish EQO	conc at 500m as a % of EQO	1997 EQS	conc at 500m as a % of 1997 EQS
	mg/l	mg/l	mg/l		mg/l		mg/l	
Phenol	0.0002	0.001	0.000200008	0.004%			0.0005	40.002%
Cadmium	0.00004	0.005	0.000040038	0.096%	0.0025	1.602%	0.005	0.801%
Lead	0.0005	0.005	0.000500038	0.008%	0.0025	20.002%	0.005	10.001%
Mercury	0.000001	0.0001	0.000001001	0.077%	0.0003	0.334%	0.001	0.100%
Copper	0.0002	0.05	0.000200384	0.192%	0.005	4.008%	0.05	0.401%
Arsenic	0.001	0.05	0.001000384	0.038%	0.0025	40.015%	0.05	2.001%
Hydrocarbons	0.0002	0.5	0.000203839	1.920%			0.01	2.038%
Nickel	0.0003	0.5	0.000303839	1.280%	0.003	10.128%	0.1	0.304%
Zinc	0.0004	0.5	0.000403839	0.960%	0.004	10.096%	0.1	0.404%
Chromium	0.0005	0.1	0.000500768	0.154%	0.005	10.015%	0.1	0.501%

* - predicted concentrations at 500m are presented to 9 decimal places so that differences from the background metal concentrations can be identified

Table I.4: Concentration of various contaminants at 500m from the discharge location in current speeds of 0.35m/s.

Metal	background metal conc (max)	IPPC ELV	Predicted concentration at 500m from discharge*	% increase above background at 500m	Scottish EQO	conc at 500m as a % of EQO	1997 EQS	conc at 500m as a % of 1997 EQS
	mg/l	mg/l	mg/l		mg/l		mg/l	
Phenol	0.0002	0.001	0.000200018	0.009%			0.0005	40.004%
Cadmium	0.00004	0.005	0.000040091	0.228%	0.0025	1.604%	0.005	0.802%
Lead	0.0005	0.005	0.000500091	0.018%	0.0025	20.004%	0.005	10.002%
Mercury	0.000001	0.0001	0.000001002	0.182%	0.0003	0.334%	0.001	0.100%
Copper	0.0002	0.05	0.000200910	0.455%	0.005	4.018%	0.05	0.402%
Arsenic	0.001	0.05	0.001000910	0.091%	0.0025	40.036%	0.05	2.002%
Hydrocarbons	0.0002	0.5	0.000209100	4.550%			0.01	2.091%
Nickel	0.0003	0.5	0.000309100	3.033%	0.003	10.303%	0.1	0.309%
Zinc	0.0004	0.5	0.000409100	2.275%	0.004	10.228%	0.1	0.409%
Chromium	0.0005	0.1	0.000501820	0.364%	0.005	10.036%	0.1	0.502%

* - predicted concentrations at 500m are presented to 9 decimal places so that differences from the background metal concentrations can be identified

Environmental impacts

It is predicted that no observable environmental impacts will occur due to the discharge in the Corrib Field. At a depth of 350m there is very little light available for growth of the phytoplankton, and so there is very limited scope for heavy metals from the produced water discharge to accumulate in the zooplankton and higher trophic levels, which prey on phytoplankton. Benthos are generally affected by contaminants in the seabed sediments around them, so these organisms are unlikely to be directly affected by the plume of produced water, because it will rise in the water column from a point above the seabed. Fish and marine mammals are unlikely to be significantly affected by transient contact if they swim through the discharge plume. Bioaccumulation is very unlikely to occur in any sessile species present in the vicinity of the outfall due to the very low concentrations and action of currents which will result in little change in sediment metal concentrations local to the discharge point.

While most metals in the discharge will eventually adsorb onto particles that are suspended in the water column and settle out onto the seabed, this process is likely to be extremely gradual, and will involve very low concentrations dispersed over a wide area.

It can be seen from the extremely high levels of pre-discharge treatment and the comprehensive modelling studies, that the impacts from the discharge on the water and sediments and the biota that they support are likely to be negligible.

Biocide

For two hours per day, the Treated Produced Water will be dosed with a DBNPA biocide (DOW Antimicrobial 7287 that has an active concentration of 40 ppmv) in order to prevent bacterial growth from causing restrictions and corrosion within the umbilical cores used to deliver the Treated Produced Water to the discharge point at SW3. Two factors influence the fate of the biocide after discharge into the marine environment, that limit its ability to cause environmental impacts:

- Dilution - the product will be diluted as the discharge water disperses, and at some distance from the point of discharge its concentration will fall below a level at which it has an environmental effect.
- Breakdown of the chemical product – The DBNPA biocide will break down through hydrolysis into bromide, ammonia and carbon dioxide. These are naturally occurring substances in the environment. The bromide is naturally present at c. 60mg/l in seawater. The ammonia will be assimilated by micro-organisms and used in protein production, or otherwise oxidised. At the ambient seawater parameters at SW3 (pH 8.2, temperature of 10^{o}C), half of the DBNPA will hydrolyse after 10 hours. The risk that the biocide could persist in harmful concentrations is consequently extremely low.

Risk assessment

The Osborne-Adams risk assessment method has been used to assess the environmental risk of the proposed discharge. This method is routinely used in the UK to assess subsea discharges in the oil and gas industry (CHARM is the model more frequently used for this assessment, however, CHARM is not applicable to discharges from the seabed).

The assessment is based on the amount of time required for the chemical to reach a concentration, in a 500 m radius water column, at which there may be detrimental impact compared with the refreshment rate of the water column. In Osborne-

Adams terms an acceptable discharge is one where the time taken (T1) to discharge sufficient chemical to exceed PEC/PNEC = 1 in the 500 m column water is greater than the time taken (T2) to completely refresh that column of water (i.e. if T1>T2), unless there are other local environmental sensitivities. The PEC is the predicted environmental concentration and the PNEC is the predicted no-effect concentration of the chemical, calculated from toxicity tests.

The following assumptions were used to conduct the risk assessment for the discharge of Antimicrobial 7287 at the Corrib manifold:

- Continuous discharge of produced water to the marine environment
- Residual current speed in the area is 0.15 m/s and water depth is 350 m
- Discharge rate 65 m^3 over 24 hours, 2.71 m^3/hour.
- Produced water dosed with 200 ppm of Antimicrobial 7287, Antimicrobial 7287 has a specific gravity of 1.17 therefore dosage of 234 mg/l
- Antimicrobial 7287 is batch dosed into produced water for 2 hours per day
- Total mass of Antimicrobial 7287 discharged in one day 1.27 kg

The results of the risk assessment show that the water column will be refreshed faster than the chemical can build up in the 500m water column described above, assuming the discharge quantity above. However, the Osborne Adams risk assessment method does not take into account any cumulative effects of a repeated discharge over a period of time. Additional Osborne Adams modelling was therefore carried out for larger discharges of the chemical, using cumulative discharges equivalent to 7, 30, 180 and 365 days worth of chemical in 2 hours from the same discharge point (effectively mimicking a repeated discharge).

The risk assessment for all discharged quantities indicates that the time taken to refresh the water column is less than the time taken for the discharge to exceed the predicted no effect concentration (PNEC) when discharged into a column of water of 500 m radius around the discharge point.

It can be concluded from the risk assessment that even if all the biocide in 1 years' worth of treatment were discharged in 1 day for 2 hours, then assuming this discharge was uniformly mixed into the water column of 500 m radius, and given the currents in the area, it would be unlikely to result in a toxic effect on marine organisms within that water column.

It should be noted that the Osborne-Adams risk assessment is conservative as it assumes that there is no biodegradation of the biocide and it has retained full efficacy when it is discharged. Information on the CEFAS chemical template shows that the biodegradation rate for DBNPA is 78% in 28 days, so assuming that there is no biodegradation is very conservative. In addition, it has already been described how the effect of hydrolysis on the biocide when discharged into ambient seawater conditions is 50% degradation every 10 hours. This effect is similarly not taken into account by the Osborne-Adams risk assessment.

This degree of conservatism also means that a potential discharge rate of up to 80m^3/day (which has been applied for as an upper discharge limit) may be possible

through the umbilical will also not be expected to cause any appreciable increase in harmful effects on marine organisms at 500m from the discharge.

While the Osborne-Adams assessment considers a column of water centred on the discharge location, the HR Wallingford modelling considers the movement of the plume away from the discharge point.

The HR Wallingford modelling takes the discharge biocide concentration of 200ppm and applies the dilutions of 55,000 and 132,000 predicted at 500m from the discharge point with current speeds of 0.35m/s and 0.15m/s respectively.

The resulting concentrations at 500m from the discharge location will be 0.0015ppm and 0.0036ppm for 0.15m/s and 0.35m/s respectively. For the UK CEFAS Registration the worst-case toxicity is 0.106ppm. It can therefore be seen that the concentrations in the discharge plume are much lower than this level of toxicity at 500m from the discharge point. A potential increase in discharge rate from 65m^3/day to 80m^3/day would not make any significant difference to these concentrations, which would still be orders of magnitude lower than the CEFAS Registration worst-case toxicity value.

Impacts from the biocide

Dilution to the product's 'no-effect' concentration and breakdown of the biocide's active component limits the potential for marine life to be exposed to harmful effects. Biocide will be batch dosed for 2 hours per day, consequently over a 24-hour period approximately 5.4m^3 of treated produced will be treated with the biocide. The biocide will be incorporated into the plume of Treated Produced Water that rises from the point of release. Given the rapid bio-degradation of the product, marine life will only be affected if directly exposed to a sufficient concentration of the biocide (standard tests are carried out to elucidate these concentrations, with Dow Chemicals information showing that the LC_{50}[1] for pink shrimp is between 1.8 and 3.2mg/l, while that for the glass shrimp is 11.5mg/l; these toxicity experiments were based on exposure times of 96 hours at constant DBNPA concentration). The low levels of biological growth at Point SW3 mean that it is unlikely that significant marine life will be exposed to the biocide before it has dispersed, and consequently the discharge is not expected to cause a detectable environmental impact.

Hydraulic Fluid

The umbilical cable which will be laid from the Terminal out to the manifold in the Corrib Field will provide the facilities to control the production of gas from the Corrib Field wells. In order to provide that control, the ability to open and close certain valves on the wellhead structures on each well is required. The options for this control were fully discussed in the 2001 Offshore EIS, and include the use of hydraulic fluid which is pumped through the umbilical to turn the valves. This was considered to be the optimal solution, and given that using a closed system would result in the fluid having to be pumped back another 95km to the Terminal and open system was selected. Open systems result in the discharge of the hydraulic fluid once it has been used to turn the valves.

In order to fully open or close all the valves on a single wellhead in the Corrib Field for control purposes, approximately 14 litres of a 50:50 glycol:water mixture would be discharged. It is estimated that a maximum of 1,344 litres of the glycol mixture will be discharged per year (based on all valves being operated monthly on each well); this is equivalent to 672 litres of glycol. The glycol:water mixture is an

[1] LC_{50} is the concentration which is lethal to half of the animals tested in the time period stated

environmentally benign hydraulic fluid of low toxicity, high biodegradability and low bioaccumulation potential (which is classified under OSPAR as a chemical which Poses Little or No Risk to the Environment (a PLONOR substance)). Given the benign nature of the chemical, and available dilution and dispersion available in the Corrib Field the discharge is expected to have a negligible impact upon the water quality.

Noise from subsea installations

Noise from the subsea infrastructure at the Corrib Field will be generated from two sources:

1) Release of treated produced water at the manifold from the two umbilical cores (of 25.4 mm and 19.0 mm diameter). This will be a relatively constant source of noise; and

2) Opening of valves through operation of hydraulic/pneumatic system on wellheads. This will be an intermittent source of noise.

The noise emitted to the marine environment by these two sources is anticipated to be low, though predicted levels of noise are not available from engineering data. Data on noise generated by similar subsea infrastructure worldwide are also not available, which is likely to be a reflection of the perceived relative lack of potential impact compared to other anthropogenic sources (e.g. seismic surveys, piling). The presence of epifaunal marine growth on much "noisier" subsea elements of oil and gas infrastructure (e.g. production and drilling platforms), and the frequent association of free-swimming vertebrate species (cetaceans, pinnipeds and fish) with these structures, would suggest that typical operational noise is not detrimental to such ecological receptors.

The cetacean fauna at the location of the Corrib Field is known to be diverse, and to include (or potentially include) deep diving species such as sperm whale *Physeter macrocephalus* and the northern bottlenose whale *Hyperoodon ampullatus*, both of which routinely dive to the water depths found in the Corrib field. It is considered feasible that noise from the above sources in the Field (combined with the detectable physical presence of a seabed structure), could occasionally attract cetaceans to investigate. However, this is considered to be a negligible "impact", given the context of much more significant natural (e.g. wind, wave, rain, and currents) and anthropogenic (e.g. cross-Atlantic vessel traffic, commercial fisheries) sources of noise at the Field.

References

Environmental Protection Agency (1997), Environmental Quality Objectives and Environmental Quality Standards: The Aquatic Environment - A Discussion Document. EPA, Wexford, Ireland.

Metoc (2000) Enterprise Energy Ireland Limited, Corrib Field Development. Metocean Criteria; Corrib Field and Sealine Route. Metoc Report No.978 Rev1

I.2.2 Impact of uncontaminated surface water runoff discharges

There are no adverse impacts to surface water anticipated from uncontaminated surface water (stormwater) from run-off from the site.

It is proposed to increase the Suspended Solids Limit in the existing IPPC licence from 5mg/l to 30mg/l. An increase of the suspended solids concentration limit to 30mg/l, associated with periods of heavy rainfall, will not give rise to any additional

impact over that which has been experienced during the construction phase. The proposed limit is less than the 35mg/l limit imposed by the Planning Authority for the construction phase of the Project. Construction phase stormwater runoff from the site has been determined not to have any significant impact on the water quality in Bellanaboy River or Carrowmore Lake.

Mayo County Council has carried out several biological sampling events upstream and downstream of the discharge from the settlement ponds during the Construction Phase. These have shown that the Bellanaboy River has remained a healthy aquatic environment. The quotation given below is taken from a recent report prepare by a Mayo County Council Senior Engineer and presented to the Project Monitoring Committee. In this instance the *outfall* refers to the outlet from the settlement ponds.

> *"Biological water quality monitoring of the Bellanaboy River for 2009 was carried out in June in conjunction with the North Western Regional Fisheries Board. As in previous years the monitoring was carried out both upstream and downstream of the outfall from the terminal site using the SSRS (Small Stream Risk Score) scheme. The results of the 2009 biological monitoring are that both upstream and downstream locations scored well indicating a healthy aquatic environment as in previous years".* (PMC Meeting dated 16th September 2009)

I.3. Assessment of Impact of Sewage Discharge.

Give summary details and an assessment of the impacts of any existing or proposed emissions on the environment, including environmental media other than those into which the emissions are to be made.

Full details of the assessment and any other supporting information should form **Attachment Nº I.3.**

There are no emissions to sewers.

I.4 Assessment of Impact of Ground/Groundwater Emissions

Describe the existing groundwater quality. Tables I.4(i) should be completed.
Give summary details and an assessment of the impacts of any existing or proposed emissions on the ground (aquifers, soils, sub-soils and rock environment), including any impact on environmental media other than those into which the emissions are to be made. This includes landspreading, land injection etc.

Land on which material may be landspread shall be identified on a suitable scaled map (1:10,560 and 1:50,000) and submitted as no greater than A3 size. All vulnerable (as a result of ground emissions) surface water bodies must be identified on these maps. Additional information should be included in **Attachment Nº I.4**.

Landspreading of Agricultural/Non Agricultural Wastes

Tables I.4(ii) and I.4.(iii) should be complete where applicable. Further information is available in the Application Guidance Document.

Answer

There have been no changes from the original IPPC application in 2004. The Puraflo system is the proposed system for treating sanitary waste water. The following paragraph from the original application is presented again below:

The Puraflo system will treat the domestic sewage (from toilets, canteen etc.) from the Terminal to a very high standard prior to discharge to the percolation area where further effluent polishing can be expected to occur. Taking into account the relatively small volume and high quality of the treated effluent and the fact that the underlying aquifer is considered a Poor Aquifer with moderate vulnerability (majority of site including percolation area), the discharge of the treated effluent to the percolation area at the Terminal site is not predicted to have any significant impact on the underlying soils, bedrock or hydrogeology at the Terminal site.

In support of the original licence application, Minerex Environmental completed a report on the aquifer vulnerability assessment and a hydrogeological investigation, which were presented in the original application.

I.5 Ground and/or Groundwater Contamination

Summary details of known ground and/or groundwater contamination, historical or current, on or under the site must be given.

Full details including all relevant investigative studies, assessments, or reports, monitoring results, location and design of monitoring installations, plans, drawings, documentation, including containment engineering, remedial works, and any other supporting information should be included in **Attachment Nº I.5**.

Answer

There have been no changes from the original IPPC application in 2004. Minerex Environmental carried out a hydrogeological investigation in support of the original IPPC application and details of this are available in the original documentation.

I.6 Assessment of the Environmental Impact of On-site Waste Recovery and/or Disposal.

Describe the arrangements for the prevention and recovery of waste generated by the activity.

Give details, and an assessment of the impact of any existing or proposed on-site waste recovery/disposal on the environment, including environmental media other than those into which the emissions are to be made.

This information should form **Attachment Nº I.6.**

Answer

There is no onsite waste recovery or disposal operations.

The strategy will be to reduced the quantity of produced water being removed offsite by road tanker, the preference will be to discharge as much treated produced water through the umbilical.

I.7 Noise Impact

Give details and an assessment of the impacts of any existing or proposed emissions on the environment, including environmental media other than those into which the emissions are to be made.

Ambient noise measurements
Complete Table I.7(i) in relation to the information required below:

(i) State the maximum Sound Pressure Levels which will be experienced at typical points on the boundary of the operation. (State sampling interval and duration)

(ii) State the maximum Sound Pressure Levels which will be experienced at typical noise sensitive locations, outside the boundary of the operation.

(iii) Give details of the background noise levels experienced at the site in the absence of noise from this operation.

Prediction models, maps (no larger than A3), diagrams and supporting documents, including details of noise attenuation and noise proposed control measures to be employed, should form **Attachment Nº I.7.**

I.7.1 Ambient Noise

The ambient noise levels are described in detail in the 2004 application and EIS. Noise emissions will comply with the limits given in the current IPPC Licence.

I.7.2 Noise Modelling

In order to take account of design changes such as the addition of SCR's and additional pumps required for produced water discharges SEPIL commissioned Alan Saunders Associates (ASA) to carry out a full review of noise during at the Terminal and to prepare a noise model to predict the noise contribution from the operation of the Terminal at site boundary and noise sensitive locations.

A new model was developed afresh using the latest data available from the engineering design consultants. The noise model of the Terminal was developed using the Cadna A noise modelling software package which uses calculation methods from the International Standard ISO 9613 Acoustics - Attenuation of sound during propagation outdoors – Part 1: Calculation of the absorption of sound by the atmosphere and Part 2: General method of calculation. The noise modelling report included in Attachment I.7 details the noise model used, the input data and the modelling results.

The octave band sound power levels for the noise sources at the Terminal (refer to Table E.5(i)) were used as input data to the noise model. Under normal operational conditions, noise levels emitted from the Terminal site will be relatively constant with the majority of equipment running continuously. Some equipment will only run intermittently and therefore contribute less to the overall noise levels, but for the purpose of the noise model all such equipment was assumed to run continuously and therefore can be considered a conservative estimate.

The model was run for two different scenarios:

- Daytime Operation (including maintenance). All normal operational equipment running continuously and:
    - Maintenance flare and associated header/pipework running continuously
    - Diesel transfer pumps, emergency generator, firewater pumps (daytime testing) running continuously

- Night-time Operation (including maintenance): All normal operational equipment running continuously and:
  - Maintenance flare and associated header/pipework running continuously

The meteorological conditions modelled represent a theoretical case of adverse (ie downwind) propagation in all directions from the noise source.

The predicted noise contribution (sound pressure levels) from the Terminal at the three closest noise sensitive locations to the south, south-west and north respectively of the Terminal are summarised in Table 18 below. Detailed noise modelling results for all noise sensitive and site boundary locations together with noise contour plots generated by the noise model are included in the noise modelling report in Attachment I.7.

TableI.5 Predicted Noise Contribution (Sound Pressure Levels - dBA) at Noise Sensitive Locations (NSLs)

Modelling Scenario	Closest NSL to South	Closest NSL to South-West	Closest NSL to North
Daytime	37	34	31
Night-time	33	30	27

I.7.3 Noise Impact

The Terminal has been designed so that during normal operation the noise contribution from the Terminal does not exceed the following noise levels as assessed at the nearest noise sensitive property (i.e. residential dwelling) under free field conditions:

- Daytime (07:00 - 23:00) 45 dB L_{Aeq} 30 minutes
- Night-time (23:00 - 07:00) 35 dB L_{Aeq} 30 minutes

These levels are extremely stringent and are some 10 dBA lower than the noise levels generally recommended in the EPA Guidance Note for Noise in Relation to Scheduled Activities. The Guidance Note recommends that "..the noise level at sensitive locations should be kept below an $L_{Ar\ T}$ T value of 55 dB(A) by daytime. At night, to avoid disturbance, the noise level at noise sensitive locations should not exceed an $L_{Aeq\ T}$ value of 45 dB(A). Audible tones and impulsive noise at sensitive locations at night should be avoided, irrespective of the noise level".

Various noise control and attenuation measures (refer to Section E.5 of the IPPC Application Form) have been incorporated into the design of the Terminal so that during normal operation it will not cause the very stringent noise levels specified above to be exceeded. Operation of the Terminal is not predicted to result in any audible/noticeable or significant tonal or impulsive noise at noise sensitive locations. The relatively large distances from the Terminal to the nearest sensitive locations and the low density of dwellings will also assist in minimising any impact the Terminal will have on ambient noise levels at noise sensitive locations.

The results of the noise modelling (Table 18) indicate that the noise contribution from the Terminal will comply with the design limits specified above at all noise sensitive locations. The closest noise sensitive location to the Terminal is a residential dwelling ca.350 metres south of the Terminal operations boundary. The predicted noise contribution from the Terminal at this location is below the design limits specified above and will not have any significant impact on existing ambient noise levels (Table 17). As this noise sensitive location is located just south of the R314 road, traffic noise would influence noise levels at this location.

The operation of the HP and LP flares would cause the normal operational noise limits to be exceeded however the only times the HP/LP flares will operate will be for testing during the commissioning phase and thereafter only in emergency situations. Therefore following commissioning the HP/LP flares will be used rarely (only in emergency situations).

Taking into account all of the above, the noise generated during normal operation of the Terminal is not predicted to have any significant impact on ambient noise levels or noise sensitive locations (receptors) in the vicinity of the Terminal.

I.8 Environmental Considerations and BAT

Describe in outline the main alternatives, if any, to the proposals contained in the application.

Describe any environmental considerations which have been made with respect to the use of cleaner technologies, waste minimisation and raw material substitution.

Describe the measures proposed or in place to ensure that:

(a) The best available techniques are or will be used to prevent or eliminate or, where that is not practicable, generally reduce an emission from the activity;
(b) no significant pollution is caused;
(c) waste production is avoided in accordance with Council Directive 75/442/EEC of 15 July 1975 on waste; where waste is produced it is recovered or, where that is technically and economically impossible it is disposed of while avoiding or reducing any impact on the environment;
(d) energy and other resources are used efficiently;
(e) the necessary measures are taken to prevent accidents and limit their consequences;
(f) the necessary measures are taken upon definitive cessation of activities to avoid any pollution risk and return the site of operation to a satisfactory state.

Supporting information should form **Attachment Nº I.8.**

The alternatives considered for biological control in the umbilical cores is covered in Attachment F1.5

SECTION J: ACCIDENT PREVENTION & EMERGENCY RESPONSE

Describe the existing or proposed measures, including emergency procedures, to minimise the impact on the environment of an accidental emission or spillage.

Also outline what provisions have been made for response to emergency situations outside of normal working hours, i.e. during night-time, weekends and holiday periods.

Describe the arrangements for abnormal operating conditions including start-up, leaks, malfunctions or momentary stoppages.

Supporting information should form **Attachment Nº J.**

Answer:

J.1 Storage and Containment

Storage and containment for chemicals is as described in the 2004 application and will comply with the requirement of 3.6 of the IPPC Licence (P0738-01).

All areas where rainwater has the potential to come into contact with chemicals are located in the process areas that drain to the potentially contaminated surface water system (oily water) as described in Section F.

Stormwater Retention
Condition 3.12.3 of the existing IPPC Licence requires that in the event of a fire or a spillage to "storm water", the site storm water shall be automatically diverted to the firewater retention facility".

Stormwater is rainwater that falls on non process areas on site and enters the uncontaminated surface water drainage system (described in Section F), and under normal conditions is expected to be uncontaminated.

On confirmation of a fire or a potential pollutant spillage into the uncontaminated surface water drainage system the EHT isolation valve (MOV-8201) will be closed to prevent discharge into the settlement ponds. Automatic closure of the isolation valve is initiated on a High Alarm event from the online TC monitor in the EHT, which continuously monitors drainage flow through the EHT. Valve closure can also be initiated manually by the control room operator in line with approved emergency response procedures.

Control and instrumentation for the TOC and TC facilities is provided with an uninterruptible power supply (UPS) and will therefore continue to function in the event of a site wide power outage. The EHT isolation valve would also still be operable under these circumstances as it can draw power from the National Grid via the Terminal's emergency power distribution board.

In the event that the EHT isolation valve is closed, the water will be retained within the stormwater ditches and perimeter surface water drain system. This system has a capacity of 2,246 m^3. The retained runoff would be sampled to assess and confirm the level of contamination. In the event it is confirmed to be contaminated the water will be pumped to the open drain sump for

treatment in the oily water system and discharged via the outfall in compliance with the ELV's in the licence.

A duty and stand-by pump is installed and will be maintained on the EHT for the transfer of contaminated runoff to the Open Drain Sump. Both pumps are plumbed independently and are capable of simultaneous operation. If the retained water cannot be treated on site it will be exported offsite for disposal by a licensed waste management contractor with appropriate treatment facilities.

