Deep Panuke

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Title

Waste Management Plan – Operations and Drilling Phase

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CONTENTS

ABBREVIATIONS

WMP	Waste Management Plan
CNSOPB	Canada Nova Scotia Offshore Petroleum Board
OWTG	Offshore Waste Treatment Guidelines
OCSG	Offshore Chemical Selection Guidelines (pilot)
ORMS	Operations Risk Management System
EHS	Environment, Health and Safety
WHMIS	Workplace Hazardous Materials Information System
MSDS	Materials Safety Data Sheets
MEG	Monoethlyene Glycol
TDG	Transportation of Dangerous Goods
WMC	Waste Management Co-ordinator
WBM	Water Based Mud
NORM	Naturally Occurring Radioactive Material
EMOBM	Enhanced Mineral Oil Based Mud

1 INTRODUCTION

1.1 Description

EnCana Corporation is proposing to further develop its Deep Panuke gas prospect located offshore Nova Scotia, approximately 44 km to the West of Sable Island.

The Project involves production and processing of gas offshore and transport, via subsea pipeline, of market-ready gas to Goldboro, Nova Scotia to an interconnection with the M&NP main transmission pipeline for further transport to markets in Canada and the northeast United States.

1.2 Scope

As part of the Environmental Management Plan for the Deep Panuke Project, a Waste Management Plan (WMP) is required to address all aspects of waste generated throughout the life of the Project. The scope of this document is to address wastes generated during the Operations phase of the Project and the Drilling phase (due to the similar waste streams).

Specifically, the waste covered under this WMP (Operations) includes the following sources:

Deep Panuke platforms
- Production activities
- Maintenance activities
- Accommodations

Drill Rig
- Drilling and completion activities

Pipeline
- Maintenance and pigging operations

Vessels
- Standby and supply vessels

The WMP is intended to be a 'living document' that will be updated as further information about waste streams is known. The document outlines EnCana's corporate policies and standards related to waste management and outlines pollution prevention strategies to reduce environmental impact.

The goals of the WMP are to:
- Minimize the potential to cause harm to human health and the environment
- Achieve and maintain compliance with applicable legislation, standards and EnCana targets
- Reduce operational costs
- Reduce potential liabilities that may arise from waste handling operations

- Provide documentation of applicable procedures, policies and practices for reference during operations.

Using the fundamentals of waste management outlined in this document, a similar Plan will be developed by the Installation contractor for the Construction/Installation Phase and another for the Decommissioning Phase.

1.3 Tie-in to other Plans

The WMP (Operations) is an integral part of the overall Project Environmental Management Plan and is supported by other Project and EnCana documents. These other documents include:

Waste Management Procedures Manual (EC98-1S-0013)

- The Deep Panuke WMP (Operations) has been developed in accordance with this Manual.

Specifications for Handling of Bulk Waste Containers for Deep Panuke Project (DP00-1S-0036)

- Outlines number, dimensions, locations and categories of bulk containers required for the Project and the transfer of bulk waste between decks and platforms.

Alert/Emergency Response Contingency Plan (12-SM-100)

- Links with the WMP to address potential emergency situations that may result from inadequate waste handling (e.g. hazmat spill).

Nova Scotia Spill Response Plan (EC98-1S-0023)

- Links with the WMP to ensure that waste management is addressed under spill containment and clean up.

Deep Panuke Environmental Compliance Monitoring Plan (*to be developed*)

- Links with the WMP to ensure regulatory requirements and Company targets are achieved.

Chemical Management Procedures Manual (EC98-1S-0012)

- Links with the WMP to ensure that all production chemicals are approved prior to the shipment, use, treatment and disposal at the offshore facilities.

Safe Work Practices Manual (EC98-1S-0015)

- Links with the WMP with regard to the handling of wastes, including chemical and radioactive.

Audit Guidelines Manual (EC98-1S-0005)

- Links with the WMP with regard to inspections and audits that will be undertaken on the waste management system.

Event Management Procedures Manual (EC98-1S-0010)

- Links with the WMP with regard to accident/incident reporting and investigation

Training and Qualification Manual (EC98-1S-0020)

- Links with the WMP with regard to training requirements and qualifications for operational personnel involved with waste handling, transportation and disposal

2 CORPORATE POLICIES AND PRINCIPLES

In accordance with EnCana's Environmental Management Plan, the Deep Panuke WMP will be based upon relevant corporate policies and industry principles with regard to waste management.

2.1 EnCana Corporate EHS Policy

EnCana Offshore & International Operations, and EnCana Offshore & New Ventures Exploration (EnCana) are committed to safeguarding the environment and minimizing health and safety risks to our employees, contractors and the communities in which we do business. EnCana pursues a policy of continual improvement in the measures taken to protect the environment and the health and safety of those who may be affected by our activities. Strong EHS performance is key to the success of EnCana, and EHS strategies are integrated into business decisions.

