

1. Abbreviations and Definitions

Definitions for the Odour Risk Assessment	
Activity / Event	The specific operation being undertaken relating to the proposed hazard and risk.
Potential Release Point	The point at which the pollutant / emission leaves its dedicated infrastructure and enters the environment.
Hazard	The hazards category i.e. type of emission.
Source	The pollutants from the activity taking place such as flaring.
Pathway	The pathway the pollutant is taking such as air or unsaturated zones.
Receptor	Those who it may have an adverse effect on i.e. surrounding residents, wildlife and habitats, designated sites.
Exposure Probability	The chance of the hazard occurring without taking into account mitigation measures.
Impact Severity	The impact of the hazard should it occur without taking into account mitigation measures.
Risk Magnitude	A hazard that has been assessed and has been given a risk rating level pre-mitigation measures.
Risk Management	Mitigation measures that will be put in place to control the risks so far as reasonably practicable.
Residual Risk	A hazard that has been assessed and has been given a risk rating level post mitigation measures.
Not Significant	The severity, together with the likelihood of the risk is not expected to cause any harm to the environment.
Low	The severity, together with the likelihood of the risk has low potential to cause harm to the environment.
Medium	The severity, together with the likelihood of the risk has moderate potential to cause harm to the environment.
High	The severity, together with the likelihood of the risk has a high potential to cause harm to the environment.

Table 1: Definitions

2. Methodology

The structure of the Odour Risk Assessment follows the Environment Agency online guidance and uses a model known as the 'Source-Pathway-Receptor' model. The Odour Risk Assessment shall:

- Identify the risk from the site;
- Assess risks and checking they are acceptable;
- Justify appropriate measures to control the risk (if needed); and
- Present the findings of the risk assessment.

The Odour Risk Assessment has included the following activities which have been reviewed for applicability within the proposed operations.

- Accidents.
- Air Emissions.
- Climate Change
- Fugitive Emissions.
- Global Warming Potential.
- Noise.
- Odour.
- Releases to Water.
- Visible Emissions.

3. Scoring Criteria

In order to establish a risk rating for each Source-Pathway-Receptor (S-P-R) linkage both the Likelihood (Exposure Probability) and Consequence (Impact Severity) have been issued with a score using Table 2 and Table 3 respectively. The score is used in conjunction with Table 4 to provide an overall risk rating of the activity. All scores and risk ratings are provided on the basis that the mitigation measure are not in place.

The Residual Risk uses the same scoring system but does consider the proposed mitigation measures.

Likelihood	Descriptor
Very Low	Rarely encountered, never reported or highly unlikely.
Low	Infrequent occurrences.
Medium	Can be expected to occur several times per year.
High	Repeated Occurrences.

Table 2: Scoring System Likelihood

Consequence	Descriptor
Very Low	Slight environmental effect that does not exceed a regulatory standard.
Low	Minor environmental effect, may breach a regulatory standard, localised to the point of release with no significant impact.
Medium	Moderate, localised effect on people and the environment in the vicinity of the incident.
High	A major environmental incident resulting in significant damage to the environment and harm to human health.

Table 3: Scoring System Consequence

The risk matrix presented in Table 4 provides a risk rating for each S-P-R linkage identified within this Environmental Risk Assessment.

Risk Rating		Consequence			
		Very Low	Low	Medium	High
Likelihood	Very Low	Not Significant	Not Significant	Low	Low
	Low	Not Significant	Low	Medium	Medium
	Medium	Low	Medium	Medium	High
	High	Low	Medium	High	High

Table 4: Risk Matrix

Environmental risks are assigned a Not Significant, Low, Medium or High risk rating and coded using a colour coded system. A description of each risk rating is presented in Table 5 below.

Consequence	Acceptable	Descriptor
Not Significant	Acceptable	Near-certain that an incident will not occur, or the consequences would not be significant.
Low	Acceptable	Unlikely an incident will occur, or the consequences would be minor confined to the immediate area.
Medium	Tolerable	Activity can only take place provided that impacts are localised and risk remediation is readily
High	Unacceptable	The risk must be further reduced before the activity can commence.

Table 5: Risk Rating Definition

Source ID	Activity / Event Leading to Emission	Potential Release Point	S-P-R Linkage			Probability of Exposure	Consequence	Magnitude of Risk	Risk Management	Residual Risk	Responsible Person for Monitoring Release Point
			Source	Pathway	Receptor						
ASSESSMENT OF ODOUR EMISSIONS - MAJOR											
01	Combustion of Natural Gas	Combustion Unit Stack	Gas and Particulate Matter Emissions	Carried on Prevailing Winds	See Receptor Table	Medium	Medium	Medium	• Air Quality Impact Assessment concludes no significant impact. • Combustion temperature managed to ensure efficient (>98%) combustion efficiency. • Combustion unit subject to approval by the EA. • Competent flare operators. • Dedicated scrubbers in place to remove VOCs / H2S from natural gas, if necessary. • Employ odour masking if necessary. • Equipment installed, serviced and maintained by competent and qualified contractors. • Flare monitoring (to be) in place with results reported in accordance with EA permit. • Flare pilot light on prior to delivery of wellbore fluids. • Identification of short term or long term odour sources. • Installation and leak testing of flare equipment prior to commission. • Odour Management Plan implemented for the site. • Personnel inducted/trained on emergency response procedures. • Plant, tanks and pipework tested for leaks prior to first use to confirm integrity. • Pressure test equipment prior to use. • Propane shall be used to increase the calorific value of the gas whilst heavy with nitrogen / carbon dioxide. • Records kept of complaints and subsequent mitigation imposed if necessary. • Regular inspection of wellhead connections and pipes for failure or leaks. • Regular maintenance and inspections conducted as directed by written procedures. • Sensitive Receptors in excess of 500 metres away from the development. • Well control procedures established and tested. • Working personnel subject to a site induction covering odour management.	Negligible	Wellsite Supervisor
02	Combustion of Natural Gas	Generator Exhaust	Gas and Particulate Matter Emissions	Carried on Prevailing Winds	See Receptor Table	Low	Medium	Medium	• Competent operators. • Employ odour masking if necessary. • Equipment installed, serviced and maintained by competent and qualified contractors. • Equipment to be serviced/maintained. • Generators assessed for compliance with Emission Limit Values. • Identification of short term or long term odour sources. • Odour Management Plan implemented for the site. • Records kept of complaints and subsequent mitigation imposed if necessary. • Regular inspection of connections and pipes for failure or leaks. • Working personnel subject to a site induction covering odour management.	Negligible	Wellsite Supervisor
03	Well Clean Up / Cold Venting	Combustion Unit Stack	Wellbore Gas	Carried on Prevailing Winds	See Receptor Table	Medium	Medium	Medium	• Cold venting of gas is not considered BAT and is therefore not anticipated to be undertaken. • Combustion unit subject to approval by the EA. • Competent flare operators. • Employ odour masking if necessary. • Flare pilot light on prior to delivery of wellbore fluids. • Identification of short term or long term odour sources. • Odour Management Plan implemented for the site. • Propane shall be used to increase the calorific value of the gas whilst heavy with nitrogen / carbon dioxide. • Records kept of complaints and subsequent mitigation imposed if necessary. • Vent lines subject to installation of a drum filter to remove VOCs / H2S where necessary. • Working personnel subject to a site induction covering odour management.	Negligible	Wellsite Supervisor
ASSESSMENT OF ODOUR EMISSIONS - MINOR											
04	Storage of Crude Oil	Dedicated Vent Line(s)	Crude Oil Vapour	Carried on Prevailing Winds	See Receptor Table	Low	Low	Low	• Breather line elevated to promote better dispersion of the entrained oil vapours. • Dedicated scrubbers in place to remove VOCs / H2S from natural gas, if necessary. • Employ odour masking if necessary. • Equipment installed, serviced and maintained by competent and qualified contractors. • Identification of short term or long term odour sources. • Minimise flow through vents. • Odour Management Plan implemented for the site. • Records kept of complaints and subsequent mitigation imposed if necessary. • Vent lines subject to installation of a drum filter to remove VOCs / H2S where necessary. • Working personnel subject to a site induction covering odour management.	Negligible	Wellsite Supervisor
05	Storage of Low Volume Odorous Products	Damaged / Unsealed Storage Containers	• Hydraulic Oil. • Diesel. • Lubricating Oil. • Drilling Fluids / Chemical Products and constituents.	Carried on Prevailing Winds	See Receptor Table	Medium	Medium	Medium	• Chemicals segregated, stored correctly and sealed when not in use. • Competent personnel only to store / use chemicals. • Containers are to be sealed immediately after use. • Containers checked on delivery, pre-use and periodically for signs of damage/leaks. • Employ odour masking if necessary. • Identification of short term or long term odour sources. • Inspection of storage and work areas for signs of spillages. • Inspection of storage areas for signs of degradation/damage to containers/leaks. • Odour Management Plan implemented for the site. • Products kept within their dedicated storage area when not in use. • Quantities of odorous products to be kept to a minimum. • Records kept of complaints and subsequent mitigation imposed if necessary. • Regular inspection of storage areas/containers for damage/leaks. • Storage containers identified as damaged/leaking used as priority or quarantined for offsite disposal. • Use of alternative non-odorous chemicals where possible. • Working personnel subject to a site induction covering odour management.	Negligible	Wellsite Supervisor
06	Storage of Sewage	Sewage Tanks	Sewage	Carried on Prevailing Winds	See Receptor Table	Medium	Medium	Medium	• Breaking containment of tanks and pipework systems shall minimised. • Employ odour masking if necessary. • Identification of short term or long term odour sources. • Inspection of storage and work areas for signs of spillages. • Inspection of storage areas for signs of degradation/damage to containers/leaks. • Monitor waste levels to prevent overfilling/spillage. • Odour Management Plan implemented for the site. • Pipes used within the transfer to be capped after use. • Plant, tanks and pipework cleaned / purged where possible prior to breaking containment. • Records kept of complaints and subsequent mitigation imposed if necessary. • Regular inspection of connections and pipes for failure or leaks. • Regular inspection of storage areas/containers for damage/leaks. • Spillages to be remediated as soon as reasonably practicable. • Storage containers identified as damaged/leaking used as priority or quarantined for offsite disposal. • Tanks monitored and emptied as required. • Tanks sealed after transfer. • Tanks self-contained / enclosed where necessary to limit emissions to air. • Working personnel subject to a site induction covering odour management.	Negligible	Wellsite Supervisor
07	Storage of General Waste	Waste Skips	General Waste	Carried on Prevailing Winds	See Receptor Table	Medium	Medium	Medium	• Employ odour masking if necessary. • Identification of short term or long term odour sources. • Inspection of storage and work areas for signs of spillages. • Inspection of storage areas for signs of degradation/damage to containers/leaks. • Monitor waste levels to prevent overfilling/spillage. • Odour Management Plan implemented for the site. • Personnel inducted on waste procedures. • Records kept of complaints and subsequent mitigation imposed if necessary. • Regular inspection of storage areas/containers for damage/leaks. • Segregation of waste. • Skips clearly marked to ensure waste segregation and avoid cross contamination. • Skips monitored daily and emptied as required. • Skips self-contained / enclosed to prevent emissions. • Working personnel subject to a site induction covering odour management.	Negligible	Wellsite Supervisor

Source ID	Activity / Event Leading to Emission	Potential	S-P-R Linkage			Probability of Emission	Consequence	Magnitude of Risk	Risk Management	Residual Risk	Responsible Person for
08	Storage of Odorous Waste Products	Waste Receptacles including: • Waste Containers. • Waste Storage Tanks. • Waste Skips.	• Hydraulic Oil. • Diesel. • Lubricating Oil. • Waste / Used Chemical Products.	Carried on Prevailing Winds	See Receptor Table	Medium	Medium	Medium	• Employ odour masking if necessary. • Identification of short term or long term odour sources. • Inspection of storage and work areas for signs of spillages. • Inspection of storage areas for signs of degradation/damage to containers/leaks. • Monitor waste levels to prevent overfilling/spillage. • Odour Management Plan implemented for the site. • Odourless products used ahead of those which give rise to odour where practicable. • Personnel inducted/trained on emergency response procedures. • Quantities of odorous products to be kept to a minimum. • Records kept of complaints and subsequent mitigation imposed if necessary. • Regular inspection of storage areas/containers for damage/leaks. • Remove odorous fluids where possible offsite for odour treatment prior to disposal. • Segregation of waste. • Skips clearly marked to ensure waste segregation and avoid cross contamination. • Skips monitored daily and emptied as required. • Skips self-contained / enclosed to prevent emissions. • Use of alternative non-odorous chemicals where possible. • Working personnel subject to a site induction covering odour management.	Negligible	Wellsite Supervisor
09	Breaking of Containment	• Storage Tanks. • Pipework. • Wellhead. • Separator. • Any Other Equipment.	• Crude Oil. • Formation Water. • Drilling Fluids. • Well Treatment Fluids. • Natural Gas.	Carried on Prevailing Winds	See Receptor Table	Medium	Medium	Medium	• Breaking containment of tanks and pipework systems shall minimised. • Employ odour masking if necessary. • Equipment cleaned / purged where possible prior to breaking containment. • Identification of short term or long term odour sources. • Odour Management Plan implemented for the site. • Plan for breaking containment operations at cessation of operations. • Plant, tanks and pipework cleaned / purged where possible prior to breaking containment. • Records kept of complaints and subsequent mitigation imposed if necessary. • Working personnel subject to a site induction covering odour management.	Negligible	Wellsite Supervisor
10	Use / Decanting of Low Volume Odorous Products	Containment Unit / Canister	• Hydraulic Oil. • Diesel. • Lubricating Oil. • Waste / Used Chemical Products.	Carried on Prevailing Winds	See Receptor Table	Medium	Medium	Medium	• Competent personnel only to store / use chemicals. • Containers are to be sealed immediately after use. • Containers checked on delivery, pre-use and periodically for signs of damage/leaks. • Decanting/transfer of chemicals to be conducted inside buildings where possible. • Drip trays used for the transfer or decanting of fuel/small volume liquids such as engine oil. • Employ odour masking if necessary. • Identification of short term or long term odour sources. • Inspection of storage and work areas for signs of spillages. • Inspection of storage areas for signs of degradation/damage to containers/leaks. • Minimise quantity of materials held onsite to prevent potential reactions. • Odour Management Plan implemented for the site. • Odourless products used ahead of those which give rise to odour where practicable. • Quantities of odorous products to be kept to a minimum. • Records kept of complaints and subsequent mitigation imposed if necessary. • Regular inspection of storage areas/containers for damage/leaks. • Remove odorous fluids where possible offsite for odour treatment prior to disposal. • Segregation of materials. • Spillages to be remediated as soon as reasonably practicable. • Storage containers identified as damaged/leaking used as priority or quarantined for offsite disposal. • Use of alternative non-odorous chemicals where possible. • Working personnel subject to a site induction covering odour management.	Negligible	Wellsite Supervisor
11	Produced fluids on the surface of wellbore equipment	• Drilling Rig. • Drill Pipe. • Wellhead. • Any Other Equipment.	• Oil. • Formation Water. • Drilling Fluids. • Well Treatment Fluids.	Carried on Prevailing Winds	See Receptor Table	Medium	Medium	Medium	• Cleaning and purging where possible prior to pulling out of hole. • Employ odour masking if necessary. • Ensure connections to well head are correctly fitted and pressure tested. • Identification of short term or long term odour sources. • Odour Management Plan implemented for the site. • Records kept of complaints and subsequent mitigation imposed if necessary. • Regular inspection of wellhead connections and pipes for failure or leaks. • Working personnel subject to a site induction covering odour management.	Negligible	Wellsite Supervisor
12	Accidents	• Drilling Rig. • Drill Pipe. • Wellhead. • Waste Receptacles. • Storage Tanks. • Pipework. • Wellhead. • Separator. • Any Other Equipment.	• Natural Gas. • Hydraulic Oil. • Diesel. • Lubricating Oil. • Waste / Used Chemical Products. • Oil. • Formation Water. • Drilling Fluids. • Well Treatment Fluids. • General Waste. • Sewerage.	Carried on Prevailing Winds	See Receptor Table	Medium	Medium	Medium	• Competent operators. • Competent personnel only to store / use chemicals. • Drip trays used for the transfer or decanting of fuel/small volume liquids such as engine oil. • Employ odour masking if necessary. • Equipment installed, serviced and maintained by competent and qualified contractors. • Identification of short term or long term odour sources. • Notification to emergency services of commencement of operations on mobilisation. • Odour Management Plan implemented for the site. • Odourless products used ahead of those which give rise to odour where practicable. • Personnel inducted/trained on emergency response procedures. • Products kept within their dedicated storage area when not in use. • Regular inspection of connections and pipes for failure or leaks. • Tanks and associated pipework protected. • Trained persons to operate vehicles and site plant. • Use of vacuums to remediate spillages. • Used spillage equipment to be segregated and contained to prevent odour prior to offsite disposal. • Vehicles and plant serviced and maintained in line with manufacturer requirements. • Vehicles and plant switched off when not in use. • Well control procedures established and tested. • Working personnel subject to a site induction covering odour management.	Negligible	Wellsite Supervisor
ASSESSMENT OF FUGITIVE ODOUR EMISSIONS											
12	Potential for Sour Gas	Exploration and Production Equipment. • Storage Tanks • Pipeworks • Wellhead • Pumpjack • Separator • Any Other Equipment	Hydrogen Sulphide (H2S)	Carried on Prevailing Winds	See Receptor Table	Medium	Medium	Medium	• Dedicated scrubbers in place to remove VOCs / H2S from natural gas, if necessary. • Employ odour masking if necessary. • Ensure connections to well head are correctly fitted and pressure tested. • H2S is not anticipated at a level above 5.7 mg/Nm3. • H2S Monitoring in Place. • Identification of short term or long term odour sources. • Odour Management Plan implemented for the site. • Personnel inducted/trained on emergency response procedures. • Plan for breaking containment operations at cessation of operations. • Plant, tanks and pipework cleaned / purged where possible prior to breaking containment. • Records kept of complaints and subsequent mitigation imposed if necessary. • Regular inspection of wellhead connections and pipes for failure or leaks. • Working personnel subject to a site induction covering odour management.	Negligible	Wellsite Supervisor
13	Containment Failure	Exploration and Production Equipment. • Storage Tanks • Pipeworks • Wellhead • Pumpjack • Separator • Any Other Equipment	Natural Gas Entrained Vapours From: • Oil; • Formation Water; • Drilling Fluids; • Well Treatment Fluids.	Carried on Prevailing Winds	See Receptor Table	Medium	Medium	Medium	• Containers checked on delivery, pre-use and periodically for signs of damage/leaks. • Employ odour masking if necessary. • Ensure connections to well head are correctly fitted and pressure tested. • Equipment installed, serviced and maintained by competent and qualified contractors. • Identification of short term or long term odour sources. • Inspection of storage areas for signs of degradation/damage to containers/leaks. • Odour Management Plan implemented for the site. • Personnel inducted/trained on emergency response procedures. • Plant, tanks and pipework tested for leaks prior to first use to confirm integrity. • Records kept of complaints and subsequent mitigation imposed if necessary. • Regular inspection of connections and pipes for failure or leaks. • Regular inspection of storage areas/containers for damage/leaks. • Regular inspection of storage areas/containers for damage/leaks. • Regular inspection of wellhead connections and pipes for failure or leaks. • Storage containers identified as damaged/leaking used as priority or quarantined for offsite disposal. • Tanks monitored and emptied as required. • Well control procedures established and tested. • Working personnel subject to a site induction covering odour management.	Negligible	Wellsite Supervisor