ENBRIDGE ENERGY, LIMITED PARTNERSHIP

Line 3 Replacement Project
Pipeline Safety Report

Updated January 31, 2017

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Attachments

I. Introduction

Enbridge Energy, Limited Partnership ("Enbridge") prepared this Line 3 Replacement Project ("Project") Pipeline Safety Report ("Report") to provide the Minnesota Public Utilities Commission ("MPUC") with information about Enbridge's pipeline safety programs, policies, and procedures. Safety is at the core of Enbridge's operation. We are committed to safely operating and maintaining our assets and ensuring that everyone returns home safely at the end of each and every day. This commitment to safety is based on caring for our employees, our contractors, the communities in which we operate, and the environment. The Enbridge values of Integrity, Safety, and Respect establish how we conduct our affairs, individually and collectively.

Enbridge's goal is zero safety incidents. The decisions we make and the actions we take in pursuit of that goal are guided by several foundational principles. Specifically, we believe that:

- Management is accountable for safety performance;
- Unintentional releases can be prevented;
- All incidents, injuries, and occupational illnesses can be prevented;
- All employees and contractors are responsible for safety;
- Ongoing assessment and improvement are a must; and
- Off-the-job safety and health should be promoted for our employees 24/7.

These principles are fundamental expectations as we strive towards 100 percent safety. They help create a culture in which safety is everyone's responsibility, leadership is accountable for safety performance, continuous improvement is required, hazards are controlled, and our commitment to caring extends beyond the work day.

By maintaining a constant focus on safety management, fostering a culture that values safety, learning from prior incidents, and addressing sources of potential future incidents, we enhance our ability to prevent unintentional releases that can have an impact on people, the environment, our assets, and our reputation.

Sustaining and improving safety performance does not just happen. It is the outcome of thoughtful and expert planning, well-resourced and diligent implementation, active leadership, and a strong commitment to systematic review focused on improvement.

Enbridge has developed a Safety Management System Framework[1] to provide all parts of our business with common guidance and structure. This Framework ensures that our efforts to

[1] A copy of Enbridge's Safety Management System Framework is available at: http://www.enbridge.com/AboutEnbridge/Safety/Safety-Management-System-Framework.aspx

deliver industry-leading safety and reliability performance are thoroughly and expertly planned, executed, monitored, and continually improved upon using a shared approach.

The key to outstanding safety and reliability performance is a clear, effective, and action-based management system to ensure that, as an organization, we are prepared and equipped to identify, understand, and effectively manage all risks associated with our operations so that we can move toward our goal of 100 percent safety.

While each business unit has unique operations, the Enbridge Safety Management System Framework establishes the minimum standards and components to which each business unit must adhere. Through the Enbridge Safety Management System Framework, each of our business units is expected to align, define, and document its specific programs, processes, and policies. This company-wide framework is used to capture and effectively and actively manage Enbridge's safety performance.

The Enbridge Safety Management System Framework was developed in compliance with the American Petroleum Institute ("API") Recommended Practice ("RP") 1173, and establishes the responsibilities and accountabilities required to support sustained and continually improving safety and reliability performance for all businesses within Enbridge. Additional information regarding API RP 1173, and Enbridge's implementation of the standard, is provided in Ms. Stacey Gerard's direct testimony.

Information for this Report was provided by experts working in many disciplines within Enbridge, including employees of Enbridge's engineering, compliance, integrity, operations, and emergency response fields.

II. Regulatory Oversight

A. Federal Regulations

Pipeline safety, including emergency response plans, is regulated by the United States federal government. Specifically, the United States Department of Transportation, Pipeline Hazardous Material Safety Administration ("PHMSA") is the regulatory body with oversight of and responsibility for developing and enforcing regulations governing pipeline design, construction, and operation as set forth in Chapter 601 of Title 49 of the United States Code, and regulations contained in 49 C.F.R. Parts 190, 194, 195, and 199.[2] Additionally, PHMSA is the federal regulator responsible for the development of regulations addressing inspections and audits of the pipeline operators assets and programs including approving pipeline emergency response plans under 49 C.F.R. Part 194.

[2] 49 U.S.C. § 60104(c).

B. State Regulations

PHMSA has certified the Minnesota Office of Pipeline Safety ("MN OPS") to conduct inspections on interstate gas and hazardous liquid pipelines within Minnesota. PHMSA's Office of Pipeline Safety enforces its federal regulations based on the inspections conducted by MN OPS.

PHMSA or MN OPS inspections or audits can occur at any time, but typically happen on a recurring cycle, with an audit not exceeding 3 years in Minnesota. The scope of audits and inspections conducted by these regulators are quite broad, and can include:

- Compliance with aerial patrol requirements;
- Review of integrity dig records to determine both adequacy and accuracy;
- Inspection of cathodic protection system;
- Review of tank inspection records;
- Review of the Integrated Contingency Plan manual;
- Review of operation and maintenance manuals;
- Review of pipeline integrity methodology;
- Review of leak detection methodology;
- Review of system maximum operating pressures;
- Review of facility integrity manuals;
- Inspections of facilities;
- Review of operation and maintenance procedures and records;
- Review of operator qualification records; and
- Examination of public awareness materials.

PHMSA and MN OPS also have authority over Enbridge in the event of an incident. If an incident occurs, an investigation is undertaken to determine the probable cause and prevent recurrence. Generally, pipeline regulations are governed by federal law and enforced by PHMSA.

In addition, Minnesota Statutes Chapter 115E requires pipeline companies to maintain prevention and response plans. State law also allows certain agencies to require a pipeline company to provide additional financial assurance, if, at the time of an incident, the State determines that the response efforts are inadequate.

III. Release Prevention in Pipeline Design, Construction, and Integrity Management

As stated above, Enbridge's goal is to have zero incidents on its pipelines. Enbridge works to achieve that goal by designing safe pipelines and operating them according to rigorous standards.

Enbridge also acknowledges that releases have occurred and that Enbridge must be prepared to respond to releases that may occur in the future.

A. Release Prevention in Pipeline Design and Construction

Enbridge has a long history of safely and reliably delivering energy across North America. This starts with being an industry leader in the ever-evolving optimization of specifications and standards, and detailed quality control with our material vendors and shop inspection staff. It extends to highly qualified project management staff, and rigorous training and qualifications for construction inspection, all of which results in infrastructure that is built and operated with safety and quality top of mind.

1. Pipeline Design

Enbridge's focus on release prevention begins with sound pipeline design and construction. The Project has been designed by a team of professional engineers with experience in liquid pipeline design and construction.