We will achieve sound environmental, health and safety management by:

- Integrating an environmental, health and safety management system through all parts of our business operation. This system is aligned with Corporate policies and procedures, reflects industry best practices, and is designed to meet or exceed all relevant regulations and legislation where we operate.
- Assuring that each employee, contractor and third party service provider understands their EHS responsibilities and is trained to meet them.
- Identifying, assessing and effectively managing risks, and implementing processes to re-evaluate risks following changes to requirements, operations, facilities or personnel.
- Consulting on EHS matters with all stakeholders in our areas of operations, and assessing all EHS matters before entering into new activities.
- Actively protecting the environment in all our operating areas and seeking continual improvement in the efficient use of energy and natural resources.
- Establishing EHS performance goals and objectives and regularly measuring our progress.
- Establishing an EHS program review process that assures our goal of continual EHS performance improvement.

Commitment to EHS is part of the EnCana culture and all employees are accountable in meeting EHS responsibilities. We will maintain EnCana as an environmentally responsible entity and assure the health and safety of our employees, contractors and the communities in which we operate. Our EHS policy is an integral part of our business and is publicly available.

2.2 Operations Risk Management System

EnCana's Operations Risk Management System (ORMS) provides an integrated management system for both safety and environmental risks. The system focuses on 11 key elements required for successful management of the risks associated with our operations and outlines the expectation of each level in the organization for meeting the principles and objectives of each element. Although all elements apply in some form to the WMP, the most relevant is:

Element 4 Operations & Management
Objective 4.5 *A system is in place to track emissions and wastes to ensure regulatory requirements are met.*

2.3 Waste Management Hierarchy

EnCana believes that waste management practices should follow industry fundamentals, including the Waste Management Hierarchy. The Hierarchy outlines waste management practices and their preference towards the minimization of potential environment impacts. In preference order, these are:

1. Avoid
2. Minimize (Reduce)
3. Recover Materials (Reuse and Recycle)
4. Treat & Process
5. Disposal

Throughout the WMP and as an underlying philosophy, EnCana will strive to incorporate the Hierarchy into its operations for the Deep Panuke Project. EnCana will also work closely with third party contractors to develop innovative ways of following this Hierarchy and to minimize the overall waste generated. Specifically, this could include inventory management, operations improvement, equipment or container modification or process changes.

2.4 Duty of Care Principle

The Duty of Care principle states that the producer of a waste stream has a duty to ensure that the waste is properly managed, even after that waste has been transferred to a third party. It essentially requires the producer to select third party handlers with care, assessing their capabilities, and to monitor their activities with respect to the management of the producer's waste. This principle is also addressed under EnCana's ORMS Element Six (Third Party Business Relationships), which states:

> *"Third parties working on EnCana's behalf have an impact on our operations and reputation; therefore, it is essential that they perform in a manner that is consistent with our corporate values."*

2.5 Segregation of Waste

EnCana is committed to the segregation of waste streams at the source of generation. Segregation of waste is the best possible way to:

- Avoid generation of hazardous waste
- Maximize the amount of waste that can be recycled
- Avoid safety hazards to personnel handling the waste
- Avoid environmental pollution
- Ensure compliance with regulatory requirements
- Reduce operational costs

3 ROLES AND RESPONSIBILITIES

This section outlines the roles and responsibilities for the implementation and maintenance of the WMP. These are provided for guidance purposes and may change once the Project reaches the Operations Phase.

3.1 Senior Vice President – Eastern Region

The Senior Vice President ECR has overall responsibility for ensuring that all EnCana personnel and nominated third-party contractors adhere to the Company policy for managing waste and that the WMP is in line with current regulations.

3.2 Total Loss Management Manager

- Ensure resources are allocated to maintain and implement the WMP
- Initiate reviews and updates of waste management strategies to assist in ensuring compliance or adherence to EnCana waste management standards and legislative requirements
- Provide guidance and support to all departments and facilities on the WMP
- Ensure availability of suitable training programs for EnCana personnel and those of third-party contractors
- Ensure compliance audits of third party contractor's operations with regard to EnCana's waste management program
- Ensure that qualified personnel are in place to manage and document waste handling, transporation and disposal

3.3 Environmental Analyst

- Ensure that WMP is updated and is compliant with all applicable regulations
- Monitor the implementation of the WMP to achieve compliance with company targets
- Provide assistance in consolidating and maintaining Material Safety Data Sheets (MSDS) within the Workplace Hazardous Materials Information System (WHMIS) program with facilities/site personnel
- Provide support to facility/site personnel in maintaining consolidated records and manifests of all facility/site waste pertaining to proper identification, classification, inventory, storage, treatment, transport and disposal in accordance with EnCana and legislative requirements, including the Trasportation of Dangerous Goods Act
- Periodically audit EnCana and third-party waste management planning arrangements

- Ensure that records and documents of waste throughout EnCana facilities/sites are maintained
- Coordinate and identify the training requirements of EnCana personnel and those of third-party contractors in contingency planning, handling of hazardous waste, chemical hazards information, WHMIS and EnCana requirements with regards to waste management

3.4 Facility/Site Manager

- Nominate a suitable facility/site Waste Management Coordinator (WMC),
- Ensure that the WMP adequately reflects the waste streams of the facility and that it is fully implemented to meet EnCana waste management requirements
- Ensure that waste consignments are accompanied by the relevant documented information to allow the next person in the chain to manage the waste,
- Regularly monitor the implementation of the Waste Management Procedures Manual within the facility/site.

3.5 Staff and Third-party Contractors

- Comply with the requirements of this Waste Management Plan at all times and adopt good housekeeping practices
- Attend training in regards to waste management as required
- Review WMP and, if warranted, recommend changes to the Plan to improve pollution prevention efforts
- Document and manifest wastes transfers in accordance with regulatory requirements

Due to the nature of offshore operations, it is important to note that all waste generated from the platforms, drill rig or vessels during the Operations Phase will be shipped to EnCana's Pier facilities. At the Pier, waste will be received and then a Contractor will take control of the waste. Assuming that the waste is properly segregated offshore, each waste stream will then be treated, recycled, reused, or disposed of in an appropriate manner. EnCana will work closely with the Contractor to ensure that the WMP (Operations) is working effectively.

4 APPLICABLE WASTE MANAGEMENT LEGISLATION

Waste management for the Deep Panuke Project falls under numerous regulatory agencies' jurisdictions and applicable legislation. The following jurisdictions apply to the Operations Phase of the Project:

- **Offshore** Canada-Nova Scotia Offshore Petroleum Board (CNSOPB)
- **Pier Facility** Nova Scotia Department of Environment and Labour
  Halifax Regional Municipality
- **Transportation** Environment Canada / Fisheries and Oceans / Transport Canada

The following provides a list of applicable waste management legislation that captures the majority of the waste streams expected for the Operations Phase of the Project.

Canada-Nova Scotia Offshore Petroleum Board
- Offshore Waste Treatment Guidelines (OWTG)
- Pilot Offshore Chemical Selection Guidelines

Environment Canada
- Canadian Environmental Protection Act

Transport Canada
- Transportation of Dangerous Goods Act

Department of Fisheries and Oceans
- Canada Shipping Act

Atomic Energy Control Board
- Atomic Energy Control Act

Nova Scotia Department Environment and Labour
- Nova Scotia Environment Act, Regulations and Guidelines (Landfill disposal)
- Dangerous Goods Transportation Act
- Occupational Health and Safety Act

Halifax Regional Municipality
- Solid Waste Resource Collection and Disposal By-Law

5 WASTE SOURCES AND STREAMS

EnCana's Waste Management Procedures Manual (EC98-1S-0013) has identified 13 generic waste streams that may result from its operations, based on the CNSOPB's Offshore Waste Treatment Guidelines (OWTG). These generic streams will be evaluated and described for the Deep Panuke Project as part of the WMP (Operations). These 13 waste streams are:

1. Air Emissions
2. Produced Water
3. Drilling Muds
4. Drill Solids
5. Storage Displacement Water
6. Bilge and Ballast Water
7. Deck Drainage
8. Produced Solids
9. Well Treatment Fluids
10. Cooling Water
11. Glycol
12. Naturally Occurring Radioactive Materials (NORM)
13. Other Substances Waste and Residue

Further information related to each waste stream is outlined in the following sections.

5.1 Air Emissions

Air emissions are generated from the incomplete combustion of fossil fuels, during venting activities or from fugitive emissions.

There are no CSNOPB prescribed regulatory limits for air emissions, however the operator must estimate and report the yearly emissions to the CNSOPB. These estimates must be made in accordance with the Canadian Association of Petroleum Producer's *Global Climate Change Voluntary Challenge Guide*.

There are specific requirements for air emissions set forward under the Nova Scotia Environment Act (Air Quality Regulations), the Canadian Environmental Protection Act (Ambient Air Quality Objectives) and the Canadian Council of Ministers of the Environment. EnCana has committed to comply with these requirements in the design of the Deep Panuke Project. A complete listing and effects prediction for air emissions is outlined in the Deep Panuke Comprehensive Study Report.

EnCana will be developing a flaring plan, as part of environmental protection planning to reduce the potential impact from emissions. EnCana will also comply with the reporting requirements outlined by the CNSOPB.

Summary

- There are no prescribed CNSOPB regulatory limits, however there is a reporting requirement
- EnCana will comply with other specific requirements as outlined in the Comprehensive Study Report
- EnCana will develop a flaring plan as part of environmental protection planning

5.2 Produced Water

Produced water includes all formation water, injection water and process water that is extracted along with oil and gas during petroleum production. EnCana has reviewed the relevant waste management options for produced water (injection or treatment and discharge overboard) and has decided that with the appropriate technology and targets, the treatment and discharge overboard option will be employed for the Project. Further information on the selection process can be obtained from the Deep Panuke Comprehensive Study Report.

The regulatory requirements for produced water are outlined in the OWTG with a prescribed target of 30mg/l on a 30 day rolling average and 60mg/l for a 24 hour average for dispersed hydrocarbons.

EnCana's corporate target for produced water has been set at 25mg/l over a 30 day rolling average. To accomplish this, the Project will employ hydrocyclone technology to reduce the initial hydrocarbon levels and then organophillic clay polishers to reduce the level to less than 25mg/l.

Summary

- Treatment and discharge overboard
- Regulatory limit is 30mg/l over a 30 day rolling average
- EnCana target is 25mg/l over a 30 day rolling average

5.3 Drilling Muds

Drilling muds are fluids that are circulated in oil and gas wells to clean and condition the hole, to lubricate the drill bit and to counterbalance formation pressure. Drilling muds typically use water, oil or a synthetic fluid as the base fluid.

The chemicals used to make up the drilling muds must be evaluated and approved through the CNSOPB's pilot Offshore Chemical Selection Guidelines (OCSG). These Guidelines outlines a selection process to ensure that chemicals that have known insignificant environmental effects are selected over unknown or high-risk chemicals. The Guidelines also require each drilling program to conduct toxicity testing according to Environment Canada's test method EPS 1/RM/26[9] and submit the results to the CNSOPB.

EnCana has evaluated the drilling mud requirements for the Deep Panuke Project and expects to use a combination of water based (WBM) and enhanced mineral oil based (EMO) muds. As part of the drilling program application, EnCana will subject the applicable chemicals to the OCSG and conduct toxicity testing on the mud.

The waste management implications of drilling muds are addressed under drill solids (section 4.4 below) and when the mud is no longer required after drilling a well or well section. The OWTG allow the bulk discharge of spent water based muds after the drilling activities are complete. EnCana has evaluated the options related to WBM waste management (injection, disposal overboard, skip and ship to shore) and has selected the disposal overboard option. To reduce the number and total volumes of WBM bulk discharges, EnCana will work with the drilling contractor to conduct 'batch drilling' of well sections so that the mud can be reused.

When using enhanced mineral oil based muds (EMOBM) and drilling activities are complete, the spent mud is transported to shore and 'reconditioned' for further drilling. However, due to fine particulate in the muds, there is a limit to the number of times that this reconditioning process can be accomplished. When this occurs, the mud will have to be treated and disposed of at an approved facility (typically with thermal desorption or bio-piling).

Summary

- Chemicals and muds subject to OCSG and toxicity testing
- WBM bulk discharge overboard – batch drilling to reduce total volume
- EMOBM recovered and reconditioned on shore – final disposal at an approved facility

5.4 Drill Solids

Drill solids (cuttings) are particles that are generated by drilling into subsurface geological formations and are carried to the surface with the drilling muds. The solids are separated (treated) from the muds on the drilling rig using centrifuge and shaker screens however residual muds do remain on the solids.

There is currently no regulatory limit for the concentration of water based muds (WBM) on the cuttings prior to overboard discharge. The regulatory limit for synthetic based mud (SBM) on the cuttings is a concentration of 6.9g/100g or less on wet solids prior to overboard discharge. The CNSOPB also requires that during design, an operator evaluate the technical and economic feasibility of re-injection of the associated drill cuttings into a subsurface formation.

EnCana has evaluated the various options for this waste stream and has committed in the Deep Panuke Comprehensive Study Report that no synthetic based mud cuttings will be discharged overboard, regardless of the regulatory limit of 6.9g/100g. Although it is unclear at this time, the SBM cuttings will either be re-injected into a formation or will be 'skipped' to shore for treatment at an approved facility (typically with thermal desorption or bio-piling). For WBM cuttings, EnCana will treat to reduce the mud concentration and then dispose of the cuttings overboard.

Summary

- Regulatory limit on SBM is 6.9g/100g wet solids / no restrictions on WBM
- WBM cuttings will be treated by shaker screens and centrifuge and discharged overboard
- No SBM cuttings will be discharged overboard – will be injected or skipped to shore for disposal

5.5 Storage Displacement Water

Storage displacement water is water that is pumped into oil storage chambers on production installations during oil production and off-loading operations.

The regulatory limit for discharge overboard is to reduce oil concentration to less than 15mg/l.

Storage displacement water is not applicable to this Deep Panuke WMP (Operations).

Summary

- Storage displacement water is not applicable to the Deep Panuke WMP (Operations)

5.6 Bilge and Ballast Water

Bilge water is seawater that may seep or flow into the structure from various points in the offshore installation. Ballast water is water used to maintain the stability of the offshore facility.

The regulatory limit for discharge overboard is to reduce the oil concentration to less than 15mg/l.

Bilge and ballast water discharges are not applicable to the Deep Panuke platforms. Water of these types that are generated by the standby or supply vessel is treated and discharged overboard as per the regulations (includes the Shipping Act). This discharge is tracked by the vessels' Oil Pollution Book. A drilling rig can also generate this type of water when in transit or when pre-loading, however it is also treated and tracked in the same manner as a vessel.

Summary

- Regulatory limit for bilge and ballast water is an oil concentration of less than 15mg/l
- These types of water are not applicable to the platforms
- For standby/supply vessels and drilling rigs, this water is treated to the regulatory limit and the discharge overboard tracked in their respective Oil Pollution Books.

5.7 Deck Drainage

Deck drainage is water that reaches the deck of offshore installations through precipitation, sea spray or from routine operations such as washdown and fire drills.

The regulatory limit for discharge overboard is to reduce the oil concentration to less than 15mg/l. For the platforms, both open and closed drains systems exist. The open drains liquid is treated using an organophillic clay polisher to ensure that hydrocarbon contamination for

discharge overboard is below the regulatory limit and will alarm if the limit is exceeded. It is important to note that other wastes will be generated from this open drains system (e.g. tank sludge, recovered oil, absorbant cloths), however these wastes are addressed in Section 5.13 below.

The closed drains system collects drainage, during maintenance operations, of liquids that are hazardous at atmospheric conditions. Depending on the platform, the liquid is pumped either to the low pressure or high pressure knock-out drum and then flared or is sent to the Inlet Separator for further processing. No liquid from the closed drains system is routed overboard.

Although the drilling rig has not been sourced yet, most rigs combine their open and closed systems to include a skim tank/separator to remove free oil and an on-line analyser that will alarm and shut-in if the regulatory limit is exceeded. Deck drainage for vessels typically is not treated and is routed directly overboard.

Summary

- Regulatory limit for deck drainage is an oil concentration of less than 15mg/l
- The platform's open drains system is treated by polishers to the regulatory limit and discharged overboard
- The platform's closed system is sent to flare or reprocessed. No liquid is discharged overboard.
- A typical drilling rig system will treat and discharge overboard to the regulatory limit
- The vessel's systems are not treated and are routed directly overboard.

5.8 Produced Solids

Produced solids originate from geological formations and are separated from formation fluids during oil and gas production. It may also contain scale particles that are generated during the processing of those fluids.

There is no prescribed regulatory limit for produced solids, instead the volumes must be reported to the CNSOPB. This is not expected to be a concern for the Deep Panuke Project due to the reservoir being carbonate based as opposed to sand based.

Summary

- Produced solids are not expected to be a concern for the Project.

5.9 Well Treatment Fluids

Well treatment fluids are used in operations such as well workover, well stimulation, well completion and formation fracturing.

The regulatory limit for discharge overboard is to reduce the oil concentration to 30mg/l or less. Strongly acidic fluids that are recovered will require treatment with neutralizing agents to a pH of at least 5 before discharge.

The chemicals used to make up the well treatment fluids must be evaluated and approved through the CNSOPB's pilot Offshore Chemical Selection Guidelines (OCSG). These Guidelines outlines a selection process to ensure that chemicals that have known insignificant environmental effects are selected over unknown or high-risk chemicals.

It is unknown at this time what types of well treatment fluids are required for the Deep Panuke Project. Typically, due to the properties of the chemicals, the majority of these fluids remains downhole and is not recovered at surface. However, any chemicals that return to surface will be treated as per the OWTG and discharged overboard. Those chemicals that cannot be treated will be recovered and transported to shore for disposal at an approved facility.

Summary

- It is unknown at this time which type of chemicals will be required.
- Chemicals must be evaluated and approved through the CNSOPB's OCSG
- Regulatory limit for oil concentration is less than 30mg/l and at least pH5
- Most of chemicals remain downhole, those that are recovered will be treated and discharged as per the OWTG or transported to shore for disposal at an approved facility

5.10 Cooling Water

Cooling water is used to control temperatures for process or machinery equipment on the platforms and drilling rigs.

There are no regulatory limits on cooling water other than the CNSOPB may impose restrictions on the use and concentrations of residual chlorine or biocides used in the water.

For the platforms, the cooling medium system uses an ethylene glycol/water mixture so that the solution will not freeze at the lowest ambient temperature encountered on the platform. Seawater will be pumped to the platform, pass through a heat exchanger and then be discharged overboard. This process is a closed loop system so that the seawater does not mix with the glycol.

A sodium hypochlorite system will be used mainly as a biocide to prevent possible biological marine growth that could obstruct seawater flow in the piping circuits and the close clearance plate type heat exchanger. As a colateral benefit, t will also prevent foul odours in the seawater discharge caisson. The details of this system will be reviewed by the CNSOPB prior to use.

For a typical drilling rig, a fixed chlorine system is connected to the cooling water to reduce potential marine growth. EnCana and the CNSOPB will review the details of this system prior to use, once the rig is selected.

Summary

- There is no prescribed regulatory limit for cooling water, however they may impose restrictions on chlorine or biocide concentrations
- Sodium hypochlorite will be used on the platforms to prevent marine growth. Details of the system will be reviewed by EnCana and the CNSOPB prior to use.

- Typical drilling rig will use a chlorine based system, details to be reviewed by CNSOPB prior to use

5.11 Glycol

Glycol is used as a temperature control medium on the Deep Panuke platforms, drilling rig and vessels. One form of glycol, monoethylene glycol, is also added to gas to inhibit water formation in pipelines.

The only regulatory requirement is on monoethylene glycol (MEG) and its presence in the produced water discharge. The operator must measure and report to the CNSOPB the MEG concentration in this discharge. Due to the characteristics of the Deep Panuke gas, there is no requirement to add glycol to the pipeline.

Glycol used on the platforms, drilling rigs and vessels for temperature control (i.e. heating or cooling mediums) will be supplier specific and will include other chemicals such as corrosion inhibitors in solution. They are closed loop systems and will not be discharged overboard.

Please refer to Section 5.13 below for further information related to the management of glycol waste.

Summary

- There is no prescribed regulatory limit for glycol, just a reporting requirement on MEG
- Glycol will not be added to the Deep Panuke pipeline
- Other forms of glycol used on the platforms, rigs and vessels are in a closed loop system
- Refer to Section 5.13 below for management of glycol waste

5.12 Naturally Occurring Radioactive Material (NORM)

NORM is material containing radioactive elements such as uranium, thorium and potassium, and any of their decay products, such as radium and radon. When substances containing NORM are processed, the NORM can be concentrated through precipitation in processing equipment, which could result in a hazard to human health or the environment.

NORM contamination is controlled under the guidance document *Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials*. All NORM contamination must be reported to the CNSOPB to discuss potential handling and disposal options.

EnCana has developed work practice with regard to NORM contamination, which is located in the Safe Work Practices Manual (EC98-1S-0015). When NORM contamination is encountered, a plan regarding the handling, transportation and disposal of waste has to be developed and approved by the CNSOPB. EnCana will contract a third party expert to help develop this plan to reduce the potential risk to the environment and worker health. Due to the nature of the material, disposal at an approved facility is the only waste option available.

Summary

- There are no prescribed regulatory limits for NORM contamination, however operator must report and develop a site-specific plan to deal with the waste
- Disposal at an approved facility is the only waste option available

5.13 Other Substances Waste and Residue

This section covers all 'other' solid and liquid waste streams that may be generated from the offshore operations on the platforms, drilling rig and vessels. This encompasses a wide variety of waste streams and includes all plastics, paper, cardboard, sludge, waste oil, scrap steel, spent lubricants, used filters, etc that may be generated.

Due to this variety of waste streams, the structure of this section differs from the previous ones and instead relies upon Appendix A to outline the waste streams, hazard classification and expected management strategies. The management strategies outlined are for guidance purposes and will be updated to better reflect Deep Panuke Operations once further information is known about each specific waste stream. EnCana will work closely with third party contractors to develop innovative ways to reduce the total waste generated and seek alternatives to disposal.

Appendix A has been structured to address the topic headings of 1) General, 2) Production, 3) Maintenance, 4) Drilling and 5) Vessels. A waste stream that is common to multiple topic headings is grouped under the largest expected generator of that waste (e.g. lube oil may come from Production, Drilling and Vessels, however it has been grouped under Maintenance).

A separate document, titled "Specifications and Handling of Bulk Waste Containers for the Deep Panuke Project DP00-1S-0036" has been created to address the specific dimensions, locations and categories of bulk waste containers. It also addresses the transfer of bulk waste between decks and platforms.

The regulatory requirements for each of these streams are generally captured under the Nova Scotia Environment Act and the Halifax Regional Municipality by-laws for waste management.

6 INSPECTIONS AND AUDITS

Inspections and audits are effective tools to ensure that the WMP (Operations) is properly implemented and maintained. The following provides guidance with regard to the waste management system inspections and audits for the Deep Panuke Project.

- Regular documented inspections of waste collection and storage points shall be carried out by the facility/site Waste Management Co-ordinator (WMC). The objective of the inspection is to ensure a high standard of housekeeping and compliance with the WMP and regulations. A recommended Inspection Checklist for inspections is presented in Appendix B.

- In addition, the facility/site WMC shall also periodically perform, on behalf of the facility/site manager, documented audits of waste contractors and contractor waste management practices to ensure compliance with EnCana waste management requirements.

- To ensure compliance and allow for continued improvement, the Environmental Analyst shall also audit each facility/site Waste Management Plan at least annually.

- All audits shall be planned and implemented in accordance with the procedures contained in the EnCana Audit Guidelines Manual (EC98-1S-0005).

- The Loss Management Manager shall also review, in conjunction with the facility/site manager, the waste inventory annually as a minimum; to ensure that it is updated with the current best practice on the management of wastes from EnCana facilities/sites.

- All accidents/incidents relating to waste management shall be addressed by the facility/site manager and reported/investigated in the same manner as any other accident/incident using the procedures identified in the Event Management Procedures Manual (EC98-1S-0010).

7 TRAINING OF PERSONNEL

Training of personnel is a crucial aspect of waste management to ensure that the WMP (Operations) is properly implemented. All personnel involved in the handling, transportation and disposal of waste will have up to date training in the required courses as per EnCana's Training and Qualification Manual (EC98-1S-0020). Depending on job position, the following courses will apply:

- Workplace Hazardous Materials Information System (WHMIS)
- Transportation of Dangerous Goods
- H_2S Alive or equivalent
- EnCana WMP (Operations) orientation – *to be developed*

8 TRANSPORTATION

The transportation of hazardous wastes by air, marine, rail and road is regulated under the federal *Transportation of Dangerous Goods Act (1992)*. The *Transportation of Dangerous Goods Regulations*, adopted by all provinces and territories, establishes the safety requirements for the transportation of dangerous goods. EnCana will comply with all requirements outlined in the TDG Act and Regulations.

Federal and provincial legislation provides for the regulation of an extensive list of products, substances or organisms classified as dangerous. TDG uses a system of diamond-shaped placards and labels to identify dangerous goods. The Act also specifies packaging and spill response requirements for various classes of materials. The products fall into one of nine classes:

Class 1 – Explosives
Class 2 – Gases
Class 3 – Flammable liquids
Class 4 – Flammable solids
Class 5 – Oxidizing substances
Class 6 – Poisons
Class 7 – Radioactive material
Class 8 – Corrosives
Class 9 – Miscellaneous products

9 DOCUMENTATION AND RECORD KEEPING

The documentation regarding waste generation, handling and disposal and the retention of these records is critical in the determination of the effectiveness of the WMP (Operations) and to ensure compliance with regulatory requirements. These records serve as traceable evidence for EnCana and its third-party contractors.

To facilitate this, EnCana has developed a Waste Manifest Form that must be completed for the shipment, transportation and reception of all waste from its facilities. This Form will be used in addition to the required documentation outlined under the Transportation of Dangerous Goods Act. The Waste Manifest Form is attached as Appendix C below.

The facility/site WMC is responsible for the storage, retention and retrieval of records and to ensure these records are complete and legible. The facility/site WMC shall also ensure that personnel who generate waste regularly review these records for completeness. This provides protection from liability, as waste contractors may not always return signed copies of the Waste Manifest Form confirming that the waste is stored or has been treated or disposed of in accordance with acceptable procedures.

Appendix A Other Waste Streams

Waste Streams	Sources	Classification	Management Option
General			
Aluminum cans	Largely empty beverage cans	NH	Recycle
Domestic Sewage	From accommodations areas	NH	Treatment and disposal
Food	Scraps and organic waste	NH	Treatment and disposal
Fryer fat	Changeout for deep fryers	NH	Disposal
Glass	Largely empty bottles	NH	Recycle
Glass	Contaminated from laboratory, Draeger tubes, etc.	H	Disposal
Medical (sharps)	Syringes, blades, etc.	H	Disposal
Medical (biomedical waste)	Bandages, tissues, etc	H	Disposal
Packaging materials	Plastics, cardboard, paper, etc.	NH	Recycle
Paper and cardboard	Wastes from office and domestic use	NH	Recycle
Plastic bottles	Largely drink bottles	NH	Recycle
Washdown water	Cleaning of deck area	NH	Drainage system
Wood	Pallets, crates, site clearing	NH	Reuse or recycle
Production			
Absorbents	Spill clean up	H/NH	Disposal
Amine	Process waste	H	Disposal
Chemicals (misc.)	Spent misc. chemicals	H/NH	Disposal
Containers (steel)	Empty drums	NH	Reuse or recycle
Containers (other)	Empty chemical drums/pails/sacks	H/NH	Reuse or disposal
Fire fighting foam	Used in firefighting activities / or / leftover from changeout	NH	drains system or onshore disposal
Flammable liquid	Methanol, condensate, etc.	H	Disposal
Fuel waste (diesel)	Spills, fuel contamination	H	Disposal
Pigging sludge	Pipeline cleaning operations	H	Disposal
Production chemicals	Spent fluids, contaminated chemicals	H	Disposal

H – Hazardous NH – NonHazardous

Appendix A Other Waste Streams (cont'd)

Waste Streams	Sources	Classification	Management Option
Maintenance			
Activated carbon	Spent fines from filtration systems	H/NH	Disposal
Batteries	Depleted cells used in vehicles and machinery	H	Recycle
Cables/copper	Residual from construction or decommissioning activities	NH	Recycle
Drum cleaning waste	From cleaning activities for drum re-use	H/NH	Disposal
Electrical gear	From maintenance operations	NH	Recycle or disposal
Filters (oil)	Spent filters from machinery	H	Disposal
Filters (clay)	Spent filters from polishers (H2S and oil)	H	Disposal
Filters (H2S contaminated)	Spent filters	H	Disposal
Fuel oil waste	leftover / changeout	H	Disposal
Glycol	From maintenance operations	H	Disposal
Greases	From maintenance operations	H	Disposal
Industrial refuse	Cleaning materials, insulation	NH	Recycle or disposal
Insulation	From maintenance operations	NH	Disposal
Laboratory chemicals	Waste from laboratory processes	H	Disposal
Lubricants	Equipment lube oil changes	NH	Disposal
Maintenance waste	Sandblast, grinding fines	NH	Disposal
Paint (left-over)	Residual paint	NH	Reuse or disposal
Paint materials	Cans, brushes, etc.	NH	Disposal
Rags and absorbents	From maintenance operations	H/NH	Disposal
Refrigerants	Waste from refrigerant systems	H	Disposal
Scrap metals	From maintenance operations, including bands/strapping	NH	Recycle
Tank sludge	Sediments from bottom of tanks	H	Disposal
Transformer oils	Spent oils from transformers	H	Disposal
Welding materials	Spent welding rods, grinding wheels, etc.	NH	Recycle or disposal

H – Hazardous NH – NonHazardous

Appendix A Other Waste Streams (cont'd)

Drilling			
Cement	Residual from drilling activities	NH	Disposal
Chemical sacks/pails	From used chemicals	H/NH	Disposal
Drill cable	Drilling operations	NH	Disposal
Drill Chemicals	Spent drilling or completion fluids	H/NH	Disposal
Drill pipe/casing	Drilling operations	NH	Recycle
Pipe-bands and end caps	Drilling operations	NH	Reuse
Pipe dope	Drilling operations	H	Disposal
Radioactive	Spent drilling sources	H	Disposal
Vessels			
No specific waste streams identified			

H – Hazardous NH – NonHazardous

Appendix B Waste Management Inspection Checklist

Waste Management – Inspection Checklist

To be completed by facility/site manager or facility/site Waste Management Co-ordinator, as applicable.

Item	Check	Score				
		1	2	3	4	5
1	Are all waste storage areas described on the Waste Management Plan?					
2	Do storage areas only contain waste intended for the area?					
3	Are stores maintained and used to protect the waste from the elements and contain spills and leaks?					
4	Is waste stored in proper containers?					
5	Are containers in a good condition?					
6	Are waste drums and containers secure?					
7	Are waste containers labelled to EnCana ECR standards and labels clearly visible?					
8	Is emergency equipment available at the store and in good condition?					
9	Is PPE available at the store and in use?					
10	Are the MSDSs for the waste available at the point of use?					
11	Is waste for transport securely packaged, paletted and securely tied?					
12	Do the people in charge of/working in the store understand their responsibilities and the hazards associated with the waste?					
13	What condition is the housekeeping of the store?					
14	Are waste records available and signed by authorized persons?					
15	Are disposal options followed according to the Waste Management Plan?					
16	How is waste tracked?					
17	What backup disposal system is in place in the event of the normal system being out of use?					
18	Is the plan available at the point of use and in use?					
19	Have any non-conformances from the last inspection been closed out or actioned appropriately?					

Action Item	Short Fall	Action Part	Action Date

Inspection Team Member	Signature	Date

Appendix B Waste Management Inspection Checklist (cont'd)

Score Key:

5. Excellent
4. Good
3. Fair (improvements justified)
2. Poor (below standard actions required)
1. Very poor (re-evaluate competencies and controls)

Note: *All issues good or bad need to be addressed in a report prepared for the monthly HSES performance meetings.*

Appendix C Waste Manifest Form

ENCANA	EnCana Corporation – East Coast Region (ECR)
	WASTE MANIFEST FORM

Section A – Waste Generator			
Facility/Site:			
Address:			
WMC:		Tel No:	
Description of Waste:			
Type of Containment – Loose, Sacks, Skip, Drum, Other – please describe: **Quantity in kg**			
Signature (Waste Collector):		**Collection Date:**	

Section B – Transporter #1 (Retain signed copy and give a copy to Waste Transporter #2)			
Name:			
Address:			
Telephone No:		**FAX No:**	
Waste Transporter Permit No:		**Vehicle Licence Plate:**	
Signature of Person Accepting Waste:		**Date of Transfer:**	

Section C – Transporter #2 (Retain signed copy and give a copy to Waste Disposal Company)			
Name:			
Address:			
Telephone No:		**FAX No:**	
Waste Transporter Permit No:		**Vehicle Licence Plate:**	
Signature of Person Accepting Waste:		**Date of Transfer:**	

Section D – Waste Disposal Company					
Name:					
Address:					
Telephone No:		**FAX No:**			
Treatment:		**Storage:**		**Disposal:**	
Signature of Person Authorizing Disposal:			**Date:**		

Return completed copy of this form to the waste generator within 5 days of receipt of waste.