Similarly in the highly unlikely event of contamination in the groundwater drains, as detected by continuous TOC or TC analysers in Manhole 26, the penstock in the manhole would be manually closed. On confirmation of contamination water can be pumped from MH26 by mobile pump via the Open Drains Sump to the Surface Water Treatment System for treatment, or otherwise will be disposed offsite to an appropriately licensed waste management facility.

J.2 Used / Contaminated Firewater Retention

Firewater retention is as described in the original application and will comply with all conditions under 3.12 of the current IPPC licence.

J.3 Hazard / Accident Prevention and Emergency Response

J.3.1 General

As detailed in Section B.9, the Terminal qualifies as a "Lower Tier" site under the "Seveso" Regulations. A Major Accident Prevention Policy (MAPP) will be prepared for the site in accordance with the Regulations. The MAPP will be implemented by the Safety Management System at the Terminal and will include the following elements:

- Identification, evaluation and prevention of major accident hazards
- Emergency planning and emergency response to minimise the consequences of any accidents on human health and the environment

As discussed in Section B.9, hazard identification and prevention has been a key component of the Terminal design to minimise the risk of accident/ hazardous and emergency situations arising during the operation of the Terminal. The Emergency Response Plan will be regularly tested and reviewed. It will detail the emergency response including the organisation and facilities in place and the measures to be taken to minimise the consequences of any accident/emergency situations on human health and the environment.

Specific measures incorporated into the Terminal design to detect and respond to hazardous situations are described in the following sections.

J.3.2 Hazard Detection and Monitoring

The purpose of the hazard detection and monitoring is to detect any hazard arising at the earliest possible moment. The principal detection and monitoring measures at the Terminal will include the following:

(a) Controls and instrumentation will be provided to ensure that the plant operates normally, i.e. within its intended operating range in terms of flow, temperature, pressure and liquid level. If any of these

parameters stray to the intended limit of the normal operating range, then an alarm will attract the operator's attention.

(b) Further independent instrumentation will be provided to detect deviations outside normal operation and to initiate additional alarms and shutdown.

(c) Gas detectors will be installed at strategic locations in the process areas and at air intakes to buildings and to any equipment with ignition sources, i.e. gas turbines, engines and the heating medium heater. These detectors will give early warning of potentially explosive atmospheres. Detection of flammable gas near an ignition source would immediately shut down that piece of equipment so as to eliminate the potential source of ignition.

(d) Smoke detection in all buildings. High Sensitivity Smoke Detectors (HSSDs) will be used for the very early detection of electrical fires. These are one thousand times more sensitive than a typical domestic smoke alarm and enable incipient electrical fires to be extinguished before they develop.

(e) Fire detectors will be installed at strategic locations in the plant and in all buildings. Fire, gas and smoke detectors will all be integrated into the fire and gas monitoring system, which provides executive shutdown action and warnings in the control room as appropriate. Fire detection in the storage tank area will automatically initiate the tank deluge systems.

(f) CCTV will be used to monitor critical areas.

J.3.3 Hazard Mitigation and Protection

In the event of a hazard being detected, the aim is to isolate the affected section of plant and to remove the gas inventory by depressurising it safely to flare as rapidly as possible. All control and shutdown systems have been designed to default to a safe condition in the event of failure. The principal mitigation and protection measures will include:

(a) Emergency Shutdown and Depressurisation System (ESD)
The facilities will be provided with an ESD to ensure the safe isolation and shutdown of equipment under fault or fire conditions.

Refer to Attachment D.1.6 for more details on the ESD system.

(b) Depressurisation of an isolated section or sections of plant or, if appropriate, the entire plant, during an emergency, via the flare (blowdown).

(c) Pressure relief valves to provide safe and automatic venting of pressure to the flare systems before equipment becomes over-pressured

(d) A self-sufficient and comprehensive fire protection / fire-fighting system

(e) Design of the control building to withstand the consequences of an extremely unlikely over-pressure event, to protect the operators and to ensure no damage to the control and shutdown systems.

(f) Secondary means of egress from the plant to the west in addition to the main exit to the south and east.

(g) Emergency Response Facilities

In an emergency, the control room (manned on a 24-hour basis) at the Terminal will remain the operational hub. Emergency response facilities will be provided in the Terminal administration building. The emergency response facilities will include:

- full secure telecom connections;
- off-site storage of details of personnel on site;
- monitoring of high level plant information repeated from the control room, e.g. ESD and fire and gas detection status, subsea system status, power supply status, wind speed and direction, etc.; and
- CCTV monitoring of plant.

In summary, hazard identification and prevention has been a key component of Terminal design and will minimise the risk of accident and emergency situations arising during operation. In the unlikely event of accident / emergency situation arising the detection and control / response systems to be employed at the Terminal will minimise any consequences on human health and the environment.

J.4 Public Liability Insurance

SEPIL's insurance coverage is 100% written by the Shell Group Insurance Company - Solen Versicherungen AG - and runs concurrently with all other Group insurances, from 1st July until 30th June each year. This policy provides for third party liability insurance of up to USD$500 million with cover for damages on account of third party personal injury or property damage caused by sudden and accidental pollution events.

A current Certificate of Insurance for Shell E&P Ireland Ltd is presented in Attachment J.4.

SECTION K: REMEDIATION, DECOMMISSIONING, RESTORATION & AFTERCARE

Describe the existing or proposed measures to minimise the impact on the environment after the activity or part of the activity ceases operation, including provision for post-closure care of any potentially polluting residuals.

Supporting information should be included as **Attachment No. K.**

Answer:

K.1 Timing of Decommissioning

The life of the Corrib Gas Field has been predicted by reservoir simulation and modelling to be between 15 and 20 years. Until a certain amount of production data is available to calibrate ('history match') the models, it is difficult to be more precise about the life of the field. The Bellanaboy Bridge Gas Terminal has a minimum (design) life of 30 years. Decommissioning of the Terminal is expected to take place after 2032. The timing of decommissioning will be determined by the volume of gas produced each year from the Corrib Field, which is primarily a function of the volume of gas contained within the Corrib Field and how effectively and rapidly the gas contained within the reservoir can be recovered.

K.2 Requirements of other Statutory Authorities

The Petroleum Lease for the Corrib Field was granted in 2001, by the (then) Minister for Communications, Marine and Natural Resources pursuant to the terms of the Petroleum and Other Minerals Development Act (1960). The Petroleum Lease contains stringent provisions to ensure that the Corrib Field facilities, including the Bellanaboy Bridge Gas Terminal, are decommissioned in a timely and appropriate manner.

The Corrib Facility Decommissioning Agreement (the "Agreement") forms Schedule 7 of the Petroleum Lease. The purpose of the Agreement is to ensure that the Corrib facilities, including the Bellanaboy Bridge Gas Terminal, will be decommissioned in an appropriate and timely manner. The Agreement does this by requiring the Decommissioning Plan for the Corrib facilities (including the Bellanaboy Bridge Gas Terminal) to be agreed by the Minister, in accordance with applicable laws at the time, and taking due account of the opinion of relevant bodies.

The Agreement also:

a) Provides for the establishment of Security by each of the Corrib co-venturers, sufficient to meet its share of the cost of decommissioning, and

b) Allows the Minister to decommission the facilities if the Corrib co-venturers fail to do so to his satisfaction, the Minister's costs in such circumstances being payable by the co-venturers and, ultimately, his

financial position being underwritten by the Security established under the Agreement.

The Security will cover the costs of decommissioning the Bellanaboy Bridge Gas Terminal (and offshore Corrib facilities).

Under the conditions of the planning permission for the Bellanaboy Bridge Gas Terminal granted by An Bord Pleanala, SEPIL is required to provide Security to Mayo County Council to secure the satisfactory reinstatement of the Terminal site upon the cessation of the Terminal's activity.

K.3 Decommissioning Activities

K.3.1 General

The scope of work for decommissioning the Terminal will be assessed approximately five years prior to the predicted date of decommissioning. SEPIL will prepare a Best Practical Environmental Option Study, which will comparatively assess the technical, cost, health, safety and environmental aspects of each option. An environmental impact assessment will be undertaken to identify any specific impact on the local environment. Any environmental controls that may be found to be necessary to protect the surrounding environment will be implemented.

K.3.2 Residuals Management Plan

As required by Condition 10 in the IPPC licence, a Residuals Management Plan (RMP) will be prepared within six months of the commencement of operations. The RMP will be reviewed annually as part of the site Annual Environmental Report (AER). The RMP will identify and document the action that will be carried out (and associated costs), to ensure protection of the environment in the event of site closure or extended suspension of activity (6 months or greater). It will also establish the criteria for successful decommissioning. Residuals that will be considered include:

(a) chemicals, wastes and fuels;

(b) hardware and materials such as tanks, pipelines, abatement equipment etc;

(c) buildings and infrastructure, and;

(d) environmental factors that may result in the unlikely event of a spill resulting in offsite contamination.

At this stage, costs have been estimated at €20 million, on the basis of Shell's decommissioning cost database (Sullom Voe).

The Residuals Management Plan will be financially underwritten as follows:

1. SEPIL will comply with the requirements of the Financial Accounting Standards Board, and in particular FASB 143 - Accounting for Asset Retirement Obligations. This financial standard addresses how companies must account and report for obligations associated with the retirement of tangible long-lived assets and the associated asset retirement (decommissioning) costs. This standard will require SEPIL to build up a provision on its balance sheet to cover its equity share of decommissioning obligations. The Corrib co-venturers will therefore be making provision for their respective equity shares in their accounts.

2. Liabilities under the Residuals Management Plan, will be underwritten by two forms of financial security:

(a) Under the Corrib Facility Decommissioning Agreement signed in November 2001, the Corrib co-venturers must each, not later than a specified date (essentially, when the value of the remaining reserves of natural gas in the field equal 150% of decommissioning costs), provide security to the Minister for its share of decommissioning costs. The Decommissioning Agreement contains detailed provisions as to what constitutes acceptable security. This would be a letter of credit, guarantee or bond, payment into a trust fund or other form of security acceptable to the Minister. This security will cover the costs of decommissioning all the Corrib infrastructure, including the Bellanaboy gas terminal.

(b) Under the conditions of the planning permission for the Bellanaboy gas terminal, SEPIL is required to provide Security to Mayo County Council to secure the satisfactory reinstatement of the terminal site upon cessation of activities. In this regard SEPIL intends to put in place a parent company guarantee for a sum equal to €20 million, the current estimated total cost of reinstating the gas terminal site, and would be for such period as to cover the time when decommissioning of the gas terminal site will occur.

The underwriting will align with the relevant EPA Guidance Note on Environmental Liability Risk Assessment, Residuals Management Plans and Financial Provision, 2006.

SECTION L: STATUTORY REQUIREMENTS

Indicate how the requirements of Section 83(5)(a)(i) to (v) and (vii) to (x) of the EPA Acts, 1992 and 2003 shall be met, having regard, where appropriate, to any relevant specification issued by the Agency under section 5 (3) of the Act and the reasons for the selection of the arrangements proposed.

Indicate whether or not the activity is carried out, or may be carried out, or is located such that it is liable to have an adverse effect on -

(a) a site placed on a list in accordance with Chapter 1 of SI 94 of 1997, or

(b) a site where consultation has been initiated in accordance with Article 5 of the EU Habitats Directive (92/43/EEC), or

Indicate whether or not the activity is liable to have an adverse effect on water quality in light of S.I. No. 258 of 1998 (Local Government (Water Pollution) Act, 1977 (Water Quality Standards for Phosphorus) Regulations, 1998).

Indicate whether any of the substances specified in the Schedule of the EPA (Licensing)(Amendment) 2004, S.I. 394 of 2004, are discharged by the activity to the relevant medium.

Fit and Proper Person

The PoE Act in Section 83(5)(xi) specifies that the Agency shall not grant a licence unless it is satisfied that the applicant or licensee or transferee as the case may be is a fit and proper person. Section 84(4) of the PoE Act specifies the information required to enable a determination to be made by the Agency.

- Indicate whether the applicant or other relevant person has been convicted under the PoE Act, the Waste Management Act 1996, the Local Government (Water pollution) Acts 1977 and 1990 or the Air Pollution Act 1987.
- Provide details of the applicant's technical knowledge and/or qualifications, along with that of other relevant employees.
- Provide information to show that the person is likely to be in a position to meet any financial commitments or liabilities that may have been or will be entered into or incurred in carrying on the activity to which the application relates or in consequence of ceasing to carry out that activity.

Supporting information should be included as **Attachment Nº L** with reference to where the information can be found in the application.

ANSWER

L.1 Air Pollution Act, 1987

Section 83(5)(a)(i) of the EPA Act's, 1992 and 2003 states the Agency shall not grant a licence unless it is satisfied that:

Any emissions from the activity will not result in the contravention of any relevant air quality standard specified under section 50 of the Air Pollution Act 1987, and will comply with any relevant emission limit value specified under section 51 of the Air Pollution Act 1987

The Terminal has been designed on the basis of BAT and therefore emissions to atmosphere will be minimised. The terminal will not contravene any of the air quality standards specified in the Air Pollution Act 1987 or subsequent Air Quality Regulations.

New Regulations on Ambient Air

Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009

The provisions of the Council Directive 2004/107/EC have been transposed into Irish law through new regulations relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons (PAH) in ambient air. The new regulations stipulate target values for the aforementioned substances in ambient air.

Releases of arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons (PAH) from the gas terminal process operations including combustion processes are considered to be insignificant and would not contravene any limit set out in the new regulations in 2009. The new regulations are referenced for completeness.

L.2 Water Pollution Act

Section 83(5)(a)(ii) of the EPA Act's, 1992 and 2003 states the Agency shall not grant a licence unless it is satisfied that:

Any emission from the activity will comply with, or will not result in the contravention of any relevant quality standard for waters, trade effluents and sewage effluent and standards in relation to treatment of such effluents prescribed under Section 26 of the Local Government (Water Pollution) Act, 1977.

The activity will not lead to a breach of section 26 of the local government (Water Pollution) Act 1977.

L.3 European Legislation

Section 83(5)(a)(iii) of the EPA Act's, 1992 and 2003 states the Agency shall not grant a licence unless it is satisfied that:

Any emissions from the activity or any premises, plant, methods, processes, operating procedures or other factors which affect such emissions will comply with, or will not result in the contravention of, any relevant standard

including any standard for an environmental medium prescribed under Regulations made under the European Communities Act, 1972, or under any other enactment.

The relevant standards for emissions to air and water have been discussed in Sections L.1 and L.2 respectively. Relevant guidelines for noise discussed in Section L.4. Waste management is discussed in Section L.6. Emissions from the Terminal will not result in the contravention of any relevant standard including any standard for an environmental medium prescribed under Regulations made under the European Communities Act, 1972, or under any other enactment.

L.4 Section 83(5)(a)(iv) of the EPA Act's, 1992 and 2003 states the Agency shall not grant a licence unless it is satisfied that:

Any noise from the activity will comply with, or will not result in the contravention of any regulations under Section 106.

The activity will not lead to a breach of Section 106 of the EPA Acts (Refer to the relevant sections in E and I of the application form and associated attachments)

L.5 Significant Environmental Pollution

Section 83(5)(a)(v) of the EPA Act's, 1992 and 2003 states the Agency shall not grant a licence unless it is satisfied that:

Any emissions from the activity will not cause significant environmental pollution.

The preceding sections of this licence application demonstrate that the operation of the Terminal will not cause significant environmental pollution.

L.6 Waste

Section 83(5)(a)(vii) of the EPA Act's, 1992 and 2003 states the Agency shall not grant a licence unless it is satisfied that:

Having regard to Part III of the Act of 1996, production of waste in the carrying on of the activity will be prevented or minimised or, where waste is produced, it will be recovered or, where that is not technically or economically possible, disposed of in a manner which will prevent or minimise any impact on the environment

The activity will be managed to ensure that the production of waste is prevented or minimised and where waste is produced, it will be recovered and where it is not economically and technically possible to recover it, be disposed of in a manner which will prevent or minimise any impact on the environment. (refer to section H.2 and Tables H(i) and (ii))

L.7 Energy Efficiency

Section 83(5)(a)(viii) of the EPA Act's, 1992 and 2003 states the Agency shall not grant a licence unless it is satisfied that:

Energy will be used efficiently in the carrying on of the activity

Sections G.1.2 and G.2.1 of the IPPC Application Form address energy usage and energy efficiency and demonstrate that energy will be used efficiently during the operation of the Terminal.

L.8 Accident Prevention and Response

Section 83(5)(a)(ix) of the EPA Act's, 1992 and 2003 states the Agency shall not grant a licence unless it is satisfied that:

Necessary measures will be taken to prevent accidents in the carrying on of the activity and, where an accident occurs, to limit its consequences for the environment and, in so far as it does have such consequences, to remedy those consequences

The activity will be operated so that necessary measures will be taken to prevent accidents in the carrying out of the activity. In addition, it is ensured that where an accident occurs, its consequences for the environment are limited, and where there are consequences for the environment, these consequences are remedied. (refer to Section J of the application)

L.9 Cessation of Activity

Section 83(5)(a)(x) of the EPA Act's, 1992 and 2003 states the Agency shall not grant a licence unless it is satisfied that:

Necessary measures will be taken upon the permanent cessation of the activity (including such a cessation resulting from the abandonment of the activity) to avoid any risk of environmental pollution and return the site of the activity to a satisfactory state

Section K of the IPPC Application Form addresses site closure, decommissioning and residuals management.

L.10 Best Available Techniques (BAT)

Section 5(3)(a) of the EPA Act's, 1992 and 2003 allows the agency to specify the Best Available Techniques (BAT) as a basis for providing emission limit values.

The Terminal has been designed on the basis of BAT, in particular the technologies used to minimise and control environmental emissions.

L.11 Designated Areas

The Terminal site is not located in an existing or candidate/proposed Special Area of Conservation (SAC), Natural Heritage Area (NHA) or Special Protection Area (SPA). However, there are a number of designated areas located in the wider locality. These are presented in the EIS, which accompanied the original application.

Operation of the Terminal is not predicted to have any adverse effect on the integrity of existing or proposed/candidate Special Areas of Conservation (SAC), Natural Heritage Areas (NHA) or Special Protection Areas (SPA). The Terminal will have no significant effects on any of the designated areas listed in the original EIS or other designated areas.

L.12 Discharges of substances specified in the Schedule of the EPA (Licensing) (Amendment) Regulations, 2004

Substances emitted to air and water from the Terminal which fall under the Schedule of the EPA (Licensing)(Amendment) Regulations, 2004 are listed in Table L.1 below:

Table L.1

Environmental Medium	Substance
Air (Refer to Tables E.1(iii), (iv), (v))	• Oxides of nitrogen and other nitrogen compounds • Carbon Monoxide
Water (Refer to Tables E.2(ii))	• Metals and their compounds • Materials in suspension • Substances which can have an unfavourable influence on the oxygen balance

As demonstrated in the preceding sections of the IPPC licence application the abatement / control technologies used to prevent / minimise the emissions of these substances can be considered BAT and the emissions of these substances from the Terminal will not cause any significant environmental pollution.

L.13 Fit and Proper Person

Indicate whether the applicant or other relevant person has been convicted under the PoE Act, the Waste Management Act 1996, the Local Government (Water pollution) Acts 1977 and 1990 or the Air Pollution Act 1987.

Neither Shell E&P Ireland Limited (SEPIL) nor any other relevant person employed by SEPIL have been convicted under the PoE Act, the Waste Management Act 1996, the Local Government (Water pollution) Acts 1977 and 1990 or the Air Pollution Act 1987.

Provide details of the applicant's technical knowledge and/or qualifications, along with that of other relevant employees.

Shell E&P Ireland Limited is part of the Royal Dutch/Shell Group of companies, which is a global group of energy and petrochemical companies. The following data profiles the company:

- Shell operate in circa 100 countries
- Employs approximately 102,000 employees
- Produces 3% of the world's gas
- Produce 3.2 million barrels of gas and oil every day

Thus Shell has significant experience and technical capability in the production of gas reserves and processing of the gas for export to market.

Details on the staffing and the management structure for the Terminal are given in Section C of the IPPC Licence Application form. SEPIL will employ people with the necessary qualifications, experience and technical competence to work at the Terminal and generic and job specific training will be given to all employees as described in Section C.

Provide information to show that the person is likely to be in a position to meet any financial commitments or liabilities that may have been or will be entered into or incurred in carrying on the activity to which the application relates or in consequence of ceasing to carry out that activity.

The Royal Dutch/Shell Group of Companies had sales of $26.5 billion in 2008 and capital investment represented $38.4 billion.

SEPIL will prepare a Residuals Management Plan and a costed Environmental Liabilities Risk Assessment, which will be subject to the agreement of the Agency. These studies will determine the costs associated with forseen (e.g. decommissioning) and unforseen (e.g. accidents) environmental liabilities.

With respect to decommissioning costs, the Shell Group (including SEPIL) is required to comply with the prevailing Financial Accounting Standards Board requirements relating to Asset Retirement Obligations.

SEPIL's insurance coverage is 100% written by the Shell Group Insurance Company - Solen Versicherungen AG. This policy provides for third party liability insurance of up to USD$500 million with cover for damages on account of third party personal injury or property damage caused by sudden and accidental pollution events.

SECTION M: DECLARATION

Declaration

I hereby make application for a licence / revised licence, pursuant to the provisions of the Environmental Protection Agency Acts, 1992 and 2003 and Regulations made thereunder.

I certify that the information given in this application is truthful, accurate and complete.

I give consent to the EPA to copy this application for its own use and to make it available for inspection and copying by the public, both in the form of paper files available for inspection at EPA and local authority offices, and via the EPA's website. This consent relates to this application itself and to any further information, submission, objection, or submission to an objection whether provided by me as Applicant, any person acting on the Applicant's behalf, or any other person.

Signed by: Julia Busby **Date:** 24th March 2010
(on behalf of the organisation)

Print signature name: JULIA BUSBY

Position in organisation: COMPANY SECRETARY

Company stamp or seal:

ANNEX 1: TABLES / ATTACHMENTS

Table E.1 (i) BOILER EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point: NOT APPLICABLE

Emission Point Ref. Nº:		
Location:		
Grid Ref. (12 digit, 6E,6N):		
Vent Details	Diameter:	Height above Ground(m):
Date of commencement of emission:		

Characteristics of Emission:

Boiler rating Steam Output: Thermal Input:		kg/hr MW
Boiler fuel Type: Maximum rate at which fuel is burned % sulphur content:		kg/hr
NOx		mg/Nm^3 0^{o}C. 3% O_2(Liquid or Gas), 6% O_2(Solid Fuel)
Maximum volume* of emission		m^3/hr 0^{o}C, 3 % O_2 (liquid or gas), 6 % O_2 (solid fuel)
Temperature	^{o}C(max) ^{o}C(min)	^{o}C(avg)

* Volume flow limits for emissions to atmosphere shall be based on Normal conditions of temperature and pressure, (i.e. 0^{o}C,101.3kPa), dry gas; 3% oxygen for liquid and gas fuels; 6% oxygen for solid fuels.

(i) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up/shutdown to be included):*

Periods of Emission (avg)	_____min/hr _____hr/day _____day/yr

TABLE E.1(ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. Nº:	A2-1
Source of Emission:	Gas Turbine A
Location:	Sales Gas Compressor Building
Grid Ref. (12 digit, 6E,6N):	086482E; 333180N
Vent Details Diameter: Height above Ground(m):	 1.342m x 1.342 square 21.2m
Date of commencement:	2012

Characteristics of Emission:

(i) Volume to be emitted:			
Average/day	1,705,815 Nm^3/d	Maximum/day	1,976,452 Nm^3/d
Maximum rate/hour	82,352 Nm^3/h	Min efflux velocity	10.1 $m.sec^{-1}$
(ii) Other factors			
Temperature	540 °C max [1]	115 °C min [1]	165-170 °C(avg) [1]
For Combustion Sources: Volume terms expressed as : ☐ wet. ☐√ dry. ___15 $\%O_2$			

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	60 min/hr 24 hr/day 365 day/yr (Duty/Standby with Gas Turbine B)

[1] : The average exit temperature will be in range 165-170 °C (with WHR is use). The minimum emission temperature will be 115 °C. The maximum emission temperature is likely to be 540 °C (however this represents scenario if WHR is not is use)

TABLE E.1(iii): MAIN EMISSIONS TO ATMOSPHERE - Chemical characteristics of the emission (1 table per emission point)

Emission Point Reference Number: **A2-1**

Parameter	Prior to treatment(1) *				Brief description of treatment	As discharged(1)					
	mg/Nm^3		kg/h			mg/Nm^3		kg/h.		kg/year	
	Avg	Max	Avg	Max		Avg	Max	Avg	Max	Avg	Max
NOx (as NO_2)	Not applicable*	Not applicable*	Not applicable*	Not applicable*	Low NO_x Burner	51	75	4.2	6.2	36,792	54,312
CO	Not applicable*	Not applicable*	Not applicable*	Not applicable*		63	100	5.2	8.2	45,552	71,832

* Not applicable as compound is only produced after combustion

1. Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0^{o}C,101.3kPa). Wet/dry should be the same as given in Table E.1(ii) unless clearly stated otherwise.

TABLE E.1(ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. Nº:	A2-2
Source of Emission:	Gas Turbine B
Location:	Sales Gas Compressor Building
Grid Ref. (12 digit, 6E,6N):	086494E; 333187N
Vent Details Diameter: Height above Ground(m):	 1.342m x 1.342m square 21.2m
Date of commencement:	2012

Characteristics of Emission:

(i) Volume to be emitted:			
Average/day	1,705,815 Nm^3/d	Maximum/day	1,976,452 Nm^3/d
Maximum rate/hour	82,352 Nm^3/h	Min efflux velocity	10.1 $m.sec^{-1}$
(ii) Other factors			
Temperature	540 °C max [1]	115 °C min [1]	165-170 °C(avg) [1]
For Combustion Sources: Volume terms expressed as : ☐ wet. ☐√ dry. ___15 $\%O_2$			

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	60 min/hr 24 hr/day 365 day/yr (Duty/Standby with Gas Turbine A)

[1] : The average exit temperature will be in range 165-170 °C (with WHR is use). The minimum emission temperature will be 115 °C. The maximum emission temperature is likely to be 540 °C (however this represents scenario if WHR is not is use)

TABLE E.1(iii): MAIN EMISSIONS TO ATMOSPHERE - Chemical characteristics of the emission (1 table per emission point)

Emission Point Reference Number: **A2-2**

Parameter	Prior to treatment(1) *				Brief description of treatment	As discharged(1)					
	mg/Nm^3		kg/h			mg/Nm^3		kg/h.		kg/year	
	Avg	Max	Avg	Max		Avg	Max	Avg	Max	Avg	Max
NOx (as NO_2)	Not applicable*	Not applicable*	Not applicable*	Not applicable*	Low NO_x Burner	51	75	4.2	6.2	36,792	54,312
CO	Not applicable*	Not applicable*	Not applicable*	Not applicable*		63	100	5.2	8.2	45,552	71,832

* Not applicable as compound is only produced after combustion

1. Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0^{o}C,101.3kPa). Wet/dry should be the same as given in Table E.1(ii) unless clearly stated otherwise.

TABLE E.1(ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. Nº:	A2-4
Source of Emission:	Power Generator A
Location:	Utilities Area
Grid Ref. (12 digit, 6E,6N):	086481E; 332974N
Vent Details Diameter: Height above Ground(m):	 0.4m (Internal) 15.8m
Date of commencement:	2012

Characteristics of Emission:

(i) Volume to be emitted:			
Average/day	72,776 Nm^3/d	Maximum/day	142,698 Nm^3/d
Maximum rate/hour	5,946 Nm^3/h	Min efflux velocity	13.1 $m.sec^{-1}$
(ii) Other factors			
Temperature	550 °C(max)	470 °C(min)	500 °C (avg)
For Combustion Sources: Volume terms expressed as :	☐ wet.	☐√ dry.	5 $\%O_2$

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	60 min/hr 24 hr/day 365 day/yr (Generators A/B/C – 2 Duty / 1 Standby A)

TABLE E.1(iii): MAIN EMISSIONS TO ATMOSPHERE - Chemical characteristics of the emission (1 table per emission point)

Emission Point Reference Number: **A2-4**

Parameter	Prior to treatment(1) *				Brief description of treatment	As discharged(1)					
	mg/Nm^3		kg/h			mg/Nm^3		kg/h.		kg/year	
	Avg	Max	Avg	Max		Avg	Max	Avg	Max	Avg	Max
NOx	Not applicable*	Not applicable*	Not applicable*	Not applicable*	Lean Burn Technique	250	250	1.45	1.45	12,702	12,702
CO	Not applicable*	Not applicable*	Not applicable*	Not applicable*	Selective Catalytic	300	300	1.7	1.7	14,892	14,892
NH_3	Not applicable*	Not applicable*	Not applicable*	Not applicable*	Reduction	10	10	0.06	0.06	519	519

* Not applicable as compound is only produced after combustion

1. Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0^{o}C,101.3kPa). Wet/dry should be the same as given in Table E.1(ii) unless clearly stated otherwise.

TABLE E.1(ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. Nº:	A2-5
Source of Emission:	Power Generator B
Location:	Utilities Area
Grid Ref. (12 digit, 6E,6N):	086488E; 332978N
Vent Details Diameter: Height above Ground(m):	 0.4m (Internal) 15.8m
Date of commencement:	2012

Characteristics of Emission:

(i) Volume to be emitted:			
Average/day	72,776 Nm^3/d	Maximum/day	142,698 Nm^3/d
Maximum rate/hour	5,946 Nm^3/h	Min efflux velocity	13.1 $m.sec^{-1}$
(ii) Other factors			
Temperature	550 °C(max)	470 °C(min)	500 °C (avg)
For Combustion Sources: Volume terms expressed as :	☐ wet.	☐√ dry.	5 $\%O_2$

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	60 min/hr 24 hr/day 365 day/yr (Generators A/B/C – 2 Duty / 1 Standby A)

TABLE E.1(iii): MAIN EMISSIONS TO ATMOSPHERE - Chemical characteristics of the emission (1 table per emission point)

Emission Point Reference Number: **A2-5**

Parameter	Prior to treatment(1) *				Brief description of treatment	As discharged(1)					
	mg/Nm^3		kg/h			mg/Nm^3		kg/h.		kg/year	
	Avg	Max	Avg	Max		Avg	Max	Avg	Max	Avg	Max
NOx	Not applicable*	Not applicable*	Not applicable*	Not applicable*	Lean Burn Technique	250	250	1.45	1.45	12,702	12,702
CO	Not applicable*	Not applicable*	Not applicable*	Not applicable*	Selective Catalytic	300	300	1.7	1.7	14,892	14,892
NH_3	Not applicable*	Not applicable*	Not applicable*	Not applicable*	Reduction	10	10	0.06	0.06	519	519

* Not applicable as compound is only produced after combustion

1. Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0^{o}C,101.3kPa). Wet/dry should be the same as given in Table E.1(ii) unless clearly stated otherwise.

TABLE E.1(ii) MAIN EMISSIONS TO ATMOSPHERE (1 Page for each emission point)

Emission Point Ref. Nº:	A2-6
Source of Emission:	Power Generator C
Location:	Utilities Area
Grid Ref. (12 digit, 6E,6N):	086496E; 332982N
Vent Details Diameter: Height above Ground(m):	 0.4m (Internal) 15.8m
Date of commencement:	2012

Characteristics of Emission:

(i) Volume to be emitted:			
Average/day	72,776 Nm^3/d	Maximum/day	142,698 Nm^3/d
Maximum rate/hour	5,946 Nm^3/h	Min efflux velocity	13.1 $m.sec^{-1}$
(ii) Other factors			
Temperature	550 °C(max)	470 °C(min)	500 °C (avg)
For Combustion Sources: Volume terms expressed as :	☐ wet.	☐√ dry.	5 $\%O_2$

(iii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	60 min/hr 24 hr/day 365 day/yr (Generators A/B/C – 2 Duty / 1 Standby A)

TABLE E.1(iii): MAIN EMISSIONS TO ATMOSPHERE - Chemical characteristics of the emission (1 table per emission point)

Emission Point Reference Number: **A2-6**

Parameter	Prior to treatment(1) *				Brief description of treatment	As discharged(1)					
	mg/Nm^3		kg/h			mg/Nm^3		kg/h.		kg/year	
	Avg	Max	Avg	Max		Avg	Max	Avg	Max	Avg	Max
NOx	Not applicable*	Not applicable*	Not applicable*	Not applicable*	Lean Burn Technique	250	250	1.45	1.45	12,702	12,702
CO	Not applicable*	Not applicable*	Not applicable*	Not applicable*	Selective Catalytic	300	300	1.7	1.7	14,892	14,892
NH_3	Not applicable*	Not applicable*	Not applicable*	Not applicable*	Reduction	10	10	0.06	0.06	519	519

* Not applicable as compound is only produced after combustion

1. Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0^{o}C,101.3kPa). Wet/dry should be the same as given in Table E.1(ii) unless clearly stated otherwise.

TABLE E.1(iv): EMISSIONS TO ATMOSPHERE - Minor atmospheric emissions

Emission point Reference Numbers	Description	Emission details[1]				Abatement system employed
		material	mg/Nm$^{3(2)}$	kg/h.	kg/year	
A3-1	Maintenance Ground Flare	NOx	128	1.44	25.9 (based on 18 hrs usage/yr)	Pilot only ignited during flare use; low emission, low noise flare tip
		CO	To be determined	To be determined	To be determined (based on 18 hrs usage /yr	
A3-2	Emergency Generator	NOx	1930	16.7	868 (testing)	Low sulphur diesel used
		CO	586	4.7	244 (testing)	
		SO_2	-	-	To be determined	
		Particulates	47	0.4	21 (testing)	
A3-3	Firewater Pump Engine A	NOx	4750	31	372 (testing)	Low sulphur diesel used
		CO	450	2.9	35 (testing)	
		SO_2	275	1.8	22 (testing)	
		Particulates	75	0.5	6 (testing)	

1 The maximum emission should be stated for each material emitted, the concentration should be based on the maximum 30 minute mean.
2 Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0°C101.3kPa). Wet/dry should be clearly stated. Include reference oxygen conditions for combustion sources.

TABLE E.1(iv): EMISSIONS TO ATMOSPHERE - Minor atmospheric emissions

Emission point Reference Numbers	Description	Emission details[1]				Abatement system employed
		material	mg/Nm$^{3(2)}$	kg/h.	kg/year	
A3-4	Firewater Pump Engine B	NOx	4750	31	372 (testing)	Low sulphur diesel used
		CO	450	2.9	35 (testing)	
		SO2	275	1.8	22 (testing)	
		Particulates	75	0.5	6 (testing)	
A3-5	Firewater Pump Engine C	NOx	4750	31	372 (testing)	Low sulphur diesel used
		CO	450	2.9	35 (testing)	
		SO2	275	1.8	22 (testing)	
		Particulates	75	0.5	6 (testing)	
A3-6	Firewater Pump Engine D	NOx	4750	31	372 (testing)	Low sulphur diesel used
		CO	450	2.9	35 (testing)	
		SO2	275	1.8	22 (testing)	
		Particulates	75	0.5	6 (testing)	

1 The maximum emission should be stated for each material emitted, the concentration should be based on the maximum 30 minute mean.
2 Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0°C101.3kPa). Wet/dry should be clearly stated. Include reference oxygen conditions for combustion sources.

TABLE E.1(iv): EMISSIONS TO ATMOSPHERE - Minor atmospheric emissions

Emission point Reference Numbers	Description	Emission details[1]				Abatement system employed
		material	mg/Nm$^{3(2)}$	kg/h.	kg/year	
A3-7	Laboratory Fume Hood Vent	VOCs	Minor	Minor	Minor	
A3-8	Cold venting through HP Flare Stack	Natural Gas	-	16,122	2,880	Comment: For planned changeovers of compressors: 240kg per start based on 16 sec purge @ 5kg/sec and 3 attempts to start. (compressor change over- max 1 per month)
A3-9	Cold Venting through LP Flare Stack	Natural Gas and Nitrogen	-	Normally No Flow (3)	Normally No Flow (3)	
A3-10	Sales Gas Compressor A Seal Gas Vent (Duty/Standby with A3-11)	80% Nitrogen, 20% Natural Gas	-	9	78,840 (13,060 natural gas)	
A3-11	Sales Gas Compressor B Seal Gas Vent (Duty/Standby with A3-10)	80% Nitrogen, 20% Natural Gas	-	9	78,840 (13,060 natural gas)	

1. The maximum emission should be stated for each material emitted, the concentration should be based on the maximum 30 minute mean.
2. Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0°C, 101.3kPa). Wet/dry should be clearly stated. Include reference oxygen conditions for combustion sources.
3. Normally No Flow, but if it does occur the duration of venting will be up to 15 minutes with up to 96 kg vented.

TABLE E.1(v): EMISSIONS TO ATMOSPHERE – Fugitive and Potential atmospheric emissions

Emission point ref. no. (as per flow diagram)	Description	Malfunction which could cause an emission	Emission details (Potential max. emissions)[1] (based on UKOOA emission factors)				
			Material	mg/Nm^3	kg/hour	Qty per event (kg)	Comment
A4-1	HP Flare	Production Pipeline Depressurisation – full pipeline	NOx	101.6	203.6	3258.2	Unlikely Emergency
			CO	567.3	1137.0	18191.8	
A4-1	HP Flare	Production Pipeline Depressurisation – onshore section	NOx	101.6	50.9	280.0	Unlikely Emergency
			CO	567.3	284.2	1563.4	
A4-1	HP Flare	Compressor start-up Purge	HC	HC	16122.0	240.0	Per start. Based on 16 sec purge @ 5kg/sec 16 sec) and 3 attempts to start . (compressor start-up - max. once/month). Routed to HP Flare and vented.
A4-1	HP Flare	Plant startup – base case	NOx	101.6	101.7	102.4	
			CO	567.3	567.8	571.8	
A4-1	HP Flare	Plant startup- (alternate option)	NOx	101.6	144.0	141.4	
			CO	567.3	804.0	789.6	
A4-1	HP Flare	Gas Compressor A – Manual Blowdown (Suction)	NOx	101.6	10.1	2.8	
			CO	567.3	56.6	15.4	
A4-1	Ground Flare	Compressor Compressor A – Purging (Suction)	HC	HC	8450	298.0	HC purged out with nitrogen

[1] Estimate the potential maximum emission for each malfunction identified.
Nox and CO concentrations are based on UKOOA emission factors.

TABLE E.1(v): EMISSIONS TO ATMOSPHERE – Fugitive and Potential atmospheric emissions

Emission point ref. no. (as per flow diagram)	Description	Malfunction which could cause an emission	Emission details (Potential max. emissions)[1] (based on UKOOA emission factors)				
			Material	mg/Nm^3	kg/hour	Qty per event (kg)	Comment
A4-1	Ground Flare	Gas Compressor A – Manual Blowdown (discharge)	NOx CO	101.6 567.3	10.1 56.6	1.3 7.1	
A4-1	Ground Flare	Gas Compressor A – Purging (discharge)	HC	HC	8450	138.0	HC purged out with nitrogen
A4-1	Ground Flare Ground Flare	Gas Compressor B – Manual Blowdown (suction)	NOx CO	101.6 567.3	10.1 56.6	2.8 15.4	
A4-1	Ground Flare	Gas Compressor B – Purging (Suction)	HC	HC	8450	298.0	HC purged out with nitrogen
A4-1	Ground Flare Ground Flare	Gas Compressor B – Manual Blowdown (discharge)	NOx CO	101.6 567.3	10.1 56.6	1.3 7.1	
A4-1	Ground Flare	Gas Compressor B – Purging (discharge)	HC	HC	8450	138.0	HC purged out with nitrogen
A4-2	LP Flare	Condensate Flash Drum Pressure Control	HC	N/A	1066.0	13826.0*	Qty per year
A4-2	LP Flare	Methanol Reflux Drum Pressure Control	HC CO	N/A N/A	33.0 0.0	NNF NNF	
A4-2	LP Flare	Heating Medium Surge Drum	HC	N/A	255.6	NNF	
A4-2	LP Flare	Heating Medium Drains Vessel	HC	101.6	10.1	1.3	

[1] Estimate the potential maximum emission for each malfunction identified.

TABLE E.1(v): EMISSIONS TO ATMOSPHERE – Fugitive and Potential atmospheric emissions

Emission point ref. no. (as per flow diagram)	Description	Malfunction which could cause an emission	Emission details (Potential max. emissions)[1] (based on UKOOA emission factors)				
			Material	mg/Nm^3	kg/hour	Qty per event (kg)	Comment
A4-2	LP Flare	Compressor A Turbine Fuel Gas Vent	HC	N/A	386.0	96.0	
A4-2	LP Flare	Compressor A Skid Vent - Turbine Pilot Gas Purge	HC	N/A	170.0	26.0	
A4-2	LP Flare	Compressor A Skid Vent - Routine	HC	N/A	7.6	13060.0*	HC qty per year
A4-2	LP Flare	Compressor A Skid Vent - Emergency	HC	N/A	58.0	NNF	
A4-2	LP Flare	Compressor B Turbine Fuel Gas Vent	HC	N/A	386.0	96.0	
A4-2	LP Flare	Compressor B Skid Vent - Turbine Pilot Gas Purge	HC	N/A	170.0	NNF	
A4-2	LP Flare	Compressor B Skid Vent - Routine	HC	N/A	1.4	NNF	
A4-2	LP Flare	Compressor B Skid Vent - Emergency	HC	N/A	58.0	NNF	
A4-2	LP Flare	Pig Receiver	HC	N/A	0.0	224.0	

[1] Estimate the potential maximum emission for each malfunction identified.

TABLE E.2(i): EMISSIONS TO SURFACE WATERS (One page for each emission)

Emission Point: SW3 Treated Produced Water

Emission Point Ref. Nº:	SW3
Source of Emission:	Treated Produced Water
Location :	Corrib Manifold approximately 65km offshore (c 92.5km along the pipeline route from the Terminal)
Grid Ref. (12 digit, 6E,6N):	54º 20.34 ' N; 11º 03.51 ' W (latitude and longitude co-ordinates are given due to offshore location)
Name of receiving waters:	Atlantic Ocean
Flow rate in receiving waters:	Not Applicable $m^3.sec^{-1}$ Dry Weather Flow Not Applicable $m^3.sec^{-1}$ 95%ile flow
Available waste assimilative capacity:	Not Available kg/day

Emission Details:

(i) Volume to be emitted			
Normal/day	80 m^3	Maximum/day	80 m^3
Maximum rate/hour	3.33m^3		

(ii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	60 min/hr 24 hr/day 7 day/yr

80m^3/day maximum is proposed as a daily maximum discharge rate in the event it is possible to pump more water through the cores than the initial calculations suggest.
Actual discharge is likely to be in the region of 65m^3/day.

TABLE E.2(ii): EMISSIONS TO SURFACE WATERS - Characteristics of the emission (1 table per emission point)

Emission point reference number : **SW3 Treated Produced Water**

Parameter	Prior to treatment[1]				As discharged[3]				% Efficiency
	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day	kg/year	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day[2]	kg/year[2]	
pH	4.6-7.4				6-9	6-9			
COD	500	500	72	14,454	400	400	32	11690	20
Suspended solids	320	320	46.08	9,251	5	5	0.4	146	98.4
Total Nitrogen (N)					10	10	0.80	292	N/A
Polyaromatic hydrocarbons (PAH)	1	1	0.14	28.9	0.0002	0.0002	1.6×10^{-5}	5.8×10^{-3}	99.9
Oils, Fats, Grease	15	15	2.16	434	0.3-5.0	0.3-5.0	0.024 – 0.400	8.8-146	66-98
Phenol	10	10	1.44	289	0.001	0.001	8.0×10^{-5}	0.029	99.9
Metals (As,Cd,Cr,Cu,Hg,Ni,Pb,Zn)	45.4	45.4	6.5	1,312	0.5	0.5	0.04	14.6	98.9
BTEX	25	25	3.6	723	0.01-0.1	0.01-0.1	.0008-.008	0.29-2.92	99.6-99.9
TOC (incl methanol)	200	200	28.8	5782	100	100	8.0	2920	50
Chromium	1.24	1.24	0.18	35.8	0.1	0.1	.008	2.92	91.9
Arsenic	0.5	0.5	0.07	14	0.05	0.05	.004	1.46	89.6
Cadmium	0.05	0.05	0.01	1.4	0.005	0.005	4.0×10^{-4}	0.146	90.0
Mercury	1	1	0.14	28.9	0.0001	0.0001	8.0×10^{-6}	2.9×10^{-3}	99.9
Lead	1.51	1.51	0.22	44	0.005	0.005	4.0×10^{-4}	0.146	99.7
Copper	0.44	0.44	0.06	13	0.05	0.05	0.04	14.6	88.64
Biocide - DBNPA	0	0	0	0	234 (200ppm)	234 (200ppm)	1.27	462[4] ($0.395m^3$)	

(1) All 'prior to treatment' figures are as per original IPPC licence application
(2) Daily and yearly mass emission rates are based on the on $80m^3$/day of treated produced water being discharge. Actual discharge is likely to be in the region of $65m^3$/day.
(3) Concentrations are as per existing IPPC licence or, if not stipulated in licence, as per original IPPC application.
(4) Based on 2 hour discharge per day. DBNPA was not part of the original IPPC application.

TABLE E.2(i): EMISSIONS TO SURFACE WATERS (One page for each emission)

Emission Point: SW1 Treated Surface Water from process areas

Emission Point Ref. Nº:	SW1
Source of Emission:	Treated Surface Water
Location :	Outfall Pipe 12.7km offshore from landfall location
Grid Ref. (12 digit, 6E,6N):	54º 19.72 ' N; 09º 59.46 ' W (latitude and longitude co-ordinates are given due to offshore location)
Name of receiving waters:	Atlantic Ocean
Flow rate in receiving waters:	Not Applicable $m^3.sec^{-1}$ Dry Weather Flow Not Applicable $m^3.sec^{-1}$ 95%ile flow
Available waste assimilative capacity:	Not Available kg/day

Emission Details:

(i) Volume to be emitted			
Normal/day	50 m^3	Maximum/day	720 m^3
Maximum rate/hour	30 m^3		

(ii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	60 min/hr 24 hr/day 7 day/yr

TABLE E.2(ii): EMISSIONS TO SURFACE WATERS - Characteristics of the emission (1 table per emission point)

Emission point reference number: ***SW1 Treated Surface Water from process areas***

Parameter	Prior to treatment				As discharged[2]				% Efficiency
	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day	kg/year	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day[1]	kg/year[1]	
pH	7	7	N/A	N/A	6-9	6-9	N/A	N/A	N/A
Suspended Solids	<300	<300	216	5,519	5	5	3.6	92	98.3
Dissolved Solids	<100	<100	72	1,840	Negligible	Negligible	N/A	N/A	N/A
Oil Content	50-1000	50-1000	36-720	920-18,396	0.3-5.0	0.3-5.0	0.216-3.6	5.5-92	99.4-99.5

(1) Daily mass emission rates (kg/day) calculated on the basis of design capacity of surface water treatment system of 30 m3/hr. Annual mass emission rates (kg/year) calculated on the basis of typical surface area draining to treatment system estimated at 2.1m3/hr based on a maximum annual rainfall recorded at Belmullet Meteorological Station of 1447.8mm.
(2) Discharge concentrations are generally as per current IPPC licence or original IPPC licence application.

TABLE E.2(i): EMISSIONS TO SURFACE WATERS (One page for each emission)

Emission Point: SW2 Uncontaminated Surface Water

Emission Point Ref. Nº:	SW2
Source of Emission:	Uncontaminated surface water runoff from Terminal (excluding process areas)
Location :	R314 Road Drainage Ditch (D16) to south-west of Terminal
Grid Ref. (12 digit, 6E,6N):	085982 E, 332362 N
Name of receiving waters:	Drainage ditch (D16) drains to Muingingaun River
Flow rate in receiving waters:	Not Applicable $m^3.sec^{-1}$ Dry Weather Flow Not Applicable $m^3.sec^{-1}$ 95%ile flow
Available waste assimilative capacity:	Not Available kg/day

Emission Details:

(i) Volume to be emitted			
Normal/day	Rainfall dependent	Maximum/day	Rainfall dependent
Maximum rate/hour	Rainfall dependent		

(ii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	Intermittent - dependent on rainfall

TABLE E.2(ii): EMISSIONS TO SURFACE WATERS - Characteristics of the emission (1 table per emission point)

Emission point reference number: **SW2**

Parameter	Prior to treatment				As discharged				% Efficiency
	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day	kg/year	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day	kg/year	
Suspended Solids	N/A	N/A	N/A	N/A		30	Dependent on rainfall	Dependent on rainfall	N/A
pH	N/A	N/A	N/A	N/A	6-9	6-9	-	-	
Hydrocarbons	N/A	N/A	N/A	N/A	0.3	0.3	Dependent on rainfall	Dependent on rainfall	N/A
Phosphorus Note 1	N/A	N/A	N/A	N/A	N/A	1.0	Dependent on rainfall	Dependent on rainfall	N/A
COD	N/A	N/A	N/A	N/A	91	91	Dependant on rainfall	Dependant on rainfall	N/A
Iron	N/A	N/A	N/A	N/A	0.58	0.58	Dependant on rainfall	Dependant on rainfall	N/A
Manganese	N/A	N/A	N/A	N/A	0.022	0.022	Dependant on rainfall	Dependant on rainfall	N/A
Aluminium	N/A	N/A	N/A	N/A		0.2	Dependant on rainfall	Dependant on rainfall	

(1) Molybdate Reactive Phosphorus Median Concentration

TABLE E.3(i): EMISSIONS TO SEWER (One page for each emission)

Emission Point: NOT APPLICABLE

Emission Point Ref. Nº:	
Location of connection to sewer:	
Grid Ref. (12 digit, 6E,6N):	
Name of sewage undertaker:	

Emission Details: NOT APPLICABLE

(i) Volume to be emitted			
Normal/day	m^3	Maximum/day	m^3
Maximum rate/hour	m^3		

(ii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	_____min/hr _____hr/day _____day/yr

TABLE E.3(ii): EMISSIONS TO SEWER - Characteristics of the emission (1 table per emission point)

Emission point reference number : _____

Parameter	Prior to treatment				As discharged				% Efficiency
	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day	kg/year	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day	kg/year	

TABLE E.4(i): EMISSIONS TO GROUND (1 Page for each emission point)

Emission Point or Area: Emission from Puraflo System - SL1

Emission Point/Area Ref. Nº:	**SL1**
Emission Pathway: (borehole, well, percolation area, soakaway, landspreading, etc.)	Percolation Area
Location :	Near Admin Area Car Park
Grid Ref. (12 digit, 6E,6N):	086800E, 333037N
Elevation of discharge: (relative to Ordnance Datum)	33.4m AOD (Malin)
Aquifer classification for receiving groundwater body:	Poor Generally Unproductive Aquifer (Pu)
Groundwater vulnerability assessment (including vulnerability rating):	Moderate (M) - majority of site (including percolation area) High (H) - small area in north of site (Refer to Aquifer Classification and Vulnerability Map in Attachment I.4).
Identity and proximity of groundwater sources at risk (wells, springs, etc):	Geological Survey of Ireland (GSI) well database and audit undertaken by SEPIL indicate no domestic wells within 500m radius of the percolation area.
Identity and proximity of surface water bodies at risk:	Surface water bodies are not at risk. Surface water bodies in the area and distances from site boundary (excluding drainage ditches adjacent to site) include the Bellanaboy River (ca. 100m), Muingingaun River (ca. 350m), Carrowmore Lake (ca. 2.2km), the Glenamoy River (ca. 1.1km) and Sruwaddacon Bay (ca. 1.3km)

Emission Details:

(i) Volume to be emitted			
Normal/day	ca. 4.5 m^3	Maximum/day	ca. 4.5 m^3
Maximum rate/hour	0.1875 m^3		

(ii) Period or periods during which emissions are made, or are to be made, including daily or seasonal variations (*start-up /shutdown to be included):*

Periods of Emission (avg)	60 min/hr 24 hr/day 365 day/yr

Emission point / area reference number: **SL1**

Parameter	Prior to treatment				As discharged				% Efficiency
	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day	kg/year	Max. hourly average (mg/l)	Max. daily average (mg/l)	kg/day	kg/year	
pH	Typical Domestic strength effluent	Typical Domestic strength effluent	N/A	N/A	5-8	5-8	N/A	N/A	N/A
BOD	Typical Domestic strength effluent	Typical Domestic strength effluent	N/A	N/A	< 15	< 15	0.07	26	N/A
Suspended Solids	Typical Domestic strength effluent	Typical Domestic strength effluent	N/A	N/A	< 15	< 15	0.07	26	N/A
NH_3-N	Typical Domestic strength effluent	Typical Domestic strength effluent	N/A	N/A	< 5	< 5	0.02	7	N/A
Nitrate-N	Typical Domestic strength effluent	Typical Domestic strength effluent	N/A	N/A	20	20	0.09	33	N/A

* Mass emission rates (kg/day) are based on an estimated flow of 4.5 m^3/day (calculated based on 50 employees on site over a 24 hour period)

Table E.5(i): NOISE EMISSIONS - Noise sources summary sheet (revised)

Source	Emission Point Reference No.	Equipment reference No	Sound Power [1] Level dBA at source	Octave bands (Hz) Sound Power[1] Levels dB (unweighted) per band								Impulsive or tonal qualities	Periods of Emission	OTHER COMMENTS [2]
				63	125	250	500	1K	2K	4K	8K			
Generator Building Ceiling area Roof	N1	B1X9 Roof	61	79	72	65	50	40	27	13	-	None	Continuous	
Not Allocated	N2													
Not Allocated	N3													
Generator Building Switch Room – South Wall	N4	B1X9 SWall	58	76	70	62	48	38	24	11	-	None	Continuous	
Generator A Exhaust	N5	G8801A	86	94	94	84	82	78	76	76	73	None	Continuous	
Generator B Exhaust	N6	G8801B	86	94	94	84	82	78	76	76	73	None	Continuous	
Generator C Exhaust	N7	G8801C	86	94	94	84	82	78	76	76	73	None	Continuous	
Generator A Jacket Cooler	N8	E8801D	83	83	85	82	80	79	73	68	58	None	Continuous	
Generator B Jacket Cooler	N9	E8801E	83	83	85	82	80	79	73	68	58	None	Continuous	
Generator C Jacket Cooler	N10	E8801F	83	83	85	82	80	79	73	68	58	None	Continuous	
Generator A Mixture Cooler	N11	E8801A	79	79	81	78	76	75	68	63	53	None	Continuous	
Generator B Mixture Cooler	N12	E8801B	79	79	81	78	76	75	68	63	53	None	Continuous	
Sales Gas Compressor Building - Roof	N13	B2 Roof	88	108	102	78	62	60	59	45	22	None	Continuous	
Sales Gas Compressor A - Gas Turbine Intake	N14	K2002A	85	108	88	59	50	47	45	71	79	None	Continuous	
Sales Gas Compressor B - Gas Turbine Intake	N15	K2002B	85	108	88	59	50	47	45	71	79	None	Continuous	Standby Source - Not modelled
Sales Gas Compressor A - Gas Turbine Exhaust	N16	K2002A	86	105	96	82	81	77	75	73	74	None	Continuous	
Sales Gas Compressor B - Gas Turbine Exhaust	N17	K2002B	86	105	96	82	81	77	75	73	74	None	Continuous	Standby Source - Not modelled
Sales Gas Compressor A - Gas Turbine Ventilation	N18	K2002A	78	86	87	77	70	71	70	70	67	None	Continuous	
Sales Gas Compressor B - Gas Turbine	N19	K2002B	78	86	87	77	70	71	70	70	67	None	Continuous	Standby Source - Not modelled
Sales Gas Compressor A - Suction KO Drum	N20	D2009A	83	65	79	83	84	74	65	55	48	None	Continuous	
Sales Gas Compressor B - Suction KO Drum	N21	D2009B	83	65	79	83	84	74	65	55	48	None	Continuous	Standby Source - Not modelled
Sales Gas Compressor A - Gas Turbine Oil Cooler	N22	E2002A	87	102	98	92	81	70	72	74	71	None	Continuous	

Source	Emission Point Reference No.	Equipment reference No	Sound Power [1] Level dBA at source	Octave bands (Hz) Sound Power[1] Levels dB (unweighted) per band								Impulsive or tonal qualities	Periods of Emission	OTHER COMMENTS [2]
				63	125	250	500	1K	2K	4K	8K			
Sales Gas Compressor B - Gas Turbine Oil Cooler	N23	E2002B	87	102	98	92	81	70	72	74	71	None	Continuous	Standby Source - Not modelled
Sales Gas Compressor A - Aftercooler	N24	E2005A	96	91	96	92	97	87	86	72	62	None	Continuous	modified estimate to include aerodynamic noise
Sales Gas Compressor B - Aftercooler	N25	E2005B	96	91	96	92	97	87	86	72	62	None	Continuous	Standby Source - Not modelled
Odourisation Package	N26	N2002	86	70	75	81	81	81	81	75	70	None	Continuous	Modified vendor data
~~Heating Medium Fired Heater Inlet~~	~~N27~~	~~H5001~~	~~88~~	~~92~~	~~92~~	~~90~~	~~85~~	~~83~~	~~75~~	~~5~~	~~61~~	None	Continuous	Deleted
~~Heating Medium Fired Heater Outlet~~	~~N28~~	~~H5001~~	~~86~~	~~99~~	~~93~~	~~87~~	~~80~~	~~78~~	~~76~~	~~75~~	~~74~~	None	Continuous	Deleted
Heating Medium Circulation Pump	N29	P5002	94	82	86	86	87	90	87	83	77	None	Continuous	
Heating Medium Closed Drains Pump	N30	P8202	80	72	75	75	74	76	76	71	66	None	Continuous	
Condensate Loading Pump	N31	P3001	85	75	79	79	79	82	81	76	71	None	Continuous	
LP Condensate Pump	N32	P3002	84	81	81	79	81	82	79	74	69	None	Continuous	
Condensate Transfer Pump	N33	P3004	85	76	80	80	78	80	77	72	67	None	Continuous	
Condensate Cooler/ Condenser	N34	E3002	87	93	98	84	99	89	88	74	64	None	Continuous	
LP Gas Compressor	N35	K3001										None	Continuous	See sources ref: N35 further down list
LP Compressor Casing	N35	K3001A	91	93	99	99	65	65	65	62	55	None	Continuous	Area Source
LP Compressor Suction	N35	K3001A	94	96	102	102	68	68	68	65	58	None	Continuous	Area Source
LP Compressor Discharge	N35	K3001A	94	96	102	102	68	68	68	65	58	None	Continuous	Area Source
LP Gas Compressor Aftercooler A	N36	E3003A	98	93	99	94	99	89	88	74	64	None	Continuous	Modified estimate to include aerodynamic noise
LP Gas Compressor Aftercooler B	N37	E3003B	98	93	99	94	99	89	88	74	64	None	Continuous	Standby Source not modelled
Methanol Condenser	N38	E4002	101	96	101	97	102	92	91	77	67	None	Continuous	revised vendor

Source	Emission Point Reference No.	Equipment reference No	Sound Power [1] Level dBA at source	Octave bands (Hz) Sound Power[1] Levels dB (unweighted) per band								Impulsive or tonal qualities	Periods of Emission	OTHER COMMENTS [2]
				63	125	250	500	1K	2K	4K	8K			
														data
Methanol Feed Pump	N39	P4001	86	81	81	79	81	82	79	74	69	None	Continuous	revised vendor data
Methanol Reflux Pump	N40	P4003	86	81	81	79	81	82	79	74	69	None	Continuous	revised vendor data
Choke Valve Methanol Injection Pump	N41	P4005	86	81	81	79	81	82	79	74	69	Impulsive (at source)	Continuous	revised estimate
Terminal Methanol Injection Pump	N42	P4006	84	68	73	79	79	79	79	73	68	Impulsive (at source)	Continuous	revised estimate
Methanol Export Booster Pump	N43	P4009	83	73	77	76	76	79	77	72	66	None	Continuous	revised vendor data
Methanol Still Scale Inhibitor Package	N44	N4001	86	89	87	85	83	81	78	73	68	None	Continuous	
Corrosion Inhibitor Package	N45	N9001	81	65	70	76	76	76	76	70	65	None	Continuous	revised vendor data
Air Compressor Package	N46	N8501	91	94	92	90	88	86	83	78	73	None	Continuous	
Nitrogen Generation Package	N47	N8601	85	88	86	84	82	80	77	72	67	None	Continuous	
Chlorination Package	N48	N8902	84	68	73	79	79	79	79	73	68	None	Continuous	revised estimate
Diesel Distribution Pump	N49	P8801	79	66	71	71	71	71	75	71	67	None	Continuous	revised vendor data
Potable Water Distribution Pump	N50	P8901	82	71	75	75	76	77	77	72	67	None	Daytime Only	revised vendor data
Service Water Distribution Pump	N51	P8902	85	47	60	67	74	82	79	76	70	None	Continuous	revised vendor data
Waste Water Building	N52	General	104	113	112	109	101	96	86	70	50	None	Continuous	modelled as area sources
Waste Water Pump	N53	P4002	81	72	76	76	75	77	75	72	67	None	Continuous	revised vendor data
Not Allocated	N54													
Not Allocated	N55													
Treated Produced Water Sump Pump	N56	P6005	82	73	77	77	76	78	76	71	66	None	Continuous	revised vendor data
Produced Water CPI Feed Pump	N57	P6001A	86	89	87	85	83	81	78	73	68	None	Continuous	
Treated Water Pump	N58	P8301A	88	72	77	83	83	83	83	77	72	None	Continuous	revised estimate

Source	Emission Point Reference No.	Equipment reference No	Sound Power [1] Level dBA at source	Octave bands (Hz) Sound Power[1] Levels dB (unweighted) per band								Impulsive or tonal qualities	Periods of Emission	OTHER COMMENTS [2]
				63	125	250	500	1K	2K	4K	8K			
Not Allocated	N59													
Not Allocated	N60													
Oil Sump Pump	N61	P8303	84	79	79	77	78	79	78	75	68	None	Continuous	
Closed Drains Drum Sump Pump	N62	P8204	86	70	75	81	81	81	81	75	70	None	Continuous	
Maintenance Flare	N63	N8111	106	107	101	94	88	92	98	102	100	None	Continuous	
Firewater Pump House Section 1- Roof	N64	B3X1 Roof	104	122	118	99	82	74	69	50	29	None	Testing1 pump for 1 hour per week day only	
Firewater Pump A Exhaust	N65	P8701A exh	90	93	91	90	87	85	82	77	72	None	Testing1 pump for 1 hour per week day only	
Firewater Pump B Exhaust	N66	P8701B exh	90	93	91	90	87	85	82	77	72	None	Testing1 pump for 1 hour per week day only	
Firewater Pump C Exhaust	N67	P8701C exh	90	93	91	90	87	85	82	77	72	None	Testing1 pump for 1 hour per week day only	
Firewater Pump D Exhaust	N68	P8701D exh	90	93	91	90	87	85	82	77	72	None	Testing1 pump for 1 hour per week day only	
Emergency Generator Enclosure	N69	G8802 encl	102	105	103	101	99	97	94	89	84	None	Testing1 hour per week day only	
Emergency Generator Exhaust	N70	G8802 Exh	103	107	107	102	102	97	92	92	89	None	Testing1 hour per week day only	
Local Equipment Room No.1– Supply SF5 Inlet	N71	B99 HV SF5	80	76	22	82	78	75	63	57	62	None	Continuous	
Local Equipment Room No.1 – Extract EF5 Discharge	N72	B99 HV EF5	87	84	84	85	80	79	82	76	68	None	Continuous	
~~Administration Building – Supply SF7 Inlet~~	~~N73~~	~~B15 HV SF7~~	~~64~~	~~60~~	~~62~~	~~66~~	~~63~~	~~53~~	~~50~~	~~53~~	~~51~~	None	Continuous	Deleted – Negligible Source
~~Administration Building – Extract EF12 Outlet~~	~~N74~~	~~B15 HVEF12~~	~~66~~	~~66~~	~~68~~	~~68~~	~~64~~	~~60~~	~~52~~	~~43~~	~~54~~	None	Continuous	Deleted – Negligible Source
Generator Building generator A - East wall	N75	B1X1 EWall	64	77	77	60	52	45	39	37	21	None	Continuous	
Generator Building	N76	B1X1 NWall	68	83	83	67	59	51	45	43	27	None	Continuous	

Source	Emission Point Reference No.	Equipment reference No	Sound Power [1] Level dBA at source	Octave bands (Hz) Sound Power[1] Levels dB (unweighted) per band								Impulsive or tonal qualities	Periods of Emission	OTHER COMMENTS [2]
				63	125	250	500	1K	2K	4K	8K			
Generator A – North Wall														
Generator Building Generator B - North Wall	N77	B1X2 NWall	69	83	83	67	58	51	45	43	27	None	Continuous	
Generator Building Generator C – North Wall	N78	B1X3 NWall	60	77	74	53	41	31	24	19	-	None	Continuous	
Generator Building Generator C - West Wall	N79	B1X3 WWall	53	71	68	47	35	24	18	12	-	None	Continuous	
Generator Building Section 1 –Equipment door	N80	B1X1D2	83	102	95	86	75	68	62	55	51	None	Continuous	
Generator Building Section 2 – Equipment door	N81	B1X2D2	83	102	95	86	75	68	62	55	51	None	Continuous	
Generator Building Section 3 - Equipment Door	N82	B1X3D2	83	102	95	86	75	68	62	55	51	None	Continuous	
Generator Building Ceiling (via North Wall)	N83	B1X35NWall	65	84	78	50	59	51	37	32	18	None	Continuous	
Generator Building Ceiling (via West Wall)	N84	B1X5WWall	63	83	76	48	57	49	36	31	17	None	Continuous	
Generator Building Power Generation Cell Hot Inlet East	N85	B1 FD10	76	93	90	75	63	58	59	60	62	None	Continuous	
Generator Building Power Generation Cell Hot Inlet West	N86	B1 FD9	76	93	90	75	63	58	59	60	62	None	Continuous	
Generator Building Power Generation Extract EF1 outlet	N87	B1 HV EF1	86	97	91	79	74	69	79	82	79	None	Continuous	duty increase +4dB added to previous data ref TN19
Generator Building Power Generation Extract EF3 Outlet	N88	B1 HV EF3	78	94	85	84	68	60	57	59	66	None	Continuous	duty increase +1dB added to previous data ref TN19
Generator Building Power Generation Supply SF1 Inlet	N89	B1 HV SF1	79	96	91	77	71	68	67	65	63	None	Continuous	duty increase +1dB added to previous data ref TN19
Generator Building Power Generation Supply SF3	N90	B1 HV SF3	70	87	82	68	62	59	58	56	54	None	Continuous	duty increase +1dB added to

Source	Emission Point Reference No.	Equipment reference No	Sound Power [1] Level dBA at source	Octave bands (Hz) Sound Power[1] Levels dB (unweighted) per band								Impulsive or tonal qualities	Periods of Emission	OTHER COMMENTS [2]
				63	125	250	500	1K	2K	4K	8K			
Inlet														previous data ref TN19
Generator Building HVAC Room - South Wall	N91	B1X10SWall	60	73	71	64	48	51	41	27	13	None	Continuous	
Generator Building HVAC Room – West Wall	N92	B1X14WWal	56	69	66	59	52	47	37	23	9	None	Continuous	
Generator Building HVAC Room – East Wall	N93	B1X8EWall	56	69	66	59	52	47	37	23	9	None	Continuous	
Generator Building HVAC Room - Roof	N94	B1X4 Roof	64	77	74	67	60	55	45	31	17	None	Continuous	
Generator Building Switch Room - East Wall	N95	B1X7EWall	52	70	64	56	42	32	18	5	-	None	Continuous	
Generator Building Switch Room – West Wall	N96	B1X8WWal	52	70	64	56	42	32	18	5	-	None	Continuous	
Generator C Mixture Cooler	N97	E8801C	79	79	81	78	76	75	68	63	53	None	Continuous	
Sales Gas Compressor Building - East Wall	N98	B2 E Wall	86	106	100	76	60	58	57	43	20	None	Continuous	
Sales Gas Compressor Building - North Wall	N99	B2 N Wall	88	108	101	78	61	59	58	45	22	None	Continuous	
Sales Gas Compressor Building - South Wall	N100	B2 S Wall	88	108	101	78	61	59	58	45	22	None	Continuous	
Sales Gas Compressor Building - West Wall	N101	B2 W Wall	86	106	100	76	60	58	57	43	20	None	Continuous	
Sales Gas Compressor Building - Main Access Door	N102	B2 D1	79	100	90	75	63	59	53	48	41	None	Continuous	
Sales Gas Compressor Building – HVAC Room East Wall	N103	B2HV Ewall	68	79	83	68	55	48	44	22	-	None	Continuous	duty increase +4dB added to previous data ref TN19
Sales Gas Compressor Building – HVAC Room Roof	N104	B2HV Roof	70	81	85	69	57	50	46	24	-	None	Continuous	duty increase +4dB added to previous data ref TN19
Sales Gas Compressor Building – HVAC Room West Wall	N105	B2HV Wwall	69	80	84	69	56	50	45	23	-	None	Continuous	duty increase +4dB added to previous data ref

Source	Emission Point Reference No.	Equipment reference No	Sound Power [1] Level dBA at source	Octave bands (Hz) Sound Power[1] Levels dB (unweighted) per band								Impulsive or tonal qualities	Periods of Emission	OTHER COMMENTS [2]
				63	125	250	500	1K	2K	4K	8K			
														TN19
Sales Gas Compressor Building – HVAC Extract Outlet	N106	B2HVACextr	92	94	94	79	82	77	87	86	86	None	Continuous	duty increase +4dB added to previous data ref TN19
Sales Gas Compressor Building – HVAC Supply Inlet	N107	B2HVACin	88	102	96	87	77	54	48	52	67	None	Continuous	duty increase +4dB added to previous data ref TN19
Backwash Air Blower	N108	K8301	87	89	88	86	84	82	79	74	69	None	Continuous	
Sand Filter Feed Pump	N109	P6004A	85	88	86	84	82	80	77	72	67	None	Continuous	
Oil Transfer Pump	N110	P6007	79	63	68	74	74	74	74	68	63	None	Continuous	revised vendor data
Treated Produced Water Disposal Pump	N111	P6025A	86	81	81	79	81	82	79	74	69	None	Continuous	
Treated Produced Water Disposal Pump	N112	P6026A	86	81	81	79	81	82	79	74	69	None	Continuous	
Treated Produced Water Booster Pumps	N113	P8302	74	58	63	69	69	69	69	63	58	None	Continuous	
Multi Media Backwash Feed Pump	N114	P8308	75	59	64	70	70	70	70	64	59	None	Continuous	
Firewater Pump House Doors	N115	B3 D1	103	116	115	107	97	93	88	82	76	None	Continuous	
Firewater Pump House Section 1 – North Wall	N116	B3X1 NWall	96	113	110	91	74	66	61	42	21	None	Testing1 pump for 1 hour per week day only	
FW Pump House Section 1 –South Wall	N117	B3X1 SWall	96	113	110	91	74	66	61	42	21	None	Testing1 pump for 1 hour per week day only	
FW Pump House Section 1 – West Wall	N118	B3X1 WWall	97	115	112	92	75	67	62	43	22	None	Testing1 pump for 1 hour per week day only	
Firewater Pump House Section 2 – South Wall	N119	B3X2 SWall	96	113	110	91	74	66	61	42	21	None	Testing1 pump for 1 hour per week day only	
Firewater Pump House Section 2 – East Wall	N120	B3X2 EWall	97	115	112	92	75	67	62	43	22	None	Testing1 pump for 1 hour per week day only	

Source	Emission Point Reference No.	Equipment reference No	Sound Power [1] Level dBA at source	Octave bands (Hz) Sound Power[1] Levels dB (unweighted) per band								Impulsive or tonal qualities	Periods of Emission	OTHER COMMENTS [2]
				63	125	250	500	1K	2K	4K	8K			
Firewater Pump House Section 2 - North Wall	N121	B3X2 NWall	96	113	110	91	74	66	61	42	21	None	Testing1 pump for 1 hour per week day only	
Firewater Pump House Section 2 – Roof	N122	B3X2 Roof	104	122	118	99	82	74	69	50	30	None	Testing1 pump for 1 hour per week day only	
Firewater Pump House – HVAC Inlet	N123	B3A HV in	97	111	108	102	91	81	74	75	69	None	Continuous	
Firewater Pump House – HVAC Outlet	N124	B3A HV out	97	111	108	102	91	81	74	75	69	None	Continuous	
Offspec Condensate Pump	N125	P3005	86	81	81	79	81	82	79	74	69	None	Continuous	
W/Head Meth Inj Pump	N126	P4004	86	81	81	79	81	82	79	74	69	None	Continuous	
Heating Medium Transfer Pump	N127	P5001	88	84	84	82	83	84	81	73	71	None	Continuous	
UF Recirculation Pump	N128	P6008	85	69	74	80	80	80	80	74	69	None	Continuous	
Lime Slurry Recirculation Pump	N129	P6015	79	63	68	74	74	74	74	68	63	None	Continuous	
Closed Drain Drum Pump	N130	P8201	91	78	80	82	83	82	85	86	81	None	Continuous	
Road Drainage Sump Pump	N131	P8203	84	79	79	77	78	79	78	75	68	None	Continuous	
Drain Water Sump Pump	N132	P8205	82	73	77	77	76	78	76	71	66	None	Daytime only	
Fire Water Transfer Pump	N133	P8304	95	79	84	90	90	90	90	84	79	None	Continuous	
Multimedia Filter Feed Pump	N134	P8305	90	74	79	85	85	85	85	79	74	None	Continuous	
Surface Water TPS Feed Pump	N135	P8306	97	81	86	92	92	92	92	86	81	None	Continuous	
Surface Water Pump	N136	P8307	79	63	68	74	74	74	74	68	63	None	Continuous	
Fire Water Pump Transfer Pump	N137	P8314	95	79	84	90	90	90	90	84	79	None	Daytime only	
Fire Water Pump	N138	P8701	102	86	91	97	97	97	97	91	86	None	Daytime only	
Fire water Jockey pump	N139	P8702	95	84	88	88	89	91	89	86	79	None	Continuous	
Fire water Jockey pump	N140	P8702	95	84	88	88	89	91	89	86	79	None	Continuous	
Fire water sump pump	N141	P8703	86	70	75	81	81	81	81	75	70	None	Continuous	
Urea Solution Transfer Pump	N142	P8811	74	58	63	69	69	69	69	63	58	None	Continuous	

Source	Emission Point Reference No.	Equipment reference No	Sound Power [1] Level dBA at source	Octave bands (Hz) Sound Power[1] Levels dB (unweighted) per band								Impulsive or tonal qualities	Periods of Emission	OTHER COMMENTS [2]
				63	125	250	500	1K	2K	4K	8K			
Offshore Termination Unit	N143	N1010	81	72	72	72	74	75	76	73	72	None	Continuous	
S/G Comp Lube Oil Cooler	N144	E2008A	96	94	93	95	91	91	88	83	83	None	Continuous	
Methanol Med Dump Cooler	N145	E5001	97	92	98	93	98	88	87	73	63	None	Continuous	
Oil Skimmer	N146	N8303	97	81	86	92	92	92	92	86	81	None	Continuous	
Transformer	N147	ETR320A	96	92	95	95	95	91	85	79	67	None	Continuous	
Transformer	N148	ETR320B	96	92	95	95	95	91	85	79	67	None	Continuous	
Pipework (Section 1) from Gas/Gas Exchanger (E2004) to Sales Gas Compressor Suction KO Drum (D2009A/B)	N149	PG-0105 X1	64	36	43	51	56	60	57	54	49	Tonal (at source)	Continuous	Line Source
Pipework (Section 2) from Gas/Gas Exchanger (E2004) to Sales Gas Compressor Suction KO Drum (D2009A/B)	N150	PG-0105 X2	70	41	49	57	63	66	64	60	55	Tonal (at source)	Continuous	Line Source
Pipework (Section 3) from Gas/Gas Exchanger (E2004) to Sales Gas Compressor Suction KO Drum (D2009A/B)	N151	PG-0105 X3	74	45	53	62	67	70	68	64	60	Tonal (at source)	Continuous	Line Source
Pipework (Section 4) from Gas/Gas Exchanger (E2004) to Sales Gas Compressor Suction KO Drum (D2009A/B)	N152	PG-0105 X4	79	45	53	63	72	75	73	68	62	Tonal (at source)	Continuous	Line Source
Pipework (Section 1) from Sales Gas Compressor Suction KO Drum (D2009A/B) to Sales Gas Compressor (K2002A/B)	N153	PG-0106 X1	82	74	69	71	80	78	75	70	63	Tonal (at source)	Continuous	Line Source
Pipework (Section 2) from Sales Gas Compressor Suction KO Drum (D2009A/B) to Sales Gas Compressor (K2002A/B)	N154	PG-0106 X2	85	77	72	74	83	81	78	73	66	Tonal (at source)	Continuous	Line Source

Source	Emission Point Reference No.	Equipment reference No	Sound Power [1] Level dBA at source	Octave bands (Hz) Sound Power[1] Levels dB (unweighted) per band								Impulsive or tonal qualities	Periods of Emission	OTHER COMMENTS [2]
				63	125	250	500	1K	2K	4K	8K			
Pipework (Section 3) from Sales Gas Compressor Suction KO Drum (D2009A/B) to Sales Gas Compressor (K2002A/B)	N155	PG-0106 X3	78	77	72	74	78	71	68	63	56	Tonal (at source)	Continuous	Line Source
Pipework (Section 1) from Sales Gas Compressor (K2002A/B) to Sales Gas Compressor Aftercooler (E2005A/B)	N156	PG-0107 X1	81	74	69	66	75	77	74	70	64	Tonal (at source)	Continuous	Line Source
Pipework (Section 2) from Sales Gas Compressor (K2002A/B) to Sales Gas Compressor Aftercooler (E2005A/B)	N157	PG-0107 X2	81	74	69	66	75	77	74	70	64	Tonal (at source)	Continuous	Line Source
Pipework (Section 3) from Sales Gas Compressor (K2002A/B) to Sales Gas Compressor Aftercooler (E2005A/B)	N158	PG-0107 X3	78	71	66	63	72	74	71	67	61	Tonal (at source)	Continuous	Line Source
Pipework (Section 4) from Sales Gas Compressor (K2002A/B) to Sales Gas Compressor Aftercooler (E2005A/B)	N159	PG-0107 X4	76	69	64	61	70	72	69	65	59	Tonal (at source)	Continuous	Line Source
Pipework (Section 5) from Sales Gas Compressor (K2002A/B) to Sales Gas Compressor Aftercooler (E2005A/B)	N160	PG-0107 X5	69	62	57	54	63	65	62	58	52	Tonal (at source)	Continuous	Line Source
Pipework (Section 6) from Sales Gas Compressor (K2002A/B) to Sales Gas Compressor Aftercooler (E2005A/B)	N161	PG-0107 X6	63	56	51	48	57	59	56	52	46	Tonal (at source)	Continuous	Line Source
Pipework (Section 1) from Sales Gas Compressor Aftercooler (E2005A/B) to Sales Gas Metering	N162	PG-0013 X1	68	36	36	44	50	56	61	64	61	None	Continuous	Line Source

Source	Emission Point Reference No.	Equipment reference No	Sound Power [1] Level dBA at source	Octave bands (Hz) Sound Power[1] Levels dB (unweighted) per band								Impulsive or tonal qualities	Periods of Emission	OTHER COMMENTS [2]
				63	125	250	500	1K	2K	4K	8K			
(N2001)														
Pipework (Section 2) from Sales Gas Compressor Aftercooler (E2005A/B) to Sales Gas Metering (N2001)	N163	PG-0013 X2	71	36	39	47	53	59	64	67	64	None	Continuous	Line Source
Pipework (Section 3) from Sales Gas Compressor Aftercooler (E2005A/B) to Sales Gas Metering (N2001)	N164	PG-0013 X3	68	36	36	44	50	56	61	64	61	None	Continuous	Line Source
Pipework (Section 4) from Sales Gas Compressor Aftercooler (E2005A/B) to Sales Gas Metering (N2001)	N165	PG-0013 X4	71	36	39	47	53	59	64	67	64	None	Continuous	Line Source
Pipework (Section 5) from Sales Gas Compressor Aftercooler (E2005A/B) to Sales Gas Metering (N2001)	N166	PG-0013 X5	77	37	45	53	59	65	70	73	70	None	Continuous	Line Source
Pipework (Section 6) from Sales Gas Compressor Aftercooler (E2005A/B) to Sales Gas Metering (N2001)	N167	PG-0013 X6	76	36	43	52	58	64	69	72	69	None	Continuous	Line Source
Pipework (Section 7) from Sales Gas Compressor Aftercooler (E2005A/B) to Sales Gas Metering (N2001)	N168	PG-0013 X7	74	36	42	50	56	62	67	70	67	None	Continuous	Line Source
Pipework (Section 8) from Sales Gas Compressor Aftercooler (E2005A/B) to Sales Gas Metering (N2001)	N169	PG-0013 X8	69	36	37	45	51	57	62	65	62	None	Continuous	Line Source
Pipework (Section 9) from Sales Gas Compressor Aftercooler (E2005A/B) to	N170	PG-0013 X9	67	36	35	43	49	55	60	63	60	None	Continuous	Line Source

Source	Emission Point Reference No.	Equipment reference No	Sound Power [1] Level dBA at source	Octave bands (Hz) Sound Power[1] Levels dB (unweighted) per band								Impulsive or tonal qualities	Periods of Emission	OTHER COMMENTS [2]
				63	125	250	500	1K	2K	4K	8K			
Sales Gas Metering (N2001)														
Pipework (Section 10) from Sales Gas Compressor Aftercooler (E2005A/B) to Sales Gas Metering (N2001)	N171	PG-0013X10	62	36	30	38	44	50	55	58	55	None	Continuous	Line Source
Pipework (Section 11) from Sales Gas Compressor Aftercooler (E2005A/B) to Sales Gas Metering (N2001)	N172	PG-0013X11	58	36	26	34	40	46	51	54	51	None	Continuous	Line Source
Pipework from Sales Gas Compressor (K2002A/B) to Recycle Valve	N173	PG-0110	84	43	52	60	66	72	77	80	77	None	Continuous	Line Source
Pipework from Recycle Valve to Sales Gas Compressor (K2002A/B)	N174	PG-0111	67	58	58	63	63	63	60	51	45	Tonal (at source)	Continuous	Line Source
Pipework from Sales Gas Compressor (K2002A/B) to Relief Valve	N175	PG-0127	76	69	64	61	70	72	69	65	59	Tonal (at source)	Continuous	Line Source
~~CVRO2008 to Maintenance Flare~~	-	~~GFL 2153~~	~~91~~	~~51~~	~~59~~	~~65~~	~~73~~	~~79~~	~~84~~	~~87~~	~~84~~	None		Now included in ground flare estimate
~~Maintenance Flare Header Section 1~~	-	~~GFL2173 X1~~	~~54~~	~~26~~	~~22~~	~~28~~	~~36~~	~~42~~	~~48~~	~~50~~	~~47~~			Now included in ground flare estimate
~~Maintenance Flare Header Section 2~~	-	~~GFL2173 X2~~	~~64~~	~~26~~	~~32~~	~~38~~	~~45~~	~~52~~	~~57~~	~~60~~	~~57~~			Now included in ground flare estimate
~~Maintenance Flare Header Section 3~~	-	~~GFL2173 X3~~	~~78~~	~~38~~	~~46~~	~~52~~	~~60~~	~~66~~	~~71~~	~~74~~	~~71~~			Now included in ground flare estimate
~~Maintenance Flare Header Section 4~~	-	~~GFL2173 X4~~	~~89~~	~~48~~	~~56~~	~~63~~	~~70~~	~~77~~	~~82~~	~~85~~	~~81~~			Now included in ground flare estimate

1. For items of plant sound power levels may be used. 2. Line source data is expressed as Lw / m

TABLE F.1(i): ABATEMENT / TREATMENT CONTROL

Emission point reference number *: A2-1 (Gas Turbine A)*

Control[1] parameter	Equipment [2]	Equipment maintenance	Equipment calibration	Equipment back-up
NOx	Gas Turbine Combustion Process - Low NOx Burner & Waste Heat Recovery	In line with manufacturers recommendations	In line with manufacturers recommendations	Spare equipment requirements to be determined
CO	Gas Turbine Combustion Process - Low NOx Burner & Waste Heat Recovery	In line with manufacturers recommendations	In line with manufacturers recommendations	Spare equipment requirements to be determined
O_2	Gas Turbine Combustion Process - Low NOx Burner & Waste Heat Recovery	In line with manufacturers recommendations	In line with manufacturers recommendations	Spare equipment requirements to be determined
Temperature	Gas Turbine Combustion Process - Low NOx Burner & Waste Heat Recovery	In line with manufacturers recommendations	In line with manufacturers recommendations	Spare equipment requirements to be determined
Exhaust Velocity	Gas Turbine Combustion Process - Low NOx Burner & Waste Heat Recovery	In line with manufacturers recommendations	In line with manufacturers recommendations	Spare equipment requirements to be determined

Control[1] parameter	Monitoring to be carried out[3]	Monitoring equipment	Monitoring equipment calibration
NOx	Continuous	Infrared Analyser	In line with manufacturers recommendations
CO	Continuous	Infrared Analyser	In line with manufacturers recommendations
O_2	Continuous	Oxygen Analyser	In line with manufacturers recommendations
Temperature	Continuous	Temperature Probe	In line with manufacturers recommendations
Exhaust Gas Flowrate	Continuous	By calculation from continuous measurement of fuel gas flowrate, fuel gas composition and exhaust gas O2.	In line with manufacturers recommendations

[1] List the operating parameters of the treatment / abatement system which control its function.
[2] List the equipment necessary for the proper function of the abatement / treatment system.
[3] List the monitoring of the control parameter to be carried out.

TABLE F.1(i): ABATEMENT / TREATMENT CONTROL

Emission point reference number *: A2-2 (Gas Turbine B)*

Control[1] parameter	Equipment [2]	Equipment maintenance	Equipment calibration	Equipment back-up
NOx	Gas Turbine Combustion Process - Low NOx Burner & Waste Heat Recovery	In line with manufacturers recommendations	In line with manufacturers recommendations	Spare equipment requirements to be determined
CO	Gas Turbine Combustion Process - Low NOx Burner & Waste Heat Recovery	In line with manufacturers recommendations	In line with manufacturers recommendations	Spare equipment requirements to be determined
O_2	Gas Turbine Combustion Process - Low NOx Burner & Waste Heat Recovery	In line with manufacturers recommendations	In line with manufacturers recommendations	Spare equipment requirements to be determined
Temperature	Gas Turbine Combustion Process - Low NOx Burner & Waste Heat Recovery	In line with manufacturers recommendations	In line with manufacturers recommendations	Spare equipment requirements to be determined
Exhaust Velocity	Gas Turbine Combustion Process - Low NOx Burner & Waste Heat Recovery	In line with manufacturers recommendations	In line with manufacturers recommendations	Spare equipment requirements to be determined

Control[1] parameter	Monitoring to be carried out[3]	Monitoring equipment	Monitoring equipment calibration
NOx	Continuous	Infrared Analyser	In line with manufacturers recommendations
CO	Continuous	Infrared Analyser	In line with manufacturers recommendations
O_2	Continuous	Oxygen Analyser	In line with manufacturers recommendations
Temperature	Continuous	Temperature Probe	In line with manufacturers recommendations
Exhaust Gas Flowrate	Continuous	By calculation from continuous measurement of fuel gas flowrate, fuel gas composition and exhaust gas O2.	In line with manufacturers recommendations

[1] List the operating parameters of the treatment / abatement system which control its function.
[2] List the equipment necessary for the proper function of the abatement / treatment system.
[3] List the monitoring of the control parameter to be carried out.

TABLE F.1(i): ABATEMENT / TREATMENT CONTROL

Emission point reference number *: A2-4 (Power Generator A)*

Control[1] parameter	Equipment [2]	Equipment maintenance	Equipment calibration	Equipment back-up
NOx	Lean Burn Technique & Selective Catalytic Reduction	In line with manufacturers recommendations	In line with manufacturers recommendations	Spare equipment requirements to be determined
CO	Lean Burn Technique & Selective Catalytic Reduction	In line with manufacturers recommendations	In line with manufacturers recommendations	Spare equipment requirements to be determined
NH3	Lean Burn Technique & Selective Catalytic Reduction	In line with manufacturers recommendations	In line with manufacturers recommendations	Spare equipment requirements to be determined

Control[1] parameter	Monitoring to be carried out[3]	Monitoring equipment	Monitoring equipment calibration
NOx	Quarterly Sampling and Analysis	To be determined	In line with manufacturers recommendations
CO	Quarterly Sampling and Analysis	To be determined	In line with manufacturers recommendations
NH3	Quarterly Sampling and Analysis	To be determined	In line with manufacturers recommendations

[1] List the operating parameters of the treatment / abatement system which control its function.
[2] List the equipment necessary for the proper function of the abatement / treatment system.
[3] List the monitoring of the control parameter to be carried out.

TABLE F.1(i): ABATEMENT / TREATMENT CONTROL

Emission point reference number *: A2-5 (Power Generator B)*

Control[1] parameter	Equipment [2]	Equipment maintenance	Equipment calibration	Equipment back-up
NOx	Lean Burn Technique & Selective Catalytic Reduction	In line with manufacturers recommendations	In line with manufacturers recommendations	Spare equipment requirements to be determined
CO	Lean Burn Technique & Selective Catalytic Reduction	In line with manufacturers recommendations	In line with manufacturers recommendations	Spare equipment requirements to be determined
NH3	Lean Burn Technique & Selective Catalytic Reduction	In line with manufacturers recommendations	In line with manufacturers recommendations	Spare equipment requirements to be determined

Control[1] parameter	Monitoring to be carried out[3]	Monitoring equipment	Monitoring equipment calibration
NOx	Quarterly Sampling and Analysis	To be determined	In line with manufacturers recommendations
CO	Quarterly Sampling and Analysis	To be determined	In line with manufacturers recommendations
NH3	Quarterly Sampling and Analysis	To be determined	In line with manufacturers recommendations

[1] List the operating parameters of the treatment / abatement system which control its function.
[2] List the equipment necessary for the proper function of the abatement / treatment system.
[3] List the monitoring of the control parameter to be carried out.

TABLE F.1(i): ABATEMENT / TREATMENT CONTROL

Emission point reference number *: A2-6 (Power Generator C)*

Control[1] parameter	Equipment [2]	Equipment maintenance	Equipment calibration	Equipment back-up
NOx	Lean Burn Technique & Selective Catalytic Reduction	In line with manufacturers recommendations	In line with manufacturers recommendations	Spare equipment requirements to be determined
CO	Lean Burn Technique & Selective Catalytic Reduction	In line with manufacturers recommendations	In line with manufacturers recommendations	Spare equipment requirements to be determined
NH3	Lean Burn Technique & Selective Catalytic Reduction	In line with manufacturers recommendations	In line with manufacturers recommendations	Spare equipment requirements to be determined

Control[1] parameter	Monitoring to be carried out[3]	Monitoring equipment	Monitoring equipment calibration
NOx	Quarterly Sampling and Analysis	To be determined	In line with manufacturers recommendations
CO	Quarterly Sampling and Analysis	To be determined	In line with manufacturers recommendations
NH3	Quarterly Sampling and Analysis	To be determined	In line with manufacturers recommendations

[1] List the operating parameters of the treatment / abatement system which control its function.
[2] List the equipment necessary for the proper function of the abatement / treatment system.
[3] List the monitoring of the control parameter to be carried out.

TABLE F.1(i): ABATEMENT / TREATMENT CONTROL

Emission point reference number *:* ***SW3*** *(Treated Produced Water)*

Control[1] parameter	Equipment [2]	Equipment maintenance	Equipment calibration	Equipment back-up
Various Parameters as detailed in Table E.2(ii) SW3	Produced Water Treatment System comprising, Corrugated Plate Interceptor, Ultra Filtration Unit, Nano Filtration Unit, Granular Activated Carbon Unit, Ion Exchange Unit, pH adjustment, Sludge Treatment	Regular inspection and maintenance of equipment (to be determined)	Equipment calibration in accordance with manufacturer's instructions (to be determined)	Spare equipment requirements to be determined

Revised to reflect new discharge method and current licence

Control[1] parameter	Monitoring to be carried out[3]	Monitoring equipment	Monitoring equipment calibration
Flow, pH, Conductivity	Continuous	As per Schedule C.2.2 in current IPPC license	In line with manufacturers instructions
Temperature	Daily	Temperature Probe	In line with manufacturers instructions
COD, Suspended solids, Total nitrogen (as N)	Daily Composite Sample	As per Schedule C.2.2 in current IPPC license	In line with manufacturers instructions
BOD	Weekly Composite Sample	Standard Method	In line with manufacturers instructions
Hydrocarbons, Phenol	Fortnightly	Standard Method	In line with manufacturers instructions
Metals	Fortnightly Composite Sample	Standard Method	In line with manufacturers instructions
Toxicity	Composite Sample prior to discharge to umbilical cores	To be determined	In line manufacturers instructions.

[1] List the operating parameters of the treatment / abatement system which control its function.
[2] List the equipment necessary for the proper function of the abatement / treatment system.
[3] List the monitoring of the control parameter to be carried out.

TABLE F.1(i): ABATEMENT / TREATMENT CONTROL

Emission point reference number : **SW1** *(Treated Surface Water)*

Control[1] parameter	Equipment [2]	Equipment maintenance	Equipment calibration	Equipment back-up
Various Parameters as detailed in Table E.2(ii) SW1	Surface Water Treatment comprising Corrugated Plate Interceptor, Multi-Media Filter, Ultra Filtration Unit, Sludge Treatment	Regular inspection and maintenance of equipment (to be determined)	Equipment calibration in accordance with manufacturer's instructions (to be determined)	Spare equipment requirements to be determined

Revised to reflect current licence

Control[1] parameter	Monitoring to be carried out[3]	Monitoring equipment	Monitoring equipment calibration
Flow, pH, Conductivity	Continuous	As per Schedule C.2.2 in current IPPC licence	In line with manufacturers instructions
COD, Suspended solids	Daily Composite Sample	As per Schedule C.2.2 in current IPPC licence	In line with manufacturers instructions
Hydrocarbons, Phenol	Fortnightly	Standard Method	In line with manufacturers instructions

[1] List the operating parameters of the treatment / abatement system which control its function.
[2] List the equipment necessary for the proper function of the abatement / treatment system.
[3] List the monitoring of the control parameter to be carried out.

TABLE F.1(i): ABATEMENT / TREATMENT CONTROL

Emission point reference number *: SW2 (Uncontaminated Surface Water Runoff from Terminal)*

Control[1] parameter	Equipment [2]	Equipment maintenance	Equipment calibration	Equipment back-up
Suspended Solids	Settlement Ponds	Regular inspection of ponds. Solids removal from ponds as required, but not less than at 6-monthly intervals	Not Applicable	2 No. Settlement Ponds which can be operated singly as well as in parallel (normal operation)
Oil	Settlement Pond(s) incorporate oil skimmers	Regular Inspection and Maintenance	Not Applicable	Precautionary measure - One oil skimmer in each settlement pond.

Revised to reflect current licence

Control[1] parameter	Monitoring to be carried out[3]	Monitoring equipment	Monitoring equipment calibration
TOC	Continuous	TOC meter and recorder	In line with manufacturers instructions
Visual Inspection	Daily	Visual inspection and examine for odour	N/A
pH, Conductivity	Weekly	Standard Method	In line with manufacturers instructions
COD, Suspended solids, Aluminium (dissolved), Molybdate Reactive Phosphorus	Weekly Composite Sample	Standard Method	In line with manufacturers instructions
Manganese	Quarterly Composite Sample	Standard Method	In line with manufacturers instructions

[1] List the operating parameters of the treatment / abatement system which control its function.
[2] List the equipment necessary for the proper function of the abatement / treatment system.
[3] List the monitoring of the control parameter to be carried out.

TABLE F.1(i): ABATEMENT / TREATMENT CONTROL

Emission point reference number : **SL1** *(Emission to Ground)*

Control[1] parameter	Equipment [2]	Equipment maintenance	Equipment calibration	Equipment back-up
Discharge Parameters as detailed in Table E.4 (ii)	Septic Tank, Sump & Pump, Puraflo System	Septic tank and Sump will be de-sludged at appropriate intervals. Maintenance Contract will be taken out with specialist contractor.	Not Applicable	Alarm will indicate failure of pump in sump. Pump will be repaired/replaced if required.

Control[1] parameter	Monitoring to be carried out[3]	Monitoring equipment	Monitoring equipment calibration
Discharge Parameters as detailed in Table E.4 (ii)	Grab samples of treated effluent will be taken for analyses on a biannual basis	To be determined	In line with recommended procedure

[1] List the operating parameters of the treatment / abatement system which control its function.
[2] List the equipment necessary for the proper function of the abatement / treatment system.
[3] List the monitoring of the control parameter to be carried out.

TABLE F.2(i) : EMISSIONS MONITORING AND SAMPLING POINTS (1 table per monitoring point)

Emission Point Reference No. : **A2-1-M** (Gas Turbine A)

Parameter	Monitoring frequency	Accessibility of Sampling Points	Sampling method	Analysis method/ technique
NOx	Continuous	Accessible	Continuous	Infrared Analyser
CO	Continuous	Accessible	Continuous	Infrared Analyser
O_2	Continuous	Accessible	Continuous	Oxygen Analyser
Temperature	Continuous	Accessible	Continuous	Temperature Probe
Exhaust Velocity	Continuous	Accessible	Continuous	Air Flow Meter

TABLE F.2(i) : EMISSIONS MONITORING AND SAMPLING POINTS (1 table per monitoring point)

Emission Point Reference No. : **A2-2-M** (Gas Turbine B)

Parameter	Monitoring frequency	Accessibility of Sampling Points	Sampling method	Analysis method/ technique
NOx	Continuous	Accessible	Continuous	Infrared Analyser
CO	Continuous	Accessible	Continuous	Infrared Analyser
O_2	Continuous	Accessible	Continuous	Oxygen Analyser
Temperature	Continuous	Accessible	Continuous	Temperature Probe
Exhaust Velocity	Continuous	Accessible	Continuous	Air Flow Meter

TABLE F.2(i) : EMISSIONS MONITORING AND SAMPLING POINTS - (1 table per monitoring point)

Emission Point Reference No. : **A2-4-S** (Power Generator A)

Parameter	Monitoring frequency	Accessibility of Sampling Points	Sampling method	Analysis method/ technique
NOx	Quarterly	Accessible	To be determined	To be determined
CO	Quarterly	Accessible	To be determined	To be determined

Emission Point Reference No. : **A2-5-S** (Power Generator B)

Parameter	Monitoring frequency	Accessibility of Sampling Points	Sampling method	Analysis method/ technique
NOx	Quarterly	Accessible	To be determined	To be determined
CO	Quarterly	Accessible	To be determined	To be determined

TABLE F.2(i) : EMISSIONS MONITORING AND SAMPLING POINTS - (1 table per monitoring point)

Emission Point Reference No. : **A2-6-S** (Power Generator C)

Parameter	Monitoring frequency	Accessibility of Sampling Points	Sampling method	Analysis method/ technique
NOx	Quarterly	Accessible	To be determined	To be determined
CO	Quarterly	Accessible	To be determined	To be determined

TABLE F.2(i) : EMISSIONS MONITORING AND SAMPLING POINTS - (1 table per monitoring point)

Emissions reference point No : **SW3-S** (Treated Produced Water Sampling)

Revised to reflect current IPPC licence

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
Flow, pH, Conductivity [1]	Continuous	Accessible	Continuous sampling method to be determined	As per Schedule C.2.2 in current IPPC license
Temperature	Daily	Accessible	To be determined	Temperature Probe
COD, Suspended solids, Total nitrogen (as N)	Daily Composite	Accessible	Composite Sampler	As per Schedule C.2.2 in current IPPC license
BOD	Weekly Composite	Accessible	Composite Sampler	Standard Method
Hydrocarbons, Phenol	Fortnightly	Accessible	To be determined	Standard Method
Metals	Fortnightly Composite	Accessible	Composite Sampler	Standard Method
Toxicity	To be agreed	Accessible	Composite Sample prior to discharge to umbilical cores	To be determined

[1] These parameters at monitored at SW3-M (Treated Produced Water Monitoring Point)

TABLE F.2(i) : EMISSIONS MONITORING AND SAMPLING POINTS - (1 table per monitoring point)

Emissions reference point No : **SW1-S** (Treated Surface Water Runoff from Process Areas)

Revised to reflect current IPPC licence

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
Flow, pH, Conductivity [1]	Continuous	Accessible	Continuous sampling method to be determined	As per Schedule C.2.2 in current IPPC licence
COD, Suspended Solids	Daily	Accessible	Composite	As per Schedule C.2.2 in current IPPC licence
Hydrocarbons, Phenol	Fortnightly	Accessible	To be determined	Standard Method

[1] These parameters at monitored at SW1-M (Treated Surface Water Monitoring Point)

TABLE F.2(i) : EMISSIONS MONITORING AND SAMPLING POINTS - (1 table per monitoring point)

Emissions reference point No : SW2-S (Uncontaminated Surface Water Runoff from Terminal)

Revised to reflect current IPPC licence

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
TOC [1]	Continuous	Accessible	Continuous sampling	TOC meter and recorder
Visual Inspection	Daily	Accessible	Visual inspection and examine for odour	Visual
pH, Conductivity	Weekly	Accessible	Weekly sample	Standard Method
COD, Suspended solids, Aluminium, Molybdate Reactive Phosphorus	Weekly	Accessible	Weekly Composite	Standard Method
Manganese	Quarterly	Accessible	Composite	Standard Method

[1] TOC is monitored at SW2-M (Uncontaminated Surface Water Monitoring Point at Emergency Holding Tank)

TABLE F.2(i) : EMISSIONS MONITORING AND SAMPLING POINTS - (1 table per monitoring point)

Emission reference point No : SL1-S (Treated Effluent from Puraflo System)

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
pH	Biannual	Accessible	Grab Sample	pH meter
Biological Oxygen Demand	Biannual	Accessible	Grab Sample	Standard Methods of Analysis
Total Suspended Solids	Biannual	Accessible	Grab Sample	Standard Methods of Analysis
Ammonia (as N)	Biannual	Accessible	Grab Sample	Standard Methods of Analysis
Nitrate (as N)	Biannual	Accessible	Grab Sample	Standard Methods of Analysis
Total Coliforms	Biannual	Accessible	Grab Sample	Standard Methods of Analysis
Faecal Coliforms	Biannual	Accessible	Grab Sample	Standard Methods of Analysis
Pathogenic Bacteria	Biannual	Accessible	Grab Sample	Standard Methods of Analysis

TABLE F.2(ii): AMBIENT ENVIRONMENT MONITORING AND SAMPLING POINTS (1 table per monitoring point)

Monitoring Point Reference No : AA1-S (Ambient Air)

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
NOx	Annual	Accessible	To be determined	Standard Method of Analysis
CO	Annual	Accessible	To be determined	Standard Method of Analysis
Particulate Matter	Annual	Accessible	To be determined	Standard Method of Analysis
VOC	Annual	Accessible	To be determined	Standard Method of Analysis

TABLE F.2(ii): AMBIENT ENVIRONMENT MONITORING AND SAMPLING POINTS (1 table per monitoring point)

Monitoring Point Reference No : AA2-S (Ambient Air)

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
NOx	Annual	Accessible	To be determined	Standard Method of Analysis
CO	Annual	Accessible	To be determined	Standard Method of Analysis
Particulate Matter	Annual	Accessible	To be determined	Standard Method of Analysis
VOC	Annual	Accessible	To be determined	Standard Method of Analysis

TABLE F.2(ii): AMBIENT ENVIRONMENT MONITORING AND SAMPLING POINTS (1 table per monitoring point)

Monitoring Point Reference No : AA3-S (Ambient Air)

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
NOx	Annual	Accessible	To be determined	Standard Method of Analysis
CO	Annual	Accessible	To be determined	Standard Method of Analysis
Particulate Matter	Annual	Accessible	To be determined	Standard Method of Analysis
VOC	Annual	Accessible	To be determined	Standard Method of Analysis

TABLE F.2(ii): AMBIENT ENVIRONMENT MONITORING AND SAMPLING POINTS (1 table per monitoring point)

Monitoring Point Reference No : AA4-S (Ambient Air)

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
NOx	Annual	Accessible	To be determined	Standard Method of Analysis
CO	Annual	Accessible	To be determined	Standard Method of Analysis
Particulate Matter	Annual	Accessible	To be determined	Standard Method of Analysis
VOC	Annual	Accessible	To be determined	Standard Method of Analysis

TABLE F.2(ii): AMBIENT ENVIRONMENT MONITORING AND SAMPLING POINTS (1 table per monitoring point)

Monitoring Point Reference No : ASW1-S (Ambient Surface Water) Same as original

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
pH	Annual	Accessible	Grab Sample	pH meter
Temperature	Annual	Accessible	Grab Sample	Temperature Probe
Dissolved Oxygen	Annual	Accessible	Grab Sample	Dissolved Oxygen Meter
Turbidity	Annual	Accessible	Grab Sample	Standard Method of Analysis
Suspended Solids	Annual	Accessible	Grab Sample	Standard Method of Analysis
Conductivity	Annual	Accessible	Grab Sample	Conductivity Meter
Phosphate	Annual	Accessible	Grab Sample	Standard Method of Analysis
Nitrate	Annual	Accessible	Grab Sample	Standard Method of Analysis
Ammoniacal-Nitrogen	Annual	Accessible	Grab Sample	Standard Method of Analysis
Oil	Annual	Accessible	Grab Sample	Standard Method of Analysis

TABLE F.2(ii): AMBIENT ENVIRONMENT MONITORING AND SAMPLING POINTS (1 table per monitoring point)

Monitoring Point Reference No : AGW1-S (Ambient Groundwater)

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
Water Level	Biannual	Accessible	Grab Sample	Dip Meter
pH	Biannual	Accessible	Grab Sample	pH electrode / meter
Conductivity	Biannual	Accessible	Grab Sample	Conductivity Meter
COD	Biannual	Accessible	Grab Sample	Standard Method
Major Anions, Major Cations	Biannual	Accessible	Grab Sample	Standard Method
Hydrocarbons	Biannual	Accessible	Grab Sample	Standard Method
Heavy Metals	Biannual	Accessible	Grab Sample	Atomic Absorption/ICP
Trace Organics	Biannual	Accessible	Grab Sample	GC-MS

TABLE F.2(ii): AMBIENT ENVIRONMENT MONITORING AND SAMPLING POINTS (1 table per monitoring point)

Monitoring Point Reference No : AGW2-S (Ambient Groundwater)

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
Water Level	Biannual	Accessible	Grab Sample	Dip Meter
pH	Biannual	Accessible	Grab Sample	pH electrode / meter
Conductivity	Biannual	Accessible	Grab Sample	Conductivity Meter
COD	Biannual	Accessible	Grab Sample	Standard Method
Major Anions, Major Cations	Biannual	Accessible	Grab Sample	Standard Method
Hydrocarbons	Biannual	Accessible	Grab Sample	Standard Method
Heavy Metals	Biannual	Accessible	Grab Sample	Atomic Absorption/ICP
Trace Organics	Biannual	Accessible	Grab Sample	GC-MS

TABLE F.2(ii): AMBIENT ENVIRONMENT MONITORING AND SAMPLING POINTS (1 table per monitoring point)

Monitoring Point Reference No : AGW3-S (Ambient Groundwater)

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
Water Level	Biannual	Accessible	Grab Sample	Dip Meter
pH	Biannual	Accessible	Grab Sample	pH electrode / meter
Conductivity	Biannual	Accessible	Grab Sample	Conductivity Meter
COD	Biannual	Accessible	Grab Sample	Standard Method
Major Anions, Major Cations	Biannual	Accessible	Grab Sample	Standard Method
Hydrocarbons	Biannual	Accessible	Grab Sample	Standard Method
Heavy Metals	Biannual	Accessible	Grab Sample	Atomic Absorption/ICP
Trace Organics	Biannual	Accessible	Grab Sample	GC-MS

TABLE F.2(ii): AMBIENT ENVIRONMENT MONITORING AND SAMPLING POINTS (1 table per monitoring point)

Monitoring Point Reference No : AGW4-S (Ambient Groundwater)

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
Water Level	Biannual	Accessible	Grab Sample	Dip Meter
pH	Biannual	Accessible	Grab Sample	pH electrode / meter
Conductivity	Biannual	Accessible	Grab Sample	Conductivity Meter
COD	Biannual	Accessible	Grab Sample	Standard Method
Major Anions, Major Cations	Biannual	Accessible	Grab Sample	Standard Method
Hydrocarbons	Biannual	Accessible	Grab Sample	Standard Method
Heavy Metals	Biannual	Accessible	Grab Sample	Atomic Absorption/ICP
Trace Organics	Biannual	Accessible	Grab Sample	GC-MS

TABLE F.2(ii): AMBIENT ENVIRONMENT MONITORING AND SAMPLING POINTS (1 table per monitoring point)

Monitoring Point Reference No : AGW5-S (Ambient Groundwater)

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
Water Level	Biannual	Accessible	Grab Sample	Dip Meter
pH	Biannual	Accessible	Grab Sample	pH electrode / meter
Conductivity	Biannual	Accessible	Grab Sample	Conductivity Meter
COD	Biannual	Accessible	Grab Sample	Standard Method
Major Anions, Major Cations	Biannual	Accessible	Grab Sample	Standard Method
Hydrocarbons	Biannual	Accessible	Grab Sample	Standard Method
Heavy Metals	Biannual	Accessible	Grab Sample	Atomic Absorption/ICP
Trace Organics	Biannual	Accessible	Grab Sample	GC-MS

TABLE F.2(ii): AMBIENT ENVIRONMENT MONITORING AND SAMPLING POINTS (1 table per monitoring point)

Monitoring Point Reference No : AGW6-S (Ambient Groundwater)

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
Water Level	Biannual	Accessible	Grab Sample	Dip Meter
pH	Biannual	Accessible	Grab Sample	pH electrode / meter
Conductivity	Biannual	Accessible	Grab Sample	Conductivity Meter
COD	Biannual	Accessible	Grab Sample	Standard Method
Major Anions, Major Cations	Biannual	Accessible	Grab Sample	Standard Method
Hydrocarbons	Biannual	Accessible	Grab Sample	Standard Method
Heavy Metals	Biannual	Accessible	Grab Sample	Atomic Absorption/ICP
Trace Organics	Biannual	Accessible	Grab Sample	GC-MS

TABLE F.2(ii): AMBIENT ENVIRONMENT MONITORING AND SAMPLING POINTS (1 table per monitoring point)

Monitoring Point Reference No : AN1-M (Ambient Noise – Site Boundary Location)

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
L_{Aeq}, L_{A90}, L_{A10}, 1/3 Octave Band Analysis	Quarterly	Accessible	Type 1 Integrating Sound Level Meter	Type 1 Integrating Sound Level Meter

Monitoring Point Reference No : AN2-M (Ambient Noise – Site Boundary Location)

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
L_{Aeq}, L_{A90}, L_{A10}, 1/3 Octave Band Analysis	Quarterly	Accessible	Type 1 Integrating Sound Level Meter	Type 1 Integrating Sound Level Meter

TABLE F.2(ii): AMBIENT ENVIRONMENT MONITORING AND SAMPLING POINTS (1 table per monitoring point)

Monitoring Point Reference No : AN3-M (Ambient Noise – Site Boundary Location)

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
L_{Aeq}, L_{A90}, L_{A10}, 1/3 Octave Band Analysis	Quarterly	Accessible	Type 1 Integrating Sound Level Meter	Type 1 Integrating Sound Level Meter

Monitoring Point Reference No : AN4-M (Ambient Noise – Site Boundary Location)

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
L_{Aeq}, L_{A90}, L_{A10}, 1/3 Octave Band Analysis	Quarterly	Accessible	Type 1 Integrating Sound Level Meter	Type 1 Integrating Sound Level Meter

TABLE F.2(ii): AMBIENT ENVIRONMENT MONITORING AND SAMPLING POINTS (1 table per monitoring point)

Monitoring Point Reference No : AN5-M (Ambient Noise – Site Boundary Location)

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
L_{Aeq}, L_{A90}, L_{A10}, 1/3 Octave Band Analysis	Quarterly	Accessible	Type 1 Integrating Sound Level Meter	Type 1 Integrating Sound Level Meter

Monitoring Point Reference No : AN6-M (Ambient Noise – Site Boundary Location)

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
L_{Aeq}, L_{A90}, L_{A10}, 1/3 Octave Band Analysis	Quarterly	Accessible	Type 1 Integrating Sound Level Meter	Type 1 Integrating Sound Level Meter

TABLE F.2(ii): AMBIENT ENVIRONMENT MONITORING AND SAMPLING POINTS (1 table per monitoring point)

Monitoring Point Reference No : AN7-M (Ambient Noise – Site Boundary Location)

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
L_{Aeq}, L_{A90}, L_{A10}, 1/3 Octave Band Analysis	Quarterly	Accessible	Type 1 Integrating Sound Level Meter	Type 1 Integrating Sound Level Meter

At least one monitoring event will be conducted annually at the nearest noise sensitive location during the testing or operation of the high pressure flare.

TABLE F.2(ii): AMBIENT ENVIRONMENT MONITORING AND SAMPLING POINTS (1 table per monitoring point)

Monitoring Point Reference No : AN100-M (Permanent Noise Monitoring Station)

Parameter	Monitoring frequency	Accessibility of sampling point	Sampling method	Analysis method / technique
Sound Pressure Level, L_{Aeq}, L_{A90}, L_{A10}, 1/3 Octave Band Analysis	Continuous	Accessible	Type 1 Integrating Sound Level Meter	Type 1 Integrating Sound Level Meter

Table G.1(i) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site. Revised

Ref. Nº or Code	Material / Substance[1]	CAS Number	Danger[2] Category	Amount Stored (tonnes)	Annual Usage (tonnes)	Nature of Use	R[3] - Phrase	S[3] - Phrase
1	Natural Gas (ca. 88-94% methane, 2-5% ethane)	74-82-8 74-84-0	Extremely Flammable	25	15,282 (Fuel Use)	Product and Fuel	R 12	S 9, 16, 33
2	Hydrocarbon Condensate	Not available	Highly Flammable, Harmful	1089	3,604 (by-product)	Exported off-site as by-product	R 11, 20/22, 38, 48	-
3	Diesel (aliphatic petroleum distillates)	68476-30-2	Harmful	66	32	Fuel	R 10, 40, 51, 53, 65	S 2, 24, 36/37, 43, 62
4	Methanol (raw and product)	67-56-1	Highly Flammable, Toxic	3629	1825	Hydrate Inhibitor (i.e. antifreeze agent)	R 11, 23/24/25,39	S 7-16-36/37-45
5	Corrosion inhibitor: product to be advised Q2 2010 (Indicative data)	Not available	Irritant	4	70	Pipeline Corrosion/Scale Inhibitor	R 11, 20, 21,22, 23, 24, 25, 34, 36/38, 40, 41, 43, 50, 51, 52/53, 63, 65, 66, 67	S 2, 23, 24, 25, 26, 27, 28, 36/37, 38, 39, 45, 46, 57, 60, 61, 62, 63
6	Scale Inhibitor – product to be selected Q1 2010 (Indicative data)	Not available	Irritant	0.5	0.6	Methanol Still Scale Inhibitor	R 36	S 26, 28, 36/37, 39

Notes:
1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
2. c.f. Article 2(2) of SI Nº 77/94
3. c.f. Schedules 9 and 10 of SI No 62/2004

Table G.1(i) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance[1]	CAS Number	Danger[2] Category	Amount Stored (tonnes)	Annual Usage (tonnes)	Nature of Use	R[3] – Phrase	S[3] – Phrase
7	Tri-Ethylene Glycol	112-27-6	None	81	0 (Single fill, replenished as required, minimal losses expected)	Heating Medium	-	S 24/25
8	Nitrogen	7782-44-7	None	2 (backup only)	To be determined, capacity of generation package = 250 Nm^3/hr	Blanketing of Storage Tanks, Purging of Process Equipment	-	-
9	Hydrochloric Acid (5%)	7647-01-0	Corrosive	10	20	Acid Wash of Methanol Still (descalant)	R 20/21/ 22, 36 /37 /38	S 26-36/37 /39-45
10	Natural Gas Odourant (80% Tertiary Butyl Mercaptan, 20% Di-Methyl Sulphide)	75-66-1 75-18-13	Highly Flammable, Irritant	9	22	Natural Gas Odourant	R 11, 43	S 16, 24, 33, 36
11	Hydrated Lime	1305-62-0	Irritant	15	110	Produced/Surface Water Treatment	R 38, 41	S 22,39

Notes:
1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
2. c.f. Article 2(2) of SI Nº 77/94
3. c.f. Schedules 9 and 10 of SI No 62/2004

Table G.1(i) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance[1]	CAS Number	Danger[2] Category	Amount Stored (tonnes)	Annual Usage (tonnes)	Nature of Use	R[3] – Phrase	S[3] – Phrase
12	2-4-6 Trimercapto-s-triazine Trisodium Salt (TMT 15)	17766-26-6	Irritant	1	2.0	Produced/Surface Water Treatment	R 36	S 26, 39
13	Sulphuric Acid (30%)	7664-93-9	Corrosive	2.5	62.4	Produced Water Treatment	R 35	S 2, 26-30-45
14	Polyelectrolyte – product to be selected (Indicative data)	Not available	Irritant	1	5.8	Produced/Surface Water Treatment	R 36, 38	S 37, 39
15	Sodium Hydroxide (30%)	1310-73-2	Corrosive	3	7.7	Produced Water Treatment	R 35	S 2, 26, 27, 36/37/39
16	Ferric Chloride Solution	7705-08-0	Corrosive	1	2.7	Produced/Surface Water Treatment	R 34,37	S 2, 26, 37/39
17	Hydrochloric Acid (30%)	7647-01-0	Corrosive	3	6.2	Produced Water Treatment	R 23/24/ 25, 34, 36/37/38	S 26-36/37 /39-45

Notes: 1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
2. c.f. Article 2(2) of SI Nº 77/94
3. c.f. Schedules 9 and 10 of SI No 62/2004

Table G.1(i) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance[1]	CAS Number	Danger[2] Category	Amount Stored (tonnes)	Annual Usage (tonnes)	Nature of Use	R[3] – Phrase	S[3] – Phrase
18	Scale Inhibitor – product to be selected (Indicative data)	Not available	Irritant	0.09	1	Nanofiltration membrane scale inhibitor (Produced Water Treatment) –	R 36	S 26, 28, 36/37, 39
19	Sodium Hypochlorite	7681-52-9	Corrosive	0.5	To be determined Generated on site from Sodium Chloride	Potable Water Storage Tank – Bacterial Growth Inhibitor	R 31, 34	S 26-28. 36/37/39-45-50
20	Sodium Chloride	7647-14-5	None	0.4	1	Potable Water Chlorination Package	-	S 25
21	Propane	74-98-6	Extremely Flammable	1	0 (backup only)	Backup Fuel for Flare Ignition Systems	R 12	S 9-16

Notes:
1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
2. c.f. Article 2(2) of SI Nº 77/94
3. c.f. Schedules 9 and 10 of SI No 62/2004

Table G.1(i) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance[1]	CAS Number	Danger[2] Category	Amount Stored (tonnes)	Annual Usage (tonnes)	Nature of Use	R[3] - Phrase	S[3] - Phrase
22	Roclean L211 (Avista product)	141-43-5 57-55-6 6132-04-3 2809-21-4	Irritant	1	To be determined	UF membrane cleaning chemical	R 20, 36/37/38	S 26, 28, 36/37, 39
23	Roclean L811 (Avista product)	00064-02-8 7647-01-0	Irritant	1	To be determined	UF membrane cleaning chemical	R 34, 36/37/38	S 26, 28, 36/37, 39
24	Carbon Dioxide	124-38-9	None	1	0 (emergency use only)	Fire Fighting	-	-
25	NIAGARA 3-3 fire fighting foam concentrate	107-41-5 7647-14-5	Sensitisation by skin contact	16	0 (emergency use only)	Fire Fighting	R 43	S 24, 28, 37

Notes: 1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
2. c.f. Article 2(2) of SI Nº 77/94
3. c.f. Schedules 9 and 10 of SI No 62/2004

Table G.1(i) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance[1]	CAS Number	Danger[2] Category	Amount Stored (tonnes)	Annual Usage (tonnes)	Nature of Use	R[3] - Phrase	S[3] - Phrase
26	Mobil Aero HFA (Hydrotreated Light Naphthenic Distillate (Petroleum))	64742-53-6	None	1 *	To be determined	Lubricant for Corrosion Inhibitor Package	-	S 24-62
27	Sintofluid (mixture of synthetic base stocks and performance additives)	Not Available	None	1 *	To be determined	Lubricant for Corrosion Inhibitor Package and Methanol Still Scale Inhibitor Package	-	S 2, 25, 29
28	BroomWade 4000 HR Oil / / Shell Corena S46 (Mineral oil with additives)	68411-46-1	Harmful	0.5	0.3	Lubricant for Instrument Air Compressors	R 52/53	S 25
29	Rocol Food Lube Grease (Highly refined technical white oil)	Not Available	None	1	To be determined	General Lubricant grease	-	S 25

Notes: 1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
2. c.f. Article 2(2) of SI Nº 77/94
3. c.f. Schedules 9 and 10 of SI No 62/2004

Table G.1(i) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance[1]	CAS Number	Danger[2] Category	Amount Stored (tonnes)	Annual Usage (tonnes)	Nature of Use	R[3] - Phrase	S[3] - Phrase
30	Castrol Transaqua HT2 (Ethylene Glycol, Triethanolamine)	107-21-1 102-71-6	Harmful	1 (excluding amount in umbilical)	1.4	Hydraulic fluid in umbilical cable for offshore subsea facilities	R22	S46
31	Biocide DBNPA (antimicrobial 7287)	10222-01-2	Corrosive (in neat form)	<1.0	<1.0	Biocide	R 34, 43	S 26, 36/37, 39, 45
32	Oxygen Scavenger (DEHA)	3710-84-7 7732-18-5	Harmful	2.0	12	Oxygen scavenger	R 10, 21, 36, 37, 38	S 23, 24, 25, 26, 28
33	Oxygen Scavenger (Sodium bisulphite)	7631-90-5	Harmful	2.0	4.0	Oxygen scavenger	R 22, 31	S 2, 25, 46
34	TEG corrosion inhibitor – product to be selected (Indicative data)	7632-00-0 1310-73-2 64665-57-2	Toxic	0.05	0.05	Corrosion inhibitor	R 8, 25, 35, 36, 38, 50	S 24, 25, 26
35	Diesel biocide – product to be selected (Indicative data)	Not Available	Corrosive	0.05	0.025	Biocide	R 8, 23-25, 34, 36, 38, 43, 50/53	S 24, 26, 27, 36, 37, 39, 45

Notes: 1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
2. c.f. Article 2(2) of SI Nº 77/94
3. c.f. Schedules 9 and 10 of SI No 62/2004

Table G.1(i) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance[1]	CAS Number	Danger[2] Category	Amount Stored (tonnes)	Annual Usage (tonnes)	Nature of Use	R[3] - Phrase	S[3] - Phrase
36	Sodium sulphate	7757-82-6	-	0.5	8.0	Produced Water Treatment	-	S 22, 24, 25
37	Sodium metabisulphite	7631-90-5	Irritant	0.05	To be determined	Suspension/ preservation fluid	R 20, 22, 36, 37, 38	S 26, 36
38	Roclean L403 (Avista product)	60-00-4 7664 –38-2	Irritant	1	To be determined	NF membrane cleaning chemical	R 36/37/38	S 26, 28, 36/37, 39
39	Urea	7732-18-5 57-13-6	-	10	56	Exhaust gas treatment	-	-
40	Lube Oil Shell Turbo GT32	Not Available	Not classified as dangerous under EC criteria	10	0.1	Lubricant: Solar	Not classified	Not classified
41	Shell Rimula RT4 15w/40	68649-42-3	Not classified as dangerous under EC criteria.	2	0.6	Lubricant: For Gensets & firepumps), Ram Pumps, Emergency generator	R 38, 41, 51/53	-

Notes: 1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
2. c.f. Article 2(2) of SI Nº 77/94
3. c.f. Schedules 9 and 10 of SI No 62/2004

Table G.1(i) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance[1]	CAS Number	Danger[2] Category	Amount Stored (tonnes)	Annual Usage (tonnes)	Nature of Use	R[3] - Phrase	S[3] - Phrase
42	Nynas Nytro 10gbxt	80584-90-3 92-84-2	Harmful, Irritant	3.2	.005	Lubricant: Transformers	R 36/38, 43, 50/53, 52/53, 51/53, 61	S 61
43	Shell Corena P100	118-82-1	Not classified as dangerous under EC criteria	0.2	.08	Lubricant: (LP Compressors)	R 53	
44	Shell Turbo T46	90-30-2	Not classified as dangerous under EC criteria	0.1	0.05	Lubricant: Flowserve Pumps	R 43, 50/53	Not classified
	Shell Tellus 68	-	Not classified as dangerous under EC criteria	0.1	0.05	Lubricant: Flowserve Pumps	Not classified	Not classified
45	CLP 220-Shell Omala 100	-	Not classified as dangerous under EC criteria	0.2	0.1	Lubricant: Progressive cavity pumps	Not classified	Not classified
46	Shell Omala Oil 220 -	-	Not classified as dangerous under EC criteria	0.2	.01	Lubricant: Odourisation Metering Pump	Not classified	Not classified

Notes: 1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
2. c.f. Article 2(2) of SI Nº 77/94
3. c.f. Schedules 9 and 10 of SI No 62/2004

Table G.1(i) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance[1]	CAS Number	Danger[2] Category	Amount Stored (tonnes)	Annual Usage (tonnes)	Nature of Use	R[3] - Phrase	S[3] - Phrase
47	MEG	107-21-1	Harmful	0	To be determined	Suspension/preservation fluid	R 22	S 24, 37, 39
48	Nitric Acid	7697-37-2	Corrosive	0.050	To be determined	Online analyser reagent	R 35	S 23A-26-36/37/39-45
49	Carbonate scale dissolver – product to be selected (Indicative data)	5329-14-6 149-30-4 64-19-7	Corrosive, Irritant	0	To be determined	Remediation of scale deposits	R 10, 35, 36	S 25, 26, 60
50	Sulphate scale dissolver – product to be selected (Indicative data)	1310-58-3	Irritant	0	To be determined	Remediation of scale deposits	R 22, 35, 36, 38	S 25, 26, 37-39, 45
51	Antifoam – product to be selected (Indicative data)	Not Available	Harmful	0.050	To be determined	Produced fluid treatment	R 65	S 23, 24, 25, 37, 39
52	Granulated activated carbon	7440-44-0	Not classified as dangerous under EC criteria	4.0	To be determined	Produced water treatment	-	-
53	Demulsifier – product to be selected (Indicative data)	Not Available	Harmful	0.050	To be determined	Produced fluid treatment	R 10, 22, 22, 36, 37, 38, 40, 41, 50, 51, 53, 65, 67	S 24, 25, 26, 37, 51, 62

Notes:
1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
2. c.f. Article 2(2) of SI Nº 77/94
3. c.f. Schedules 9 and 10 of SI No 62/2004

Table G.1(i) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance[1]	CAS Number	Danger[2] Category	Amount Stored (tonnes)	Annual Usage (tonnes)	Nature of Use	R[3] - Phrase	S[3] - Phrase
54	Proppant	Not available	Non flammable, toxic or environmental hazard	Not expected to be required	-	To assist with extraction of fluids from wells	-	-
55	Catalysts 92-1 A-H/J	Not available	Non flammable, toxic or environmental hazard	1	To be determined	Used in SCR systems	-	-
56	Puraspec 5158	Not available	Non flammable, toxic or environmental hazard	15	To be determined	Used for mercury removal from hydrocarbon streams	-	-
57	Puraspec 1156	Not available	Highly flammable, Toxic	8	To be determined	Used for mercury removal from hydrocarbon streams	R11/20/23/24/25 45/48/65	-

Notes: 1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
2. c.f. Article 2(2) of SI Nº 77/94
3. c.f. Schedules 9 and 10 of SI No 62/2004

Table G.1(ii) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance(1)	TA Luft Class 1, 2 or 3	Odour			EU Lists I and II (Tick and specify Group / Family Number)			
			Odourous Yes/No	Description	Threshold µg/m³	Dangerous Substances Directive 76/464/EEC		Groundwater Directive 80/68/EEC	
						List I	List II +129(4)	List I	List II
1	Natural Gas	-	No		-	-	-	-	-
2	Hydrocarbon Condensate	-	Yes	Characteristic odour	-	Mineral Oil/ Hydrocarbon of petroleum origin -	-	Mineral Oil/ Hydrocarbon of petroleum origin	-
3	Diesel	1	Yes	Characteristic odour	-	Mineral Oil/ Hydrocarbon of petroleum origin -	-	Mineral Oil/ Hydrocarbon of petroleum origin	-
4	Methanol (raw and product)	1	Yes	Alcohol like odour	-	-	Adverse effect on oxygen balance	-	-
5	Corrosion Inhibitor – product to be selected	TBA	TBA	TBA	-	-	-	-	-
6	Scale Inhibitor – product to be selected	TBA	TBA	TBA	-	-	-	-	

1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
4. The European Commission priority candidate list

Table G.1(ii) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance[1]	TA Luft Class 1, 2 or 3	Odour			EU Lists I and II (Tick and specify Group / Family Number)			
			Odourous Yes/No	Description	Threshold µg/m^3	Dangerous Substances Directive 76/464/EEC		Groundwater Directive 80/68/EEC	
						List I	List II +129[4]	List I	List II
7	Tri-Ethylene Glycol	-	Yes	Mild odour	-	-	Adverse effect on oxygen balance	-	-
8	Nitrogen	-	No	Odourless	-	-	-	-	-
9	Hydrochloric Acid (5%)	3	Yes	Pungent	-	-	-	-	-
10	Natural Gas Odourant (80% Tertiary Butyl Mercaptan, 20% Di-Methyl Sulphide)	1	Yes	Malodorous / Strong unpleasant odour	0.1 ppb	-	Deleterious effect on odour	-	Deleterious effect on odour
11	Hydrated Lime	-	Yes	Faint "earthy" odour	-	-	-	-	-

1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
4. The European Commission priority candidate list

Table G.1(ii) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance[1]	TA Luft Class 1, 2 or 3	Odour			EU Lists I and II (Tick and specify Group / Family Number)			
			Odourous Yes/No	Description	Threshold µg/m^3	Dangerous Substances Directive 76/464/EEC		Groundwater Directive 80/68/EEC	
						List I	List II +129[4]	List I	List II
12	2-4-6 Trimercaptotriazine Trisodium (TMT) Salt	-	No		-	-	-	-	-
13	Sulphuric Acid (30%)	-	No		-	-	-	-	-
14	Polyelectrolyte – product to be selected	-	TBA		-	-	-	-	-
15	Sodium Hydroxide (30%)	-	No		-	-	-	-	-
16	Ferric Chloride Solution	-	No		-	-	-	-	-
17	Hydrochloric Acid (30%)	3	Yes	Pungent	-	-	-	-	-

1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
4. The European Commission priority candidate list

Table G.1(ii) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance[1]	TA Luft Class 1, 2 or 3	Odour			EU Lists I and II (Tick and specify Group / Family Number)			
			Odourous Yes/No	Description	Threshold µg/m^3	Dangerous Substances Directive 76/464/EEC		Groundwater Directive 80/68/EEC	
						List I	List II +129[4]	List I	List II
18	Scale Inhibitor – product to be selected	TBA	TBA	TBA		-	-	-	-
19	Sodium Hypochlorite	-	Yes	Characteristic odour of chlorine	-	-	-	-	-
20	Sodium Chloride	-	No		-	-	-	-	-
21	Propane	-	No		-	-	-	-	-
22	Roclean L211 (Avista product)	-	Yes	Slight	-	Organophosphorus compound	-	Organophosphorus compound	-
23	Roclean L811 (Avista product)	-	Yes	Slight amine	-	-	-	-	-

1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
4. The European Commission priority candidate list

Table G.1(ii) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance[1]	TA Luft Class 1, 2 or 3	Odour			EU Lists I and II (Tick and specify Group/Family Number)			
			Odourous Yes/No	Description	Threshold µg/m^3	Dangerous Substances Directive 76/464/EEC		Groundwater Directive 80/68/EEC	
						List I	List II +129[4]	List I	List II
24	Carbon Dioxide	-	No	-	-	-	-	-	-
25	Niagara Fire Foam Concentrate	-	Yes	Organic type odour	-	-	-	-	-
26	Mobil Aero HFA	-	Yes	Mild	-	Mineral Oil/ Hydrocarbon of petroleum origin -	-	Mineral Oil/ Hydrocarbon of petroleum origin	-
27	Sintofluid	-	Yes	Characteristic odour	-	Mineral Oil/ Hydrocarbon of petroleum origin -	-	Mineral Oil/ Hydrocarbon of petroleum origin	-
28	BroomWade 4000 HR Oil / / Shell Corena S46 (Mineral oil with additives)	-	Yes	Mineral oil odour	-	Mineral Oil/ Hydrocarbon of petroleum origin -	-	Mineral Oil/ Hydrocarbon of petroleum origin	-

1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
4. The European Commission priority candidate list

Table G.1(ii) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance(1)	TA Luft Class 1, 2 or 3	Odour			EU Lists I and II (Tick and specify Group / Family Number)			
			Odourous Yes/No	Description	Threshold µg/m^3	Dangerous Substances Directive 76/464/EEC		Groundwater Directive 80/68/EEC	
						List I	List II +129(4)	List I	List II
29	Rocol Food Lube Grease	-	No		-	Mineral Oil/ Hydrocarbon of petroleum origin -	-	Mineral Oil/ Hydrocarbon of petroleum origin	-
30	Castrol Transaqua HT	3	Yes	Sweetish	-	-	Adverse effect on oxygen balance	-	-
31	Biocide DBNPA	-	Yes	Light anaesthetic	-	-	Biocide	-	Biocide
32	Oxygen Scavenger (DEHA)	-	Yes	Amine	-	-	Adverse effect on oxygen balance	-	-
33	Oxygen Scavenger (Sodium bisulphite)	-	Yes	sulphur	-	-	Adverse effect on oxygen balance	-	-

1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
4. The European Commission priority candidate list

Table G.1(ii) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance[1]	TA Luft Class 1, 2 or 3	Odour			EU Lists I and II (Tick and specify Group / Family Number)			
			Odourous Yes/No	Description	Threshold µg/m^3	Dangerous Substances Directive 76/464/EEC		Groundwater Directive 80/68/EEC	
						List I	List II +129[4]	List I	List II
34	TEG corrosion inhibitor – product to be selected (Indicative data)	-	TBA			-	-	-	Nitrite containing
35	Diesel biocide – product to be selected (Indicative data)	-	TBA			-	Biocide	-	Biocide
36	Sodium sulphate	-	No			-	-	-	-
37	Sodium metabisulphite	-	No			-	-	-	-
38	RoClean L403 (Avista product)	-	Yes	Slight		-	Inorganic phosphate compound	-	Inorganic phosphate compound
39	Urea (10 x 1 m3)	-	Yes	Ammonical (slight)		-	-	-	-

1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
4. The European Commission priority candidate list

Table G.1(ii) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance(1)	TA Luft Class 1, 2 or 3	Odour			EU Lists I and II (Tick and specify Group / Family Number)			
			Odourous Yes/No	Description	Threshold µg/m^3	Dangerous Substances Directive 76/464/EEC		Groundwater Directive 80/68/EEC	
						List I	List II +129(4)	List I	List II
40	Lube Oil Shell Turbo GT32	-	Yes	Mineral oil odour	-	Mineral Oil/ Hydrocarbon of petroleum origin -	-	Mineral Oil/ Hydrocarbon of petroleum origin	-
41	Shell Nautica 15w 40	-	Yes	Mineral oil odour	-	Mineral Oil/ Hydrocarbon of petroleum origin -	-	Mineral Oil/ Hydrocarbon of petroleum origin	-
42	Nynas Nytro 10gbxt	-	Yes	Mineral oil odour	-	Mineral Oil/ Hydrocarbon of petroleum origin -	-	Mineral Oil/ Hydrocarbon of petroleum origin	-
43	Shell Corena P100	-	Yes	Mineral oil odour	-	Mineral Oil/ Hydrocarbon of petroleum origin -	-	Mineral Oil/ Hydrocarbon of petroleum origin	-

1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
4. The European Commission priority candidate list

Table G.1(ii) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance(1)	TA Luft Class 1, 2 or 3	Odour			EU Lists I and II (Tick and specify Group / Family Number)			
			Odourous Yes/No	Description	Threshold µg/m^3	Dangerous Substances Directive 76/464/EEC		Groundwater Directive 80/68/EEC	
						List I	List II +129(4)	List I	List II
44	Shell Turbo T46	-	Yes	Mineral oil odour	-	Mineral Oil/ Hydrocarbon of petroleum origin -	-	Mineral Oil/ Hydrocarbon of petroleum origin	-
45	CLP 220-Shell Omala 100	-	Yes	Mineral oil odour	-	Mineral Oil/ Hydrocarbon of petroleum origin -	-	Mineral Oil/ Hydrocarbon of petroleum origin	-
46	Shell Omala Oil 220	-	Yes	Mineral oil odour	-	Mineral Oil/ Hydrocarbon of petroleum origin -	-	Mineral Oil/ Hydrocarbon of petroleum origin	-
47	MEG	3	Yes	Sweetish	-	-	Adverse effect on oxygen balance	-	-

1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
4. The European Commission priority candidate list

Table G.1(ii) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance(1)	TA Luft Class 1, 2 or 3	Odour			EU Lists I and II (Tick and specify Group / Family Number)			
			Odourous Yes/No	Description	Threshold µg/m³	Dangerous Substances Directive 76/464/EEC		Groundwater Directive 80/68/EEC	
						List I	List II +129(4)	List I	List II
48	Nitric Acid	-	Yes	Pungent	-	-	-	-	-
49	Carbonate scale dissolver – product to be selected	-	TBA	TBA		TBA	TBA	TBA	TBA
50	Sulphate scale dissolver – product to be selected	-	TBA	TBA		TBA	TBA	TBA	TBA
51	Antifoam – product to be selected	-	Yes	Slight		TBA	TBA	TBA	TBA
52	Granulated activated carbon	-	No			-	-	-	-
53	Demulsifier – product to be selected	-	TBA	TBA		TBA	TBA	TBA	TBA

1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
4. The European Commission priority candidate list

Table G.1(ii) Details of Process related Raw Materials, Intermediates, Products, etc., used or generated on the site

Ref. Nº or Code	Material / Substance(1)	TA Luft Class 1, 2 or 3	Odour			EU Lists I and II (Tick and specify Group / Family Number)			
			Odourous Yes/No	Description	Threshold µg/m³	Dangerous Substances Directive 76/464/EEC		Groundwater Directive 80/68/EEC	
						List I	List II +129(4)	List I	List II
54	Proppant	-	TBA	TBA		TBA	TBA	TBA	TBA
55	Catalysts 92-1 A-H/J	-	TBA	TBA		TBA	TBA	TBA	TBA
56	Puraspec 5158	-	TBA	TBA		TBA	TBA	TBA	TBA
57	Puraspec 1156	-	TBA	TBA		TBA	TBA	TBA	TBA

1. In cases where a material comprises a number of distinct and available dangerous substances, please give details for each component substance.
4. The European Commission priority candidate list

TABLE H.1(i): WASTE Hazardous Waste Recovery / Disposal

Waste material	EWC Code	Main source[1]	Quantity		On-site Recovery/Disposal	Off-site Recovery, reuse or recycling	Off-site Disposal
			Tonnes / month	m^3 / month	(Method and Location)	(Method, Location & Undertaker [2])	(Method, Location & Undertaker [2])
Aqueous Filter Cartridge (hydrocarbon contaminated solids and inorganic salts)	150202	Methanol Recovery Process	0.05 tonnes/year	0.4 m^3/year	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided
Condensate Filter Cartridge (hydrocarbon contaminated solids and inorganic salts)	150202	Condensate Recovery Process	0.05 tonnes/year	0.27 m^3/year	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided
Odourisation Package Activated Carbon Filter (hydrocarbon contaminated anthracite)	150202 / 061302	Gas Odourant Storage	2.5 tonnes every four years	1 m^3 every four years	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided
Mercury Removal Bed (Hg and hydrocarbon contaminated absorbent)	050701	Mercury Removal - Gas Stream	12.2 tonnes (weight of absorbent bed) containing 40 to 1035 kg of mercury every 8 years	ca. 12.2 m^3 (volume of absorbent bed) every 8 years	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided

1 A reference should be made to the main activity / process for each waste.
2 Licensed waste contractors certified to ISO:14001 will be used.

TABLE H.1(i): WASTE Hazardous Waste Recovery/Disposal

Waste material	EWC Code	Main source[1]	Quantity		On-site Recovery/Disposal	Off-site Recovery, reuse or recycling	Off-site Disposal
			Tonnes / month	m^3 / month	(Method & Location)	(Method, Location & Undertaker [2])	Method, Location & Undertaker [2])
Mercury Removal Bed (Hg and hydrocarbon contaminated absorbent)	050701	Mercury Removal - Condensate Stream	14.5 tonnes (weight of absorbent bed) containing 30 to 265 kg of mercury every 3 years	ca. 14.5 m^3 (volume of absorbent bed) every 3 years	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided
Export Methanol Filter Cartridges (hydrocarbon contaminated solids and inorganic salts)	150202	Methanol Recovery Process	0.1 tonnes/year	0.02 m^3/year	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided
Sludge Filter Cake from Produced Water and Surface Water Treatment Systems (metals and inorganic salts)	060502	Produced and Surface Water Treatment Systems	52 tonnes/month [3]	42 m^3/month [3]	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided
Used Chemical Containers (contaminated packaging / containers)	150110	Delivery / Storage of chemicals used on site	3 tonnes/month	3 m^3/month	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided

1 A reference should be made to the main activity / process for each waste.
2 Licensed waste contractors certified to ISO:14001 will be used.
3 Estimate of sludge filter cake produced is calculated on the basis of maximum anticipated produced water flowrate of 3.3 m^3/hr to the produced water treatment system and surface water runoff rate of 2.1 m^3/hr (based on maximum annual rainfall of 1447.8 mm) to the surface water treatment system.

TABLE H.1(i): WASTE Hazardous Waste Recovery/Disposal

Waste material	EWC Code	Main source[1]	Quantity		On-site Recovery/Disposal (Method & Location)	Off-site Recovery, reuse or recycling Method, Location & Undertaker [2])	Off-site Disposal Method, Location & Undertaker [2])
			Tonnes / month	m^3 / month			
Contaminated heating medium (Tri- Ethylene Glycol)	161001	Heating Medium System	29 tonnes every ten years	30 m^3 every ten years	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided
Methanol Still Reboiler Scale (inorganic salts and sand with slight hydrocarbon contamination)	160708	Methanol Recovery Process	12 tonnes every three years	4.8 m^3 every three years	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided
Tank and/or vessel sludge (hydrocarbon contaminated sand and inorganic salts)	160708	Various Operations	100 tonnes every 3 years	50 m^3 every three years	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided
Methanol Reboiler Tubes (carbon steel with hydrocarbon contaminated solids and inorganic salts)	050799	Methanol Recovery Process	7 tonnes every six years	Volume to be determined	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided
Methanol still valve trays (carbon steel with hydrocarbon contaminated solids and inorganic salts)	050799	Methanol Recovery Process	1 tonne every three years	Volume to be determined	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided

1 A reference should be made to the main activity / process for each waste.
2 Licensed waste contractors certified to ISO:14001 will be used.

TABLE H.1(i): WASTE Hazardous Waste Recovery/Disposal

Waste material	EWC Code	Main source[1]	Quantity		On-site Recovery/Disposal	Off-site Recovery, reuse or recycling	Off-site Disposal
			Tonnes / month	m^3 / month	Method & Location)	Method, Location & Undertaker [2])	Method, Location & Undertaker [2])
Spent Laboratory Chemicals	160506	Laboratory	4.5 tonnes/year	5 m^3/year	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided
Clinical Waste	180104	First Aid Room	0.03 tonnes/year	0.03 m^3/year	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided
Oil contaminated clothing (PPE), rags etc.	150202	Clothing used by Terminal personnel	0.5 tonnes/month	0.5 m^3/month	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided
Fluorescent Light Tubes	200121	Replacement as required during maintenance	0.002 tonnes/month	0.002 m^3/month	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided
Condensate (This is a by-product from the process and will be exported off-site for recovery).	130703	Hydrocarbon condensate recovered from gas conditioning	67.2 to 672 tonnes/month	84 to 840 m^3/month	Not Applicable	Licensed Waste Contractor to be decided. It is intended that condensate taken off-site will be recovered as a fuel by contractor.	Licensed Waste Contractor to be decided

1 A reference should be made to the main activity/ process for each waste.
2. Licensed waste contractors certified to ISO:14001 will be used.

TABLE H.1(i): WASTE Hazardous Waste Recovery/Disposal

Waste material	EWC Code	Main source[1]	Quantity		On-site Recovery/Disposal	Off-site Recovery, reuse or recycling	Off-site Disposal
			Tonnes / month	m^3 / month	Method & Location)	Method, Location & Undertaker [2])	Method, Location & Undertaker [2])
Sand	01 04 07	From separators (during shutdown periods)	1.3 tonnes/year	N/A	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided

2 A reference should be made to the main activity/ process for each waste.
2. Licensed waste contractors certified to ISO:14001 will be used.

TABLE H.1(ii) WASTE - Other Waste Recovery / Disposal

Waste material	EWC Code	Main source[1]	Quantity		On-site recovery/disposal[2]	Off-site Recovery, reuse or recycling	Off-site Disposal
			Tonnes / month	m^3 / month	(Method, Location & Undertaker)	(Method, Location & Undertaker [3])	(Method, Location & Undertaker [3])
General Mixed Municipal Waste	200301	Office & Various Areas	18.3 tonnes/year	Volume to be determined	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided
Cooking Oil	200125	Canteen	2.4 tonnes/year	3 m^3/year	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided
Silica Gel	150203	Utilities Air Drying	3 tonnes every three years	2 m^3 every three years	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided
Nitrogen Generation Unit Membrane	061399	Nitrogen Generation	1 tonne every 10 years	Volume to be determined	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided
Septic Tank Domestic Sewage Sludge	200304	Treatment of Domestic sewage	4.5 tonnes every 3 years	4.5 m^3 every 3 years	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided
Settlement Pond Sludge	17 05 04	Stone/grit	<1tonne/year	< 0.5m^3/year	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided

1 A reference should be made to the main activity/ process for each waste.
2 The method of disposal or recovery should be clearly described and referenced to Attachment H.1
3 Licensed waste contractors certified to ISO:14001 will be used.

TABLE H.1(ii) WASTE - Other Waste Recovery/Disposal

Waste material	EWC Code	Main source[1]	Quantity		On-site recovery/disposal[2] (Method, Location & Undertaker)	Off-site Recovery, reuse or recycling (Method, Location & Undertaker [3])	Off-site Disposal (Method, Location & Undertaker [3])
			Tonnes / month	m^3 / month			
Surplus Treated Produced Water	161002	Produced Water Treatment Plant	450-600 m^3/month	450-600 m^3/month	Not Applicable	Licensed Waste Contractor to be decided	Licensed Waste Contractor to be decided

1 A reference should be made to the main activity/ process for each waste.
2 The method of disposal or recovery should be clearly described and referenced to Attachment H.1
3 Licensed waste contractors certified to ISO:14001 will be used.

Table I.2(i) SURFACE WATER QUALITY (sheet 1 of 2): SW1 and SW3(indicative). Results are from samples colleted off Erris Head in the Vicinity of the outfall

Parameter	Results (mg/l)				Sampling method[2] (grab, drift etc.)	Normal Analytical Range[2]	Analysis method / technique
	2 Aug 2007 Surface	2 Aug 2007 Near – bottom (89m)	21/22 July 08 Surface	21/22 July 08 Near – bottom (92m)			
pH							
Temperature	15.77	12.14	13.98	11.44	CTD probe		CTD probe
Electrical conductivity EC							
Salinity	35.1	35.2	34.9	35.1	CTD probe		CTD probe
Ammoniacal nitrogen NH_4-N	<0.01 µg/	<0.01 µg/	<0.01 µg/	0.022 µg/	Water bottle		
Chemical oxygen demand							
Biochemical oxygen demand							
Dissolved oxygen DO							
Calcium Ca							
Cadmium Cd	<0.0400 µg/l	<0.0400 µg/l	<0.0400 µg/l	<0.0400 µg/l	Water bottle		
Chromium Cr	<0.500 µg/l	<0.500 µg/l	<0.500 µg/l	<0.500 µg/l	Water bottle		
Chloride Cl							
Copper Cu	2.450 µg/l	2.080 µg/l	<0.200 µg/l	1.21 µg/l	Water bottle		
Iron Fe							
Lead Pb	0.5450 µg/l	0.3890 µg/l	0.082 µg/l	40.8 µg/l	Water bottle		
Magnesium Mg							
Manganese Mn							
Mercury Hg	<0.010 µg/l	<0.010 µg/l	<0.010 µg/l	<0.010 µg/l	Water bottle		

Table I.2(i) SURFACE WATER QUALITY: (sheet 2 of 2): SW1 and SW3(indicative). Results are from samples colleted off Erris Head in the Vicinity of the outfall

Parameter	Results (mg/l)				Sampling method (grab, drift etc.)	Normal Analytical Range	Analysis method / technique
	Date	Date	Date	Date			
Nickel Ni	1.100 µg/l	0.370 µg/l	0.350 µg/l	0.320 µg/l	Water bottle		
Potassium K							
Sodium Na							
Sulphate SO_4							
Zinc Zn	59.600 µg/l	5.900 µg/l	11.0 µg/l	8.72 µg/l	Water bottle		
Total alkalinity (as $CaCO_3$)							
Total organic carbon TOC							
Total oxidised nitrogen TON							
Nitrite NO_2							
Nitrate NO_3							
Faecal coliforms (/100mls)							
Total coliforms (/100mls)							
Phosphate PO_4							

Table I.2(ii) SURFACE WATER QUALITY: Based to Wood Environmental Annual Water Quality Report included in original Application

(Sheet 1 of 2) Monitoring Point/ Grid Reference: ASW1 (R314 Road Drainage Ditch (D16) to south-west of Terminal)

Parameter	Results (mg/l)				Sampling method[2] (grab, drift etc.)	Normal Analytical Range[2]	Analysis method / technique
	Nov'01	Dec'01	Jan'02	Feb'02			
pH	6.74	5.53	6.45	5.76	Grab Sample	-	pH meter
Temperature	8.1 ºC	10.1 ºC	7.1 ºC	5.8 ºC	Grab Sample	-	Temperature Probe
Electrical conductivity EC	143 µS/cm	155 µS/cm	192 µS/cm	212 µS/cm	Grab Sample	-	Conductivity Meter
Ammoniacal nitrogen NH_4-N	0.5	3.0	0.2	1.49	Grab Sample	-	Standard Method
Ammonium	0.64	3.86	0.26	1.91	Grab Sample	-	Standard Method
Chemical oxygen demand	Not Available	Not Available	Not Available	Not Available	-	-	-
Biochemical oxygen demand	Not Available	Not Available	Not Available	Not Available	-	-	-
Dissolved oxygen DO	8.01	9.75	10.10	11.9	Grab Sample	-	Standard Method
Suspended Solids	< 10	< 10	28	40	Grab Sample	-	Standard Method
Calcium Ca	Not Available	Not Available	Not Available	Not Available	-	-	-
Cadmium Cd	Not Available	Not Available	Not Available	Not Available	-	-	-
Chromium Cr	Not Available	Not Available	Not Available	Not Available	-	-	-
Chloride Cl	Not Available	Not Available	Not Available	Not Available	-	-	-
Copper Cu	Not Available	Not Available	Not Available	Not Available	-	-	-
Iron Fe	Not Available	Not Available	Not Available	Not Available	-	-	-
Lead Pb	Not Available	Not Available	Not Available	Not Available	-	-	-
Magnesium Mg	Not Available	Not Available	Not Available	Not Available	-	-	-
Manganese Mn	Not Available	Not Available	Not Available	Not Available	-	-	-
Mercury Hg	Not Available	Not Available	Not Available	Not Available	-	-	-

Surface Water Quality (Sheet 2 of 2) **Based on Wood Environmental Annual Water Quality Report included in Original Application.**

Monitoring Point/ Grid Reference: ASW1 (R314 Road Drainage Ditch (D16) to south-west of Terminal)

Parameter	Results (mg/l)				Sampling method (grab, drift etc.)	Normal Analytical Range	Analysis method / technique
	Nov'01	Dec'01	Jan'02	Feb'02			
Nickel Ni	Not Available	Not Available	Not Available	Not Available	-	-	
Potassium K	Not Available	Not Available	Not Available	Not Available	-	-	
Sodium Na	Not Available	Not Available	Not Available	Not Available	-	-	
Sulphate SO_4	Not Available	Not Available	Not Available	Not Available	-	-	
Zinc Zn	Not Available	Not Available	Not Available	Not Available	-	-	
Total alkalinity (as $CaCO_3$)	Not Available	Not Available	Not Available	Not Available	-	-	
Total organic carbon TOC	Not Available	Not Available	Not Available	Not Available	-	-	
Total oxidised nitrogen TON	Not Available	Not Available	Not Available	Not Available	-	-	
Nitrite NO_2	< 0.05	< 0.5	0.1	<0.05	Grab Sample	-	Standard Method
Nitrate NO_3	3.0	0.3	< 0.3	<0.3	Grab Sample	-	Standard Method
Faecal coliforms (/100mls)	Not Available	Not Available	Not Available	Not Available	-	-	
Total coliforms (/100mls)	Not Available	Not Available	Not Available	Not Available	-	-	
Phosphate PO_4	0.2	< 0.03	1.2	0.1	Grab Sample	-	Standard Method
Orthophosphate (as P)	0.065	<0.01	0.39	0.03	Grab Sample	-	Standard Method

Table I.2(ii) SURFACE WATER QUALITY: Based on Wood Environmental Annual Water Quality Report included in original Application CONTD.

(Sheet 1 of 2) Monitoring Point/ Grid Reference: ASW1 (R314 Road Drainage Ditch (D16) to south-west of Terminal)

Parameter	Results (mg/l)				Sampling method[2] (grab, drift etc.)	Normal Analytical Range[2]	Analysis method / technique
	March'02	April'02	May'02	Date			
pH	Not Available	7.02	7.07	-	Grab Sample	-	pH meter
Temperature	7.7 ºC	8.05 ºC	9.9 ºC	-	Grab Sample	-	Temperature Probe
Electrical conductivity EC	290 µS/cm	310 µS/cm	290 µS/cm	-	Grab Sample	-	Conductivity Meter
Ammoniacal nitrogen NH_4-N	34.00	59.9	25.50	-	Grab Sample	-	Standard Method
Ammonium	0.044	0.077	0.033	-	Grab Sample	-	Standard Method
Chemical oxygen demand	Not Available	Not Available	Not Available	-	-	-	-
Biochemical oxygen demand	Not Available	Not Available	Not Available	-	-	-	-
Dissolved oxygen DO	10.10	8.89	8.4	-	Grab Sample	-	Standard Method
Suspended Solids	< 3	< 3	< 3	-	Grab Sample	-	Standard Method
Calcium Ca	Not Available	Not Available	Not Available	-	-	-	-
Cadmium Cd	Not Available	Not Available	Not Available	-	-	-	-
Chromium Cr	Not Available	Not Available	Not Available	-	-	-	-
Chloride Cl	Not Available	Not Available	Not Available	-	-	-	-
Copper Cu	Not Available	Not Available	Not Available	-	-	-	-
Iron Fe	Not Available	Not Available	Not Available	-	-	-	-
Lead Pb	Not Available	Not Available	Not Available	-	-	-	-
Magnesium Mg	Not Available	Not Available	Not Available	-	-	-	-
Manganese Mn	Not Available	Not Available	Not Available	-	-	-	-
Mercury Hg	Not Available	Not Available	Not Available	-	-	-	-

Surface Water Quality (Sheet 2 of 2) **Based on Wood Environmental Annual Water Quality Report included in Original Application.**

Monitoring Point/ Grid Reference: ASW1 (R314 Road Drainage Ditch (D16) to south-west of Terminal)

Parameter	Results (mg/l)				Sampling method (grab, drift etc.)	Normal Analytical Range	Analysis method / technique
	March'02	April'02	May'02	Date			
Nickel Ni	Not Available	Not Available	Not Available	-	-	-	
Potassium K	Not Available	Not Available	Not Available	-	-	-	
Sodium Na	Not Available	Not Available	Not Available	-	-	-	
Sulphate SO_4	Not Available	Not Available	Not Available	-	-	-	
Zinc Zn	Not Available	Not Available	Not Available	-	-	-	
Total alkalinity (as $CaCO_3$)	Not Available	Not Available	Not Available	-	-	-	
Total organic carbon TOC	Not Available	Not Available	Not Available	-	-	-	
Total oxidised nitrogen TON	Not Available	Not Available	Not Available	-	-	-	
Nitrite NO_2	0.016	0.032	0.021	-	Grab Sample	-	Standard Method
Nitrate NO_3	0.11	0.462	0.314	-	Grab Sample	-	Standard Method
Faecal coliforms (/100mls)	Not Available	Not Available	Not Available	-	-	-	
Total coliforms (/100mls)	Not Available	Not Available	Not Available	-	-	-	
Phosphate PO_4	Not Available	Not Available	Not Available	-	-	-	-
Orthophosphate (as P)	0.2	0.032	0.003	-	Grab Sample	-	Standard Method

Table I.4(i) GROUNDWATER QUALITY: Based on Minerex Hydrogeological Report included in original Application.

(Sheet 1 of 2) Monitoring Point/ Grid Reference: NTS-BH-BR1 (Bedrock Well)

Parameter	Results (mg/l)				Sampling method (composite etc.)	Normal Analytical Range	Analysis method / technique
	February 2002	Date	Date	Date			
pH	6.12-6.67	-	-	-	Sample pumped from well following purging of 2-3 borehole volumes	-	pH meter
Temperature	9.9 – 11.5ºC	-	-	-		-	Temperature probe
Electrical conductivity EC	253-527 µS/cm	-	-	-		-	Conductivity Meter
Ammoniacal nitrogen NH_4-N	2.3	-	-	-		-	Standard Method
Dissolved oxygen DO	Not Available	-	-	-		-	-
Residue on evaporation (180°C)	Not Available	-	-	-		-	-
Calcium Ca	2.8	-	-	-		-	Standard Method
Cadmium Cd	Not Available	-	-	-		-	-
Chromium Cr	Not Available	-	-	-		-	-
Chloride Cl	42	-	-	-		-	Standard Method
Copper Cu	Not Available	-	-	-		-	-
Cyanide Cn, total	Not Available	-	-	-		-	-
Iron Fe (Dissolved)	31.27	-	-	-		-	Standard Method
Lead Pb	Not Available	-	-	-		-	-
Magnesium Mg	2.73	-	-	-		-	Standard Method
Manganese Mn	0.21	-	-	-		-	Standard Method
Mercury Hg	Not Available	-	-	-		-	-
Nickel Ni	Not Available	-	-	-		-	-
Potassium K	1.8	-	-	-		-	Standard Method
Sodium Na	35	-	-	-		-	Standard Method

GROUNDWATER QUALITY: **BASED ON Minerex Hydrogeological Report included in Original Application**

(Sheet 2 of 2) Monitoring Point/ Grid Reference: NTS-BH-BR1 (Bedrock Well)

Parameter	Results (mg/l)				Sampling method (composite, dipper etc.)	Normal Analytical Range	Analysis method / technique
	February 2002	Date	Date	Date			
Phosphate PO_4	0.1	-	-	-	Sample pumped from well following purging of 2-3 borehole volumes	-	Standard Method
Sulphate SO_4 – soluble	22.8	-	-	-		-	Standard Method
Zinc Zn	Not Available	-	-	-		-	-
Total alkalinity (as $CaCO_3$)	40	-	-	-		-	Standard Method
Total Hardness	37	-	-	-		-	Standard Method
Total organic carbon TOC	Not Available	-	-	-		-	-
Total oxidised nitrogen TON	Not Available	-	-	-		-	-
Kjeldahl Nitrogen	13	-	-	-		-	Standard Method
Arsenic As	Not Available	-	-	-		-	-
Barium Ba	Not Available	-	-	-		-	-
Boron B	Not Available	-	-	-		-	-
Fluoride F	Not Available	-	-	-		-	-
Phenol	Not Available	-	-	-		-	-
Phosphorus P	0.49	-	-	-		-	Standard Method
Selenium Se	Not Available	-	-	-		-	-
Silver Ag	Not Available	-	-	-		-	-
Nitrite NO_2	Not Available	-	-	-		-	-
Nitrate NO_3 - soluble	0.3	-	-	-		-	Standard Method
Faecal coliforms (/100mls)	Not Available	-	-	-		-	-
Total coliforms (/100mls)	Not Available	-	-	-		-	-
Water level (m OD)	Depth of well = 16m bgl	-	-	-		-	-

-

Table I.4(i) GROUNDWATER QUALITY: Refer to Minerex Hydrogeological Report included in Original Application.

(Sheet 1 of 2) Monitoring Point/ Grid Reference: NTS-BH-BR2 (Bedrock Well)

Parameter	Results (mg/l)				Sampling method (composite etc.)	Normal Analytical Range	Analysis method / technique
	February 2002	Date	Date	Date			
pH	6.12-6.67	-	-	-	Sample pumped from well following purging of 2-3 borehole volumes	-	pH meter
Temperature	9.9 – 11.5ºC	-	-	-		-	Temperature probe
Electrical conductivity EC	253-527 µS/cm	-	-	-		-	Conductivity Meter
Ammoniacal nitrogen NH_4-N	2.2	-	-	-		-	Standard Method
Dissolved oxygen DO	Not Available	-	-	-		-	-
Residue on evaporation (180°C)	Not Available	-	-	-		-	-
Calcium Ca	10.44	-	-	-		-	Standard Method
Cadmium Cd	Not Available	-	-	-		-	-
Chromium Cr	Not Available	-	-	-		-	-
Chloride Cl	50	-	-	-		-	Standard Method
Copper Cu	Not Available	-	-	-		-	-
Cyanide Cn, total	Not Available	-	-	-		-	-
Iron Fe (Dissolved)	50.7	-	-	-		-	Standard Method
Lead Pb	Not Available	-	-	-		-	-
Magnesium Mg	6.43	-	-	-		-	Standard Method
Manganese Mn	1.88	-	-	-		-	Standard Method
Mercury Hg	Not Available	-	-	-		-	-
Nickel Ni	Not Available	-	-	-		-	-
Potassium K	2.3	-	-	-		-	Standard Method
Sodium Na	32	-	-	-		-	Standard Method

GROUNDWATER QUALITY: **Refer to Minerex Hydrogeological Report included in Original Application**

(Sheet 2 of 2) Monitoring Point/ Grid Reference: NTS-BH-BR2 (Bedrock Well)

Parameter	Results (mg/l)				Sampling method (composite, dipper etc.)	Normal Analytical Range	Analysis method / technique
	February 2002	Date	Date	Date			
Phosphate PO_4	0.36	-	-	-	Sample pumped from well following purging of 2-3 borehole volumes	-	Standard Method
Sulphate SO_4 – soluble	4	-	-	-		-	Standard Method
Zinc Zn	Not Available	-	-	-		-	-
Total alkalinity (as $CaCO_3$)	124	-	-	-		-	Standard Method
Total Hardness	98	-	-	-		-	Standard Method
Total organic carbon TOC	Not Available	-	-	-		-	-
Total oxidised nitrogen TON	Not Available	-	-	-		-	-
Kjeldahl Nitrogen	1	-	-	-		-	Standard Method
Arsenic As	Not Available	-	-	-		-	-
Barium Ba	Not Available	-	-	-		-	-
Boron B	Not Available	-	-	-		-	-
Fluoride F	Not Available	-	-	-		-	-
Phenol	Not Available	-	-	-		-	-
Phosphorus P	0.64	-	-	-		-	Standard Method
Selenium Se	Not Available	-	-	-		-	-
Silver Ag	Not Available	-	-	-		-	-
Nitrite NO_2	Not Available	-	-	-		-	-
Nitrate NO_3- soluble	0.3	-	-	-		-	Standard Method
Faecal coliforms (/100mls)	Not Available	-	-	-		-	-
Total coliforms (/100mls)	Not Available	-	-	-		-	-
Water level (m OD)	Depth of well = 18m bgl					-	-

Table I.4(i) GROUNDWATER QUALITY: Refer to Minerex Hydrogeological Report included in Original Application

(Sheet 1 of 2) Monitoring Point/ Grid Reference: NTS-BH-OB1 (Overburden Well)

Parameter	Results (mg/l)				Sampling method (composite etc.)	Normal Analytical Range	Analysis method / technique
	February 2002	Date	Date	Date			
pH	6.5	-	-	-	Sample taken following purging of 2-3 borehole volumes	-	pH meter
Temperature	9.7ºC	-	-	-		-	Temperature probe
Electrical conductivity EC	768-789 µS/cm	-	-	-		-	Conductivity Meter
Ammoniacal nitrogen NH_4-N	4.7	-	-	-		-	Standard Method
Dissolved oxygen DO	Not Available	-	-	-		-	-
Residue on evaporation (180°C)	Not Available	-	-			-	-
Calcium Ca	29.44	-	-	-		-	Standard Method
Cadmium Cd	Not Available	-	-	-		-	-
Chromium Cr	Not Available	-	-	-		-	-
Chloride Cl	46	-	-	-		-	Standard Method
Copper Cu	Not Available	-	-	-		-	-
Cyanide Cn, total	Not Available	-	-	-		-	-
Iron Fe (Dissolved)	9.4	-	-	-		-	Standard Method
Lead Pb	Not Available	-	-	-		-	-
Magnesium Mg	3.91	-	-	-		-	Standard Method
Manganese Mn	0.64	-	-	-		-	Standard Method
Mercury Hg	Not Available	-	-	-		-	-
Nickel Ni	Not Available	-	-	-		-	-
Potassium K	3.9	-	-	-		-	Standard Method
Sodium Na	32	-	-	-		-	Standard Method

GROUNDWATER QUALITY: **Refer to Minerex Hydrogeological Report included in Original Application**

(Sheet 2 of 2) Monitoring Point/ Grid Reference: NTS-BH-OB1 (Overburden Well)

Parameter	Results (mg/l)				Sampling method (composite, dipper etc.)	Normal Analytical Range	Analysis method / technique
	February 2002	Date	Date	Date			
Phosphate PO_4	0.11	-	-	-	Sample taken following purging of 2-3 borehole volumes	-	Standard Method
Sulphate SO_4 – soluble	3	-	-	-		-	Standard Method
Zinc Zn	Not Available	-	-	-		-	-
Total alkalinity (as $CaCO_3$)	200	-	-	-		-	Standard Method
Total Hardness	167	-	-	-		-	Standard Method
Total organic carbon TOC	Not Available	-	-			-	-
Total oxidised nitrogen TON	Not Available	-	-			-	-
Kjeldahl Nitrogen	9	-	-	-		-	Standard Method
Arsenic As	Not Available	-	-	-		-	-
Barium Ba	Not Available	-	-	-		-	-
Boron B	Not Available	-	-	-		-	-
Fluoride F	Not Available	-	-	-		-	-
Phenol	Not Available	-	-	-		-	-
Phosphorus P	1.43	-	-	-		-	Standard Method
Selenium Se	Not Available	-	-	-		-	-
Silver Ag	Not Available	-	-	-		-	-
Nitrite NO_2	Not Available	-	-	-		-	-
Nitrate NO_3 - soluble	0.3	-	-	-		-	Standard Method
Faecal coliforms (/100mls)	Not Available	-	-	-		-	-
Total coliforms (/100mls)	Not Available	-	-	-		-	-
Water level (m OD)	Depth of borehole = 6.2m bgl					-	-

TABLE I.4(ii): LIST OF OWNERS/FARMERS OF LAND NOT APPLICABLE

Land Owner	Townlands where landspreading	Map Reference	Fertiliser P requirement for each farm
			*NMP must take account of on-farm slurry

Total P requirement of the client List _____

TABLE I.4(ii): LANDSPREADING **NOT APPLICABLE**

Land Owner/Farmer_____

Map Reference_____

Field ID	Total Area (ha)	(a) Usable Area (ha)	Soil P Test Mg/l	Date of P test	Crop	P Required (kg P/ha)	Volume of On-Farm Slurry Returned (m^3/ha)	Estimated P in On-Farm Slurry (kg P/ha)	(b) Volume to be Applied (m^3/ha)	P Applied (kg P/ha)	Total Volume of imported slurry per plot (m^3)

TOTAL VOLUME THAT CAN BE IMPORTED ON TO THE FARM.

Concentration of P in landspread matterial	- kg P/m^3
Concentrarion of N in landspread material	- kg N/m^3

Table I.7(i) Ambient Noise Assessment: Refer to Noise Survey Reports Included in Original Application.

Third Octave analysis for noise emissions should be used to determine tonal noises

Copy of Data from Original Application:

DAYTIME (0700 – 1900) NOISE LEVELS RECORDED

	National Grid Reference	Sound Pressure Levels (1)		
	(5N, 5E)	$L(A)_{eq}$	$L(A)_{10}$	$L(A)_{90}$
1. SITE BOUNDARY				
Location 1: (2)	08693E, 33288N	59 - 66	Not Available	31 - 33
2. NOISE SENSITIVE LOCATIONS				
Location 1: (2)	08530E, 33220N	52 – 59	Not Available	25 - 31
Location 2: (2)	08574E, 33216N	58 – 62	Not Available	37 - 43
Location 3: (2)	08536E, 33449N	57 - 64	Not Available	35 - 38

Notes

(1) For each location the range of noise levels recorded from the July 2000 and October 2003 surveys are given.
(2) Site Boundary Location 1 corresponds to Monitoring Location 6 and Noise Sensitive Locations 1, 2, 3 correspond to monitoring locations 3, 4 and 5 respectively in noise survey reports included in Attachment I.7 of original application.
(3) Monitoring locations are shown on map included in noise survey reports in Attachment I.7 of original application.

Table I.7(i) Ambient Noise Assessment: Refer to Noise Survey Reports Included in Original Application.

Third Octave analysis for noise emissions should be used to determine tonal noises

Copy of Data from Original Application:

EVENING (1900-2300) NOISE LEVELS RECORDED

	National Grid Reference	Sound Pressure Levels (1)		
	(5N, 5E)	$L(A)_{eq}$	$L(A)_{10}$	$L(A)_{90}$
1. SITE BOUNDARY				
Location 1: (2)	08693E, 33288N	60 - 61	Not Available	31 - 33
2. NOISE SENSITIVE LOCATIONS				
Location 1: (2)	08530E, 33220N	52 – 55	Not Available	23 – 26
Location 2: (2)	08574E, 33216N	53 – 57	Not Available	35 – 38
Location 3: (2)	08536E, 33449N	52 - 53	Not Available	31 - 33

Notes

(1) For each location the range of noise levels recorded from the July 2000 and October 2003 surveys are given.
(2) Site Boundary Location 1 corresponds to Monitoring Location 6 and Noise Sensitive Locations 1, 2, 3 correspond to monitoring locations 3, 4 and 5 respectively in noise survey reports included in Attachment I.7 of original application.
(3) Monitoring locations are shown on map included in noise survey reports in Attachment I.7 of original application.

Table I.7(i) Ambient Noise Assessment: Refer to Noise Survey Reports Included in Original Application.

Third Octave analysis for noise emissions should be used to determine tonal noises

Copy of Data from Original Application:

NIGHT-TIME (2300-0700) NOISE LEVELS RECORDED

	National Grid Reference	Sound Pressure Levels (1)		
	(5E, 5N)	$L(A)_{eq}$	$L(A)_{10}$	$L(A)_{90}$
1. SITE BOUNDARY				
Location 1: (2)	08693E, 33288N	51 - 55	Not Available	28 - 33
2. NOISE SENSITIVE LOCATIONS				
Location 1: (2)	08530E, 33220N	45 – 48	Not Available	25 – 27
Location 2: (2)	08574E, 33216N	50 – 51	Not Available	34 – 36
Location 3: (2)	08536E, 33449N	43 - 46	Not Available	29 - 32

Notes
(1) For each location the range of noise levels recorded from the July 2000 and October 2003 surveys are given.
(2) Site Boundary Location 1 corresponds to monitoring location 6 and Noise Sensitive Locations 1, 2, 3 correspond to monitoring locations 3, 4 and 5 respectively in noise survey reports included in Attachment I.7 of original application.
(3) Monitoring locations are shown on map included in noise survey reports in Attachment I.7 of original application.

ANNEX 2: CHECKLIST FOR ARTICLE 10 COMPLIANCE

Article 10 of the Environmental Protection Agency (Licensing) Regulations, 1994 to 2004, sets out the statutory requirements for information to accompany a licence application. The Application Form is designed in such a way as to set out these questions in a structured manner and not necessarily in the order presented in Article 10. In order to ensure a legally valid application in respect of Article 10 requirements, all Applicants should complete the following checklist and submit it with the completed Application Form.

Article 10(2)		**Section in Application**	**Checked by Applicant ✓**
(a)	give the name, address and telephone number of the applicant and, if different, any address to which correspondence relating to the application should be sent and, if the applicant is a body corporate, the address of its registered or principal office,	*B.1*	✓
(b)	give - (i) in the case of an established activity, the number of employees and other persons working or engaged in connection with the activity on the date after which a licence is required and during normal levels of operation, or (ii) in any other case, the gross capital cost of the activity to which the application relates,	*B.4*	✓
(c)	give the name of the planning authority in whose functional area the activity is or will be carried on,	*B.5*	✓
(d)	in the case of a discharge of any trade effluent or other matter (other than domestic sewage or storm water) to a sewer of a sanitary authority, give the name of the sanitary authority in which the sewer is vested or by which it is controlled,	*B.6* *(no discharges to sewer)*	✓
(e)	give the location or postal address (including, where appropriate, the name of the relevant townland or townlands) and the National Grid reference of the premises to which the activity relates,	*B.2*	✓
(f)	specify the relevant class or classes in the First Schedule to the Act to which the activity relates,	*B.3*	✓
(g)	specify the raw and ancillary materials, substances, preparations, fuels and energy which will be produced by or utilised in the activity,	*G.1*	✓
(h)	describe the plant, methods, processes, ancillary processes, abatement, recovery and treatment systems, and operating procedures for the activity,	*D & F*	✓

Article 10(2) *continued../*		Section in Application	Checked by Applicant ✓
(i)	indicate how the requirements of section 83(5)(a)(i) to (v) and (vii) to (x) of the Act shall be met, having regard, where appropriate, to any relevant specification issued by the Agency under section 5(3) of the Act and the reasons for the selection of the arrangements proposed,	*L*	✓
(j)	give particulars of the source, nature, composition, temperature, volume, level, rate, method of treatment and location of emissions, and the period or periods during which the emissions are made or are to be made,	*E & Tables E.1,E.2,E.4,E.5 & Table F.1*	✓
(k)	describe the arrangements for the prevention or minimisation of waste and, where waste is produced, the on and off site arrangements for the recovery or disposal of solid and liquid wastes,	*H.2*	✓
(l)	specify, by reference to the relevant European Waste Catalogue codes as prescribed by Commission Decision 2000/532/EC of 03 May 2000, the quantity and nature of the waste or wastes produced or to be produced by the activity,	*Tables H(i) and (ii)*	✓
(m)	provide: (i) details, and an assessment, of the impacts of any existing or proposed emissions on the environment, including on an environmental medium other than that or those into which the emissions are or are to be made, and (ii) details of the proposed measures to prevent or eliminate, or where that is not practicable, to limit, reduce or abate emissions,	*Sections F and I*	✓
(n)	identify monitoring and sampling points and outline proposals for monitoring emissions and the environmental consequences of any such emissions,	*F.2 & Attachment F.2*	✓
(o)	describe the condition of the site of the installation,	*D.2, I*	✓
(p)	describe in outline the main alternatives, if any, to the proposals contained in the application which were studied by the applicant,	*A.3, F.1.2, Attachment F.1.5*	✓
(q)	specify the measures to be taken to comply with an environmental quality standard where such a standard requires stricter conditions to be attached to a licence than would otherwise be determined by reference to best available techniques,	*E,F,I,L*	✓

Article 10(2) *continued../*		Section in Application	Checked by Applicant ✓
(r)	describe the measures to be taken for minimising pollution over long distances or in the territory of other states,	*F, I*	✓
(s)	describe the measures to be taken under abnormal operating conditions, including start-up, shutdown, leaks, malfunctions, breakdowns and momentary stoppages,	*D, F & J and associated attachments*	✓
(t)	describe the measures to be taken on and following the permanent cessation of the activity or part of the activity to avoid any risk of environmental pollution and to return the site of the activity to a satisfactory state,	*K*	✓
(u)	describe, in the case of an activity which gives, or could give rise, to an emission containing a hazardous substance which is discharged to an aquifer and is specified in the Annex to Council Directive 80/68/EEC of 17 December 1979 on the protection of groundwater against pollution caused by certain dangerous substances, the arrangements necessary to comply with said Council Directive,	*E & F*	✓
(v)	include any other information required under Article 6(1) of Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control,	*A*	✓
(w)	include a non-technical summary of information provided in relation to the matters specified in paragraphs (f) to (v) above,	*A*	✓
(x)	state whether the activity consists of, comprises, or is for the purposes an establishment to which the European Communities (Control of Major Accident Hazards involving Dangerous Substances) Regulations, 2006 apply,	*B.9*	✓

Article 10(3) Without prejudice to Article 12(1), an application for a licence shall be accompanied by -		**Section in Application**	**Checked by Applicant ✓**
(a)	a copy of the relevant page of the newspaper in which the notice in accordance with article 6 has been published,	*B.8 and Attachment B.8*	✓
(b)	a copy of the text of the site notice erected or fixed on the land or structure in accordance with article 7,	*B.8 and Attachment B.8*	✓
(c)	a copy of the notice given to the planning authority under section 85(1)(a) of the Act,	*B.8 and Attachment B.8*	✓
(d)	a copy of such plans, including a site plan and location map (no larger than A3), and such other particulars, reports and supporting documentation as are necessary to identify and describe -		
	(i) the activity	*A&B & Attachments A.2 & B.2*	✓
	(ii) the position of the site notice in accordance with article 7,	*B.8 & Attachment B.8*	✓
	(iii) the point or points from which emissions are made or are to be made, and	*E and associated attachments*	✓
	(iv) monitoring and sampling points, and	*F and associated attachments*	✓
(e)	a fee specified in accordance with section 94 of the Act.	*Included with Application*	✓

Article 10(4)		Checked by Applicant ✓
(b)	A signed original and 2 hardcopies of the application and accompanying documents/particulars in hardcopy format plus 2 copies of all files in electronic searchable PDF format on CD-Rom shall be submitted to the headquarters of the Agency. In cases where an E.I.S. is required to be submitted to the Agency in support of the application, a signed original and 2 hardcopies of the EIS plus 16* copies of all files in electronic searchable PDF format on CD-Rom shall be submitted to the headquarters of the Agency. * Energy sector applicants = 18 copies	✓
	Hardcopies submitted.	✓
	CD version submitted.	✓

ATTACHMENTS
TABLE OF CONTENTS

E.2.3	Terminal Drainage Plan
E.2.4	Perimeter Drainage Layout – Surface Water
E.2.5	Perimeter Drainage Layout – Groundwater
E.2.6	Settlement Ponds
E.2.7	Planned Catchments
E.5	Drawing showing Location of Noise Sources
F	**Control and Monitoring**
F.1.1.1	Pictorial of Location of WHRs
F.1.1.2	Schematic of SCRs
F.1.2.1	Overview of Produced Water Treatment System
F.1.2.2	Unit Operations of Produced Water Treatment System and Sludge Handling
F.1.2.3	Simplified Process Flow Diagram of Produced Water Treatment System
F.1.2.4	Produced Water Treatment Unit Schematic Waste Water Sludge Handling Schematic
F.1.3.1	Overview of Surface Water Treatment System
F.1.3.2	Unit Operations of Surface Water Treatment System
F.1.3.3	Simplified Process Flow Diagram of Surface Water Treatment System
F.1.3.4	Surface Water Treatment Unit Schematic
F.1.4.1	Description of Uncontaminated Surface Water Treatment System
F.1.5	Assessment of the Use of Biocide
F.2.1	Location of Main Air Emissions and Monitoring/Sampling Points
F.2.2	Monitoring/Sampling Points within Terminal for emissions to surface waters and to ground
F.2.3	Monitoring/Sampling Points for ambient air, ambient surface water and discharge of uncontaminated surface water
F.2.4	Location of Ambient Noise Monitoring Points and Weather Station
F.2.5	Location of Ambient Groundwater Monitoring Points
I	**Existing Environment & Impact of the Activity**
I.1	Air Dispersion Modelling Study
I.2.1	Environment in vicinity of Treated Produced Water Discharge Location
I.2.2	Produced Water Dispersion Assessment
I.2.3	Osborne Adams Risk Assessment of Produced Water Discharges
I.7	Noise Modelling Report
J	**Accident Prevention and Emergency Response**
J.4	Certificate of Insurance