Enbridge has established company standards that meet or exceed referenced regulatory (C.F.R., PHMSA, Canadian Standards Association ("CSA")) or industry (API or American Society of Mechanical Engineers ("ASME")) standards. 49 C.F.R. Part 195 prescribes safety standards and reporting requirements for pipeline facilities used in the transportation of hazardous liquids. PHMSA is the governing body for the pipeline industry that interprets and enforces the pipeline standards. API is the national trade association that represents all aspects of America's oil and natural gas industry and has led the development of petroleum equipment and operating standards for more than 85 years. API maintains standards and recommended practices, many of which have been incorporated into state and federal regulations. Enbridge, in the development of its own internal standards, references many of these state, federal, and industry standards.

To ensure proper manufacturing of pipe, Enbridge acquires pipe for all of the projects it, or one of its affiliates, is undertaking from reputable manufacturers with whom Enbridge has long-standing relationships. At these plants, recycled metal is converted into liquid steel in electric arc furnaces, cast into large slabs, then rolled and welded to the precise wall thickness required for each pipeline to produce the high-tensile pipe needed for new projects. This exacting process ensures that the pipe can be relied upon to carry large volumes of oil at pressures required for pipeline operation. Producing the pipe requires meeting stringent requirements for quality and integrity.

In addition, a comprehensive inspection system at the mill helps Enbridge to achieve this quality and integrity by ensuring accuracy at every step of the process. Expert inspectors, employed by Enbridge, examine the formed pipe for possible defects at the manufacturer's facilities. Each length of pipe is visually inspected, every weld is examined with ultrasound or x-rays, and each pipe section is pressure-tested before a final fusion-bonded epoxy coating is applied to the surface under the close scrutiny of Enbridge's inspectors. The inspectors' specific duties include monitoring ultrasonic or x-ray tests that examine the integrity of each weld; using calipers and micrometers to assess each section for exact tolerances on diameter, roundness, and straightness;

and ensuring proper coating application. The state of the art fusion-bond epoxy coating enhances the integrity of the pipe over previous coatings by decreasing the chance of dis-bondment and assisting with cathodic protection.

In designing the Project, Enbridge used a design factor of 0.72 as required by 49 C.F.R. Subpart 195.106 to meet the minimum wall thickness requirement for the planned Maximum Operating Pressure ("MOP"). Additionally, Enbridge took into account external loads (crossings and burial depth), installation stresses, and pressure cycling effects when designing the Project. As a result, the wall thickness for the Project is 0.515 inches for the majority of the route, with wall thicknesses of 0.600 inches and 0.750 inches as needed where the Project crosses roads, railroads, and certain waterbodies, as well as directly downstream of certain identified pump stations.

Further in designing the pipe for the Project, Enbridge requires that the pipe is:

- manufactured according to API Specification 5L PS2;
- grade X-70 steel with a minimum yield strength of 70,000 pounds per square inch ("psi"); and
- submerged arc welded, a common manufacturing process in the pipeline industry.

External corrosion control is also an important part of pipeline design. The coating of the pipe in the manufacturing facility and coating of the girth weld during construction are specified in Enbridge specifications, referencing C.F.R., NACE International, and other industry specifications.

Another part of the design criteria for the pipeline are the operating parameters. The design is optimized to maximize the efficiency of transporting the oil, with the MOP being set by the maximum rating of any component in an operating section, or based on the hydrostatic test pressure of the section. These criteria are set forth in 49 C.F.R. Subpart 195.304, as well as ASME B16.5 and other specifications.

Installation practices of the pipeline are also taken into consideration for the design. For example, when installing the pipeline via bore or directional drilling method, additional analysis of the pipe wall thickness is done to ensure the stresses (e.g., fatigue, circumferential, radial, longitudinal and total effective) experienced during installation are within the acceptable limits of the applicable regulations and standards. Similarly, clearances between pipe and underground structures are set forth in 49 C.F.R. Subpart 195.250 and included in Enbridge's design standards. Finally, bending practices of the pipe, whether it is in the field or a manufacturing facility, are also noted in the C.F.R. and ASME B31.4, and these parameters are included in Enbridge's design standards.

2. Routing and Avoidance

Enbridge has developed a rigorous route selection process, which includes state and federal criteria where applicable, such as Minn. R. 7852.1900, as well as overall environmental, engineering, and economic factors. Each project's route must meet the project's objective and is

then evaluated based on geographic requirements, stakeholder input, and other routing criteria that ultimately results in a reasonable and financially viable route with the least impacts to the environment and human settlement. Enbridge attempts to route new pipelines alongside existing infrastructure corridors to both minimize impacts, but also to design through areas where the route is already being patrolled by either Enbridge or other operators.

If possible, Enbridge avoids routing through High Consequence Areas ("HCAs"). HCAs are defined by federal law and include the following four areas:[3]

1. High Population Area;
2. Other Populated Area;
3. An Unusually Sensitive Area (which means a drinking water or ecological resource area); and
4. A Commercially Navigable Waterway.

Enbridge has expanded this list by subdividing the "Unusually Sensitive Area" definition into two types of sensitive areas to create the following five HCA types:

1. High Population Area;
2. Other Populated Area;
3. Drinking Water Resource;
4. Environmentally Sensitive Area; and
5. A Commercially Navigable Waterway.

Federal law requires specific inspection and safety measures in HCAs.[4] Enbridge follows the applicable federal regulations regarding identification and protection of HCAs and reviews and updates its list of HCAs on an annual basis.

All pipelines experience some level of threat due to third-party damage. Factors that affect this pipeline threat include adjacent land use, one-call system availability and promotion, sign placement, use of buried marker tape, response time for locate requests, patrol frequency, marking and locating methods, and depth of cover. With regard to population centers, the proximity to private dwellings, industrial buildings, and other places of public assembly are taken into consideration and avoided if possible. By routing through areas of less activity and exposure, the failure frequency probability is reduced by lessening the potential for encroachment and unauthorized ground disturbance. Enbridge also follows all local, state, and federal requirements for depth of cover of the pipe to help minimize the threat of third-party damage through adequate burial depths.

[3] 49 CFR Subpart 195.450.

[4] 49 CFR Subpart 195.452.

3. Pipeline Construction

Pipeline construction techniques also help ensure safe operation. Enbridge utilizes rigorous construction standards, specifications, and procedures to ensure proper construction, integrity, and operational reliability.

Timing of construction activities are taken into consideration to prevent adverse weather conditions from affecting the integrity of the pipeline and workers' safety. Cold, snow, wind, rain, and other weather conditions are accounted for when scheduling the project construction so that appropriate measures can be utilized. Additionally, Enbridge consults with federal, state, and local environmental agencies to determine timing restrictions for potentially affected species and/or resources. This includes, but is not limited to, trout streams and migratory or nesting birds.

Enbridge seeks to obtain right-of-way ("ROW") access that allows construction activities to commence without limitations to workers or pipeline safety. Generally, access to the ROW is from existing public roads and private access roads where permission has been acquired by Enbridge in advance.

During pipeline construction, clearing and grading activities are completed to allow for unencumbered ROW. Following clearing, the topsoil is stripped and separated, and the ROW is graded so that there are safe working conditions for construction activities.

Mechanical bending of the pipe is performed at certain locations to prevent geometric deformation during installation. Bends can either be done in the field or, for greater bend angles, completed in a manufacturing facility. As part of Enbridge's specifications, the bend procedure is prescribed such that the integrity of the pipe and coating is maintained throughout the process.

Enbridge has an inspection and quality assurance program that verifies, tracks, and documents the construction activities. During construction, every field weld is visually inspected by qualified Enbridge inspection staff. Enbridge also hires professional non-destructive inspection firms that perform x-ray or ultrasonic inspections on 100 percent of field welds, which is more stringent than federal regulatory requirements. Each weld is covered with an epoxy coating compatible with the rest of the pipeline, ensuring consistent quality and integrity.

During grading and trenching activities, the top soil and subsoil are separated in order to protect the various layers of soil stratification. The pipeline installation ditch is excavated to the contour of the land and in concert with the bending activities so that the pipe mirrors the shape of the trench bottom and undue stress is not introduced on the pipe.

Pursuant to the federal regulations, the majority of the Project could be buried with a depth of cover of 30 inches. However, Enbridge's target depth of cover will be 48 inches.

Where a pipeline crosses cultivated agricultural lands, state law requires that a minimum depth of cover of 54 inches be maintained, unless waived by the landowner.[5] To implement the targeted 48 inches of cover, landowners in areas where the Project crosses cultivated agricultural lands will be asked to waive the 54-inch minimum cover requirement, as Enbridge has done during the construction of prior projects. In those cases where waivers are not obtained, a minimum cover of 54 inches will be achieved.

All crossings of waterbodies, roads, railroads, and foreign utilities shall meet the requirements set forth in their respective crossing permits. These may contain depth of cover, minimum separation distances, and required crossing methods in order to minimize stresses and ensure integrity of all assets.

Cleanup activities on the ROW are completed in accordance with appropriate regulations and Project construction specifications, as well as in consultation, and pursuant to agreement, with landowners. Reclamation is performed to prevent soil erosion and ground degradation, thus preserving the stability of the ground around the pipeline and reducing the likelihood for pipe movement.

Once the pipe is lowered into the excavated ditch and backfilled with appropriate material, the new pipeline is hydrostatically tested with water to ensure integrity and to verify the MOP, which will be up to 1440 pounds per square inch gauge ("psig"). The hydrostatic testing will be conducted in accordance with both Enbridge standards and 49 C.F.R. Subpart 195.304, which require a test pressure of at least 125 percent of the MOP for at least four continuous hours. In the case of a pipeline that is not visually inspected for leakage during the test, the pipeline will be hydrostatically tested for a minimum of another four continuous hours at a test pressure of at least 110 percent of MOP.

Following the hydrostatic testing process, each tested section is inspected with an in-line inspection tool, which assesses whether any dents, buckles, or geometric non-conformities are present and also provides a baseline for future inspections. Once the pipeline has been backfilled and the ROW restored, additional surveys are done to test quality of the coating. These surveys and tests may include: Alternate Current Voltage Gradient ("ACVG") Survey or Direct Current Voltage Gradient ("DCVG") Survey; close interval study; and coating conductance testing.

For additional information regarding the construction process, including a figure showing each step, see Section 5.0 of the Route Permit Application.

4. Corrosion Prevention

Enbridge mitigates corrosion by implementing a number of different measures, such as Cathodic Protection ("CP"), AC and DC mitigation, and corrosion-inhibiting coatings.

[5] Minn. Stat. § 216G.07, subd. 1.

As part of the construction of new pipelines, 49 C.F.R. Part 195, subpart H, states that measures must be taken to mitigate and monitor corrosion on buried pipelines. In addition to external protective coatings, CP is the most commonly used form of corrosion control on buried pipelines. CP inhibits external corrosion by attaching sacrificial anodes, which corrode instead of the pipe, and/or by impressing a small electrical current through the pipe. Additionally, in accordance with 49 C.F.R. Part 195 and Enbridge specifications, these systems are regularly monitored to ensure corrosion is effectively mitigated.

AC and DC mitigation is also considered in order to reduce potential corrosion from stray currents that may be present in operating alternating and direct current electrical transmission and distribution systems. Enbridge design standards prescribe mitigation systems to account for potential stray current sources, such as adjacent cathodically protected structures or utilities, DC-powered railway and streetcar systems, underground DC-powered mining operations, HVDC transmission lines, geomagnetic/telluric activity, welding shops, or parallel HVAC transmission lines. Each is taken into the design consideration for the pipeline with regards to coating, routing, and mitigation systems.

Enbridge's coating specifications, which reference NACE International (a professional organization for the corrosion control industry), C.F.R., and other industry standards, have been implemented to reduce long term external corrosion defects. The coating is tested at various stages in the manufacturing and construction processes to minimize and repair potential defects in application. Beyond the initial coating specifications required for the new pipeline, Enbridge has a coating integrity program that manages the long term status of the pipe coating and investigates areas of potential concern.

5. Prevention of Pipeline Exposure

The current design and construction practices for new pipelines limit the likelihood of pipeline exposure due to natural events because of the depth of cover between the top of the pipe and the ground surface. Enbridge has the ability to complete horizontal directional drilling ("HDD") of waterbody crossings where conditions permit. This method installs the pipeline far below river bed elevation and the drill entry point is also located well away from the river bank. This installation method reduces the risk of the pipeline being exposed or damaged due to a rain event.

In certain locations, where buoyant forces make it difficult to maintain required depth of cover, buoyancy control measures, such as concrete coating of the pipe, set-on weights or saddle-bags, are added.

6. Valve Placement

Valves are designed and installed to isolate sections of the pipeline for maintenance purposes or in the event of a release. Valves are also required to be installed per federal pipeline safety regulations (49 C.F.R. Part 195). The valves are remotely controlled by the Control Center to limit the extent of a release. Enbridge conducted an Intelligent Valve Placement ("IVP") analysis for the

Preferred Route, which ensures that Enbridge complies with federal law and places valves in the optimal locations. PHMSA has reviewed the IVP protocol.

In accordance with federal law, valves must be placed:

(a) On the suction end and the discharge end of a pump station in a manner that permits isolation of the pump station equipment in the event of an emergency.

(b) On each line entering or leaving a breakout storage tank area in a manner that permits isolation of the tank area from other facilities.

(c) On each mainline at locations along the pipeline system that will minimize damage or pollution from accidental hazardous liquid discharge, as appropriate for the terrain in open country, for offshore areas, or for populated areas.

(d) On each lateral takeoff from a trunk line in a manner that permits shutting off the lateral without interrupting the flow in the trunk line.

(e) On each side of a water crossing that is more than 100 feet (30 meters) wide from high-water mark to high-water mark unless the PHMSA Administrator finds in a particular case that valves are not justified.

(f) On each side of a reservoir holding water for human consumption.

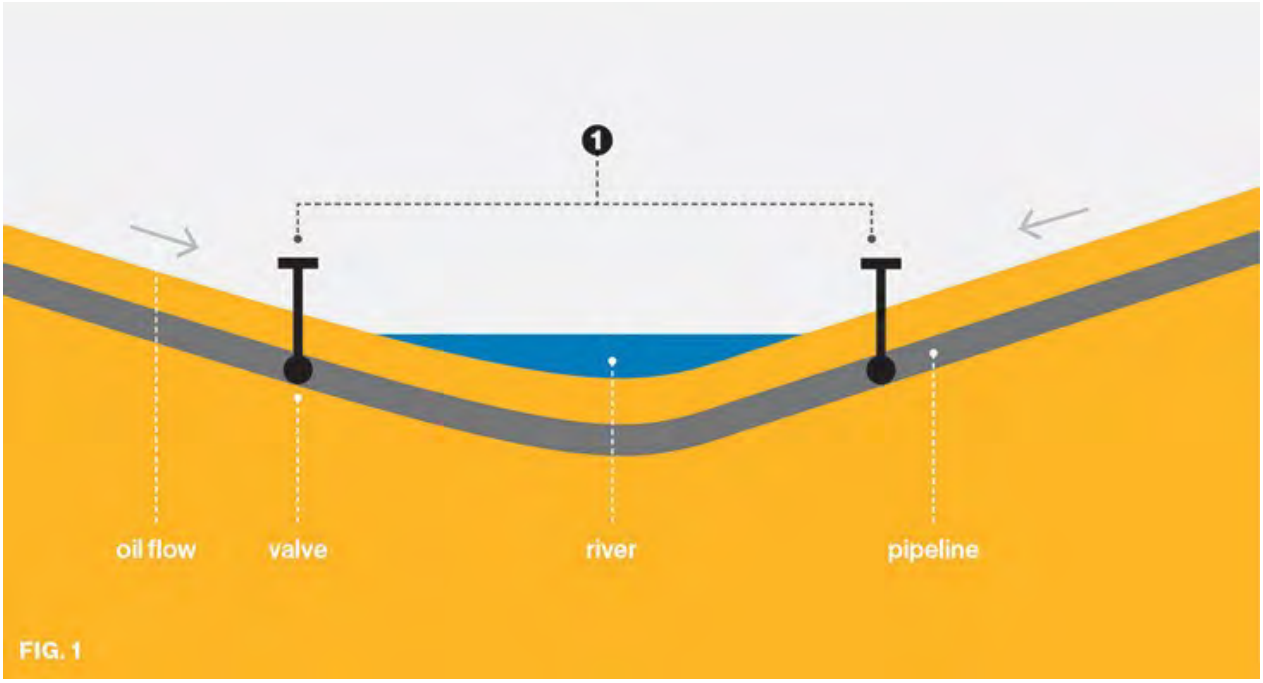
The IVP methodology, which is a key element of Enbridge's broader risk management program, combines rigorous consequence assessment, competent engineering judgment, and sound engineering practices to determine optimal valve locations. The objective of the IVP methodology, and our guiding principle, is to reduce the potential release volume in the unlikely event of a pipeline release.

Enbridge's IVP methodology is designed to ensure valves are placed at the right location to reduce potential release volumes along a pipeline corridor. Enbridge's IVP analysis takes a rigorous approach to valve placement that considers and protects water crossings, as well as other HCAs, from potential impacts.

The following illustrations demonstrate common principles in valve placement.

Figure 1: Double Sided Valley

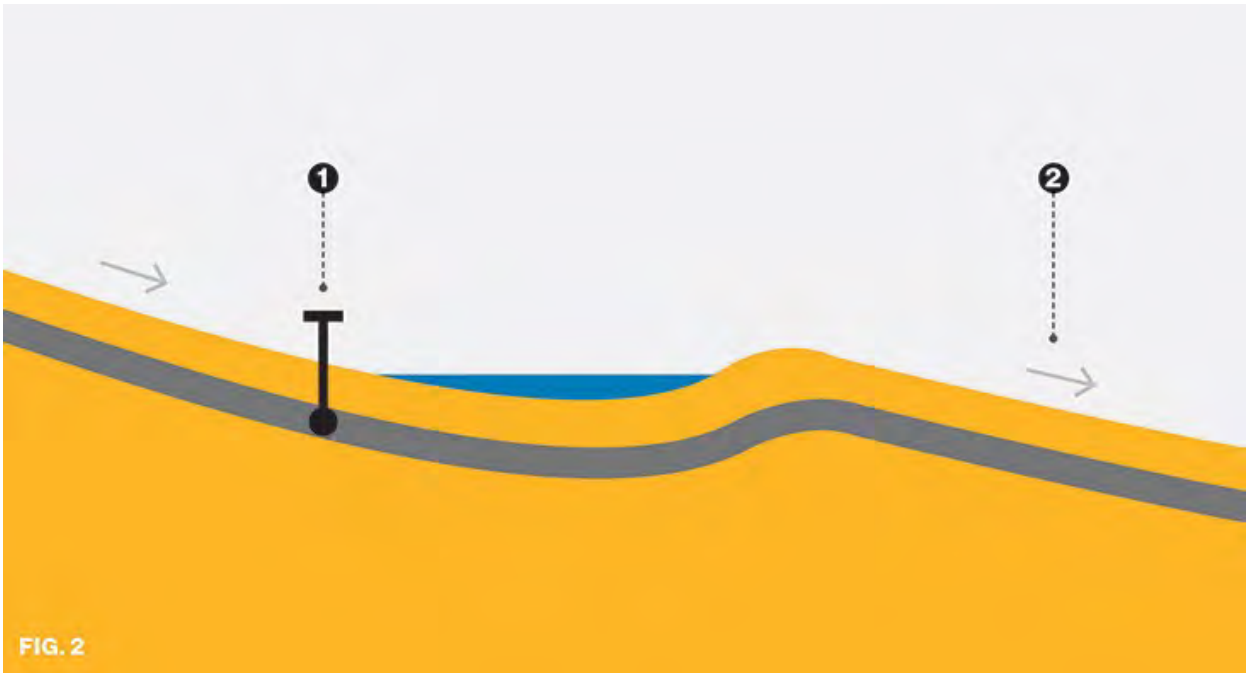
2 Valves Installed



Oil flows downhill in a pipeline after the system is shut down. In a valley scenario as depicted in Figure 1, Enbridge installs an isolation valve on each side of the water body (point 1 on Figure 1). The specific valve locations (including distance from the water body) are optimized through the IVP methodology.

Figure 2: Single Sided Valley

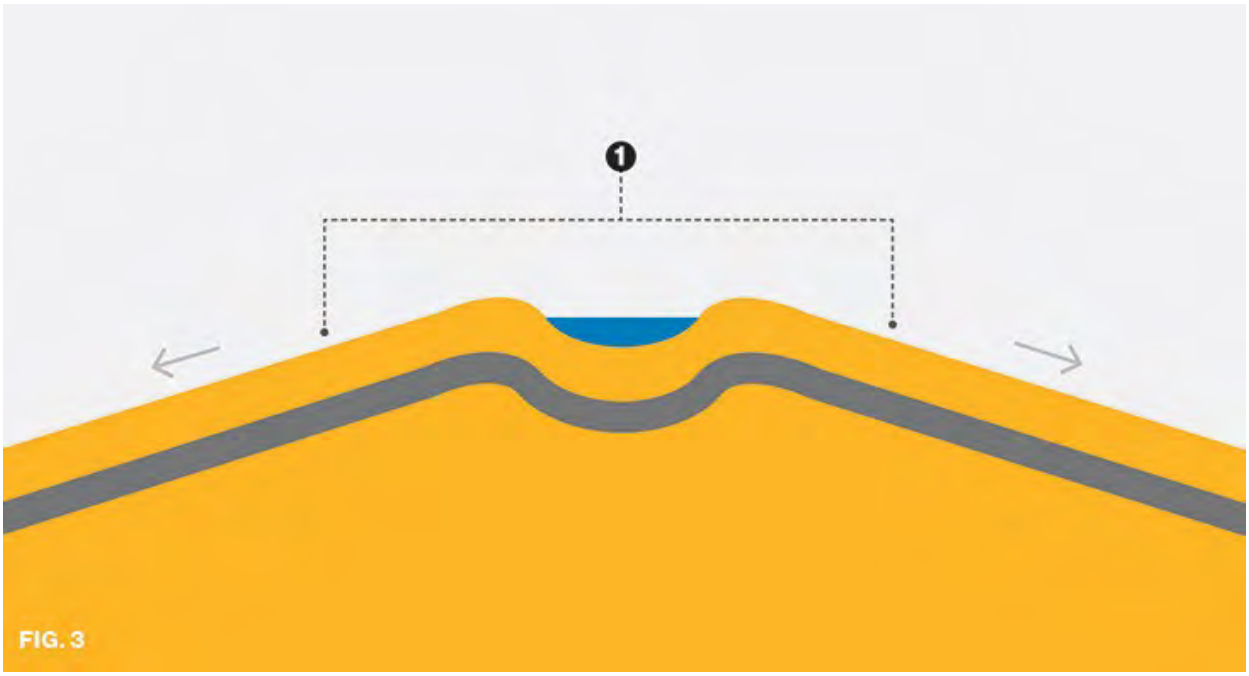
1 Valve Installed



In the scenario depicted in Figure 2, an isolation valve is placed on the left side of the body of water (point 1). However, on the right side of the body of water (point 2), oil would drain downhill away from the body of water, and a valve would provide no isolation benefit. A valve would be more optimally placed downstream, closer to any water bodies or HCAs.

Figure 3: No Valleys

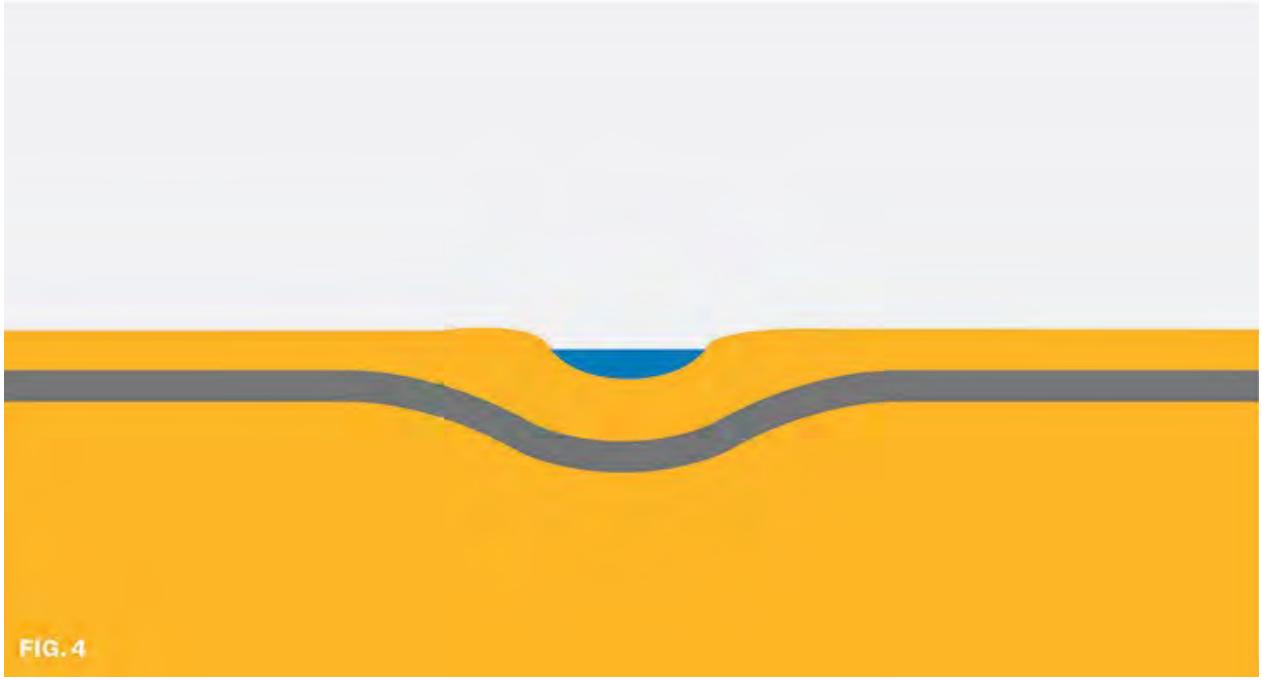
Liquid Remains in Place Naturally



In some cases, as depicted in Figure 3, bodies of water are at high points along the line. In the event of a release, these areas would act as natural isolation points due to gravity; oil would not be able to flow uphill into the body of water therefore no isolation valves are employed (point 1).

Figure 4: Flat Landscape

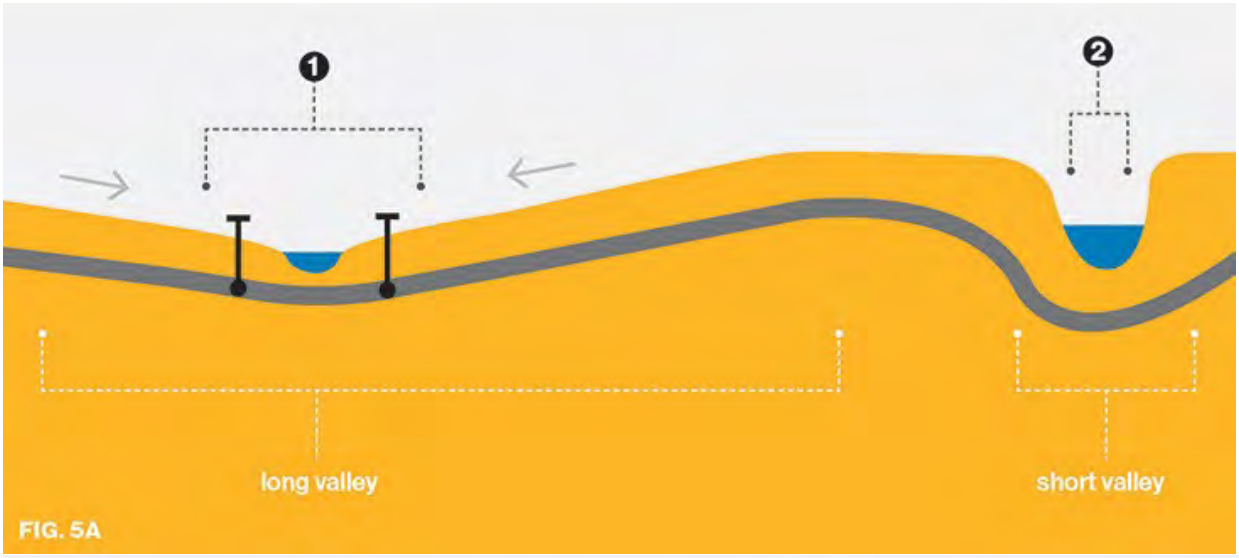
Liquid Remains in Place Naturally

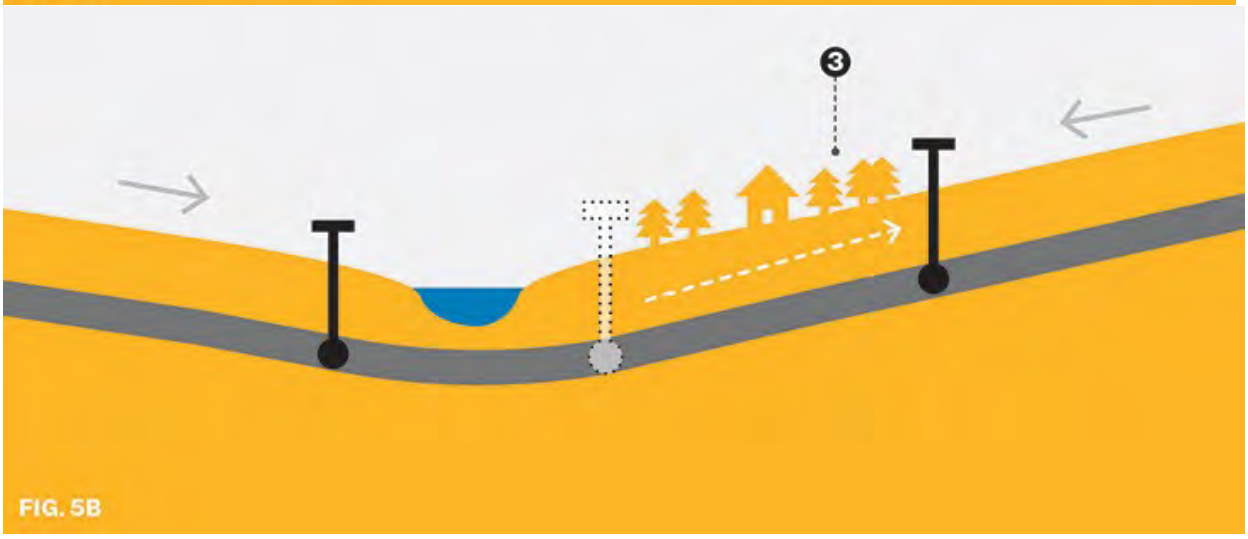


Pipeline terrain tends to be flat as depicted in Figure 4. In the event of a release, oil would stop flowing within the line and remain confined to the immediate area of the release. Valves provide no additional isolation benefit.

Figures 5A and 5B: Long Valley vs. Short Valley

Ideal Placement





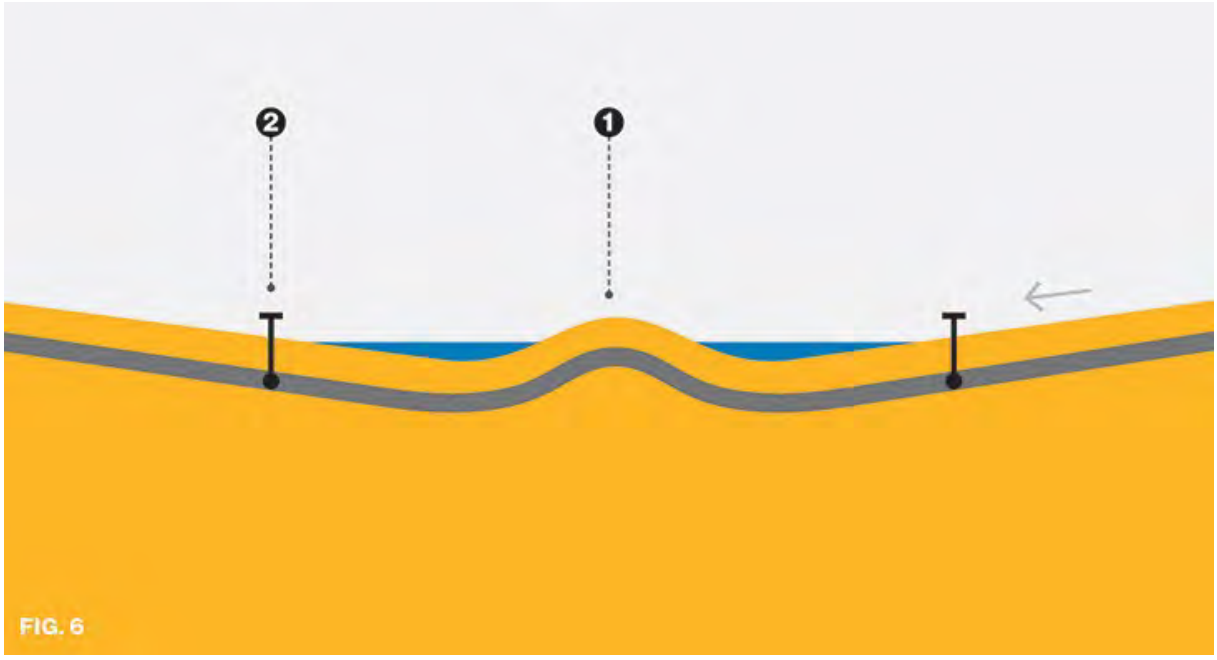
In the event of a release near a body of water at low elevation, longer valleys mean larger potential release volume. In this case (Figure 5A), isolation valves on either side of the water crossing, in close proximity to the crossing, would be optimal (point 1). Conversely, in a short, steep valley, valves often cannot be installed close to the body of water, due to the steep slope of the bank as well as the possibility of flooding; and in the event of a release, valves would only help limit oil drain along the short length of the bank, and provide little isolation benefit (point 2).

In some cases (Figure 5B), isolation valves are not directly adjacent to the banks of major water crossings. Instead, they are intentionally placed to protect not only major water crossings but

also HCAs such as additional watercourses, water intakes, urban infrastructure, and ecologically sensitive areas (point 3) – and exceed regulatory requirements in doing so.

Figure 6: Long Valley - Multiple Crossings

Ideal Placement



For a long valley with multiple water crossings as depicted in Figure 6, the land between the crossings acts as a high point, providing natural isolation from crossing to crossing (point 1). Optimal valve location is near the bottom of the long, sloping valley (point 2); this placement, in effect, allows one valve to protect more than one water crossing.

In addition to complying with all PHMSA regulations, the IVP also considers:

- The elevation profile of the proposed route;
- Locations that will reduce the potential consequence of a release;
- Construction limitations;
- Pump station locations;
- Floodplains;
- Presence of potential HCAs as defined by PHMSA;
- Proximity to densely populated areas;

- Accessibility;
- Operational considerations; and
- Future pipeline expansion potential.

Enbridge's primary consideration when determining valve locations is to reduce the potential flow of oil from higher elevations to lower elevations, particularly those close to waterbody crossings and HCAs. Among other factors, the IVP methodology recognizes that high points of topography provide effective natural isolation of product between valves. Enbridge uses a multi-step process to determine the optimal locations for mainline valves.

Enbridge first identifies the elevation profile and all waterbodies and HCAs along the centerline of the proposed route. Enbridge enters this information into a computer model. The model uses the centerline elevations to calculate the amount of oil that could be released at any point along the route. The model identifies where valves could be placed at various locations to reduce potential release volumes in major waterbodies and HCAs. The model continues to be run with various iterations of valve locations until optimized for reduction of potential oil released and the number of valves. Based on this optimized model, Enbridge develops an initial list of valve locations for further engineering review. Once the engineering review is complete, Enbridge field-verifies the potential list of valve locations to determine if any on-site constraints exist that would prevent installation of a valve at that location. Once the field verification is complete, Enbridge finalizes its list and seeks landowner agreement to place the valves at the identified locations. If any valves are moved during the review process due to on-site issues or landowner concerns, the model is rerun to verify that the new locations are effective.

Enbridge places a valve on either side of a water crossing that is more than 100 feet (30 meters) wide as required by federal regulations (see 49 C.F.R. § 195.260(e)). However, valves may not be placed directly adjacent to the water crossing in order to protect tributaries to the crossing as well as the crossing itself. There are instances where moving the valves further away from the water crossing provides additional protection to the waterbody since the valve then protects the entire basin, watershed, or tributary.

The valves prescribed through the application of the IVP methodology are remotely controllable. Remote-controlled valves can be closed quickly in the event of an incident, significantly reducing the potential volume of crude that can be released. All valves, however, are also physically accessible by roads so that they can be maintained and operated manually, if necessary.

The IVP model is conservative and is based on a worst-case full-bore release. That is, the model assumes a complete rupture of the line occurring precisely at the lowest elevation between isolation points while the line is operating at full capacity until the valves are closed. The model assumes it takes a full 10 minutes for a Control Center operator to detect the rupture and initiate the shut-down of the pipeline prior to initiating valve closure. This assumption is conservative in that Enbridge's leak detection systems and Control Center monitoring process are capable of detecting such a full-bore rupture almost instantaneously. By design, valve

closure takes three minutes from initiation. Therefore, using the full 10 minutes for initiating shut-down would result in much larger modeled volumes released than would be expected under normal operating conditions.

Enbridge estimates the potential volume of product released before valves are closed based upon these conservative assumptions. The IVP methodology then considers additional valve placements targeted at minimizing the remaining release of product after the valves have closed. The process examines the pipeline segment-by-segment on an iterative basis.

This conservative approach to risk management and valve placement is designed to ensure Enbridge meets regulatory standards.

There are operational limits on the number of valves that can be effectively placed on a pipeline. First, valves must be located where they will be of benefit, as determined by the IVP analysis. Second, the valves must be located in compliance with federal law. Finally, the valves must be placed in accessible areas where they can be supplied with power and communications equipment to allow Enbridge to remotely control the valve.

The valves are sophisticated pieces of equipment designed to isolate sections of the pipeline in the event of a release or for maintenance purposes. Each valve site will include a slab gate valve that can be controlled locally as well as remotely from the Control Center. Valve sites are also used to monitor the operation of the Project. Each valve site includes digital pressure and temperature monitoring devices that provide real-time pressure and temperature information to the Control Center.

B. Release Prevention through Integrity Management

Enbridge's integrity management program is a key component of Enbridge's release prevention efforts. Enbridge's integrity management program collects pipeline integrity data through the use of high resolution in-line inspection ("ILI") tools. This data is analyzed to identify integrity risks to the pipeline such as corrosion or cracking. The analysis is then reviewed to develop a plan for safely maintaining the pipeline with the objective of restoring the pipeline to its historical operating capability.

The sections that follow address components of Enbridge's integrity management program. Enbridge is an industry leader in investing in ILI development and has been instrumental in the advancement of new ILI technologies. Additional information regarding Enbridge's integrity management program is provided in Section 3.0 of the Project's Certificate of Need Application and Ms. Laura Kennett's direct testimony.

1. Inspections

Pipeline inspections – internal and external, below- and above-ground – are a key method by which Enbridge assesses the integrity of its pipelines. Enbridge uses sophisticated internal inspection instruments, referred to as "smart pigs" or ILI tools, to identify areas of corrosion,

cracks, and deformations (dents) that exist in a pipeline. Any anomalies that are discovered by the tools that meet specific criteria are identified for further inspection and are excavated, inspected, and repaired, as necessary.

For example, in the detection of corrosion, there are two types of sensor technologies – magnetic flux leakage and ultrasonic transducers – which provide a highly detailed profile of corrosion on external and internal surfaces. The figure below shows a magnetic flux leakage ILI tool. The tool is commonly used throughout the industry with a great deal of success in identifying metal loss anomalies.

The figure below depicts an ultrasonic crack detection ILI tool: the General Electric Phased Array Tool. The tool provides the highest resolution detection and characterization to identify cracking in welds and the pipe body.

The next figure depicts an MFL tool combined with a caliper tool that is used to detect and characterize pipeline deformations.

ILI tools use calipers (to measure geometry), gyroscopes (to gauge pipe movement), GPS (for precise pipe position), and ultrasonic or magnetic flux (to measure associated gouge, corrosion, and cracking) to measure the size, frequency and location of minute changes on both the inside and the outside of pipe walls. The ILI tools Enbridge uses to inspect its pipelines are extremely sensitive and provide a level of detail similar to that provided by an MRI, ultrasound, or x-ray screening in the medical industry.

Once gathered, the data from each ILI run is analyzed by internal Enbridge and external engineering and integrity experts to align current and prior ILI data such as anomaly density and severity with pipe characteristics, relative location of anomalies, environmental conditions, coating materials, and operating history.

Data analysis requires significant expertise by engineers and integrity specialists that review the millions of pieces of data collected through the tool runs. Once the data is collected and analyzed, Enbridge then reviews the analysis to develop an integrity management plan to address the anomalies that have been identified. This maintenance plan addresses the work required to be undertaken and predicts the amount and type of work required into the future.

PHMSA's regulations require Enbridge to assess the integrity of its pipelines at five-year intervals, not to exceed 68 months. While that is the minimum, inspections are typically more frequent due to the wide variety of ILI tools employed by Enbridge. Enbridge also assesses integrity threats via a risk-based approach, which may require additional tool runs. In accordance with federal regulations, Enbridge will perform a baseline assessment of the Project when it is placed into service (see Section 3.0 of the Project's Certificate of Need Application).

During operation Enbridge uses appropriate techniques to monitor the system and assess operational data in order to verify pipeline integrity and confirm that prevention mechanisms are effective. The monitoring techniques include ILI, on-line sensors, pressure cycle monitoring, active slope monitoring (i.e., geohazard), hydrostatic testing, Non-destructive Examination

("NDE"), direct assessment techniques and other proven and new innovative methods and technologies.

- ILI: For all mainlines and certain facility piping, ILI tools are capable of performing crack detection and metal loss inspection.

- Sensory Instruments: Instruments that read pressures/cycling, pipe movement, external and internal corrosion, and vibration are installed on each new pipeline. Flexible power options and communication options allow installation at remote locations, and the ruggedized design assures reliable operation in the harshest environments.

- Hydrostatic testing: Hydrostatic testing is conducted during pipe manufacturing, prior to pipeline commissioning, and as an integrity verification tool. The test involves filling a pipeline segment with water until it is at a pressure that is higher than the pipeline will ever operate. This can validate the safe operating pressure of the pipeline and ensure that the line is structurally sound.

- NDE: NDE does not permanently alter the article being inspected. It is a highly valuable technique that can save both money and time in product evaluation, troubleshooting, and research. Common NDE methods include ultrasonic, magnetic-particle, liquid penetrant, radiographic, and remote visual inspection; eddy-current testing; and low coherence interferometry.

- Surveys: Various surveys are used to measure pipe depth, assess river crossing and geotechnical conditions, determine the effectiveness of corrosion control, and identify third-party activity near the ROW. Aerial patrols are one of the types of surveys conducted.

2. Corrosion Protection Monitoring

As discussed in Section III(A)(4), Enbridge's pipelines have cathodic protection systems to prevent external corrosion of the pipes. The cathodic protection system is subject to regular maintenance and inspection. It is also continuously monitored. Enbridge takes actual readings each calendar year (not to exceed a 15-month interval) by taking pipe/structure to soil readings where possible. Enbridge also inspects the rectifiers and anode groundbeds used in the cathodic protection system, conducting repairs as necessary.

Enbridge evaluates the susceptibility of its pipelines to internal corrosion by integrating and evaluating data on pipeline characteristics, ILI results, operating conditions, pipeline cleanliness, crude sampling, and historical leak data.

3. Monitoring and Mitigation of Pipeline Exposure

Enbridge reviews the depth of cover over all pipelines on a periodic basis. Enbridge's ongoing integrity management program includes evaluation of pipelines that have become exposed over time. Enbridge maintains its existing assets in accordance with federal and state law, and all new pipelines are installed according to those requirements.

Enbridge's integrity management programs also include a Geohazard Management Program, which monitors for extreme weather events and for potential line exposures at flowing water crossings. Enbridge has conducted a baseline review of all river crossings to determine the potential for exposed and shallow pipe, unstable banks, and steep slopes. Based on this review, Enbridge developed flood monitoring criteria for each crossing that describes events triggering inspection (e.g., a 5-year rain event and a 25-year rain event) with the potential for several inspections based on water levels. When an inspection is triggered by an event, the regional engineering group is notified and it deploys a local pipeline maintenance crew to make visual inspection of the crossing. If the inspection finds damage, it is examined, and repair work is completed as needed on a site-by-site basis. In the unlikely event that a pipeline exposure does occur, it does not operationally increase the risk of a release.

4. Prevention of Third-Party Damage

Third-party damage is a leading cause of pipeline releases. Enbridge strives to prevent any dents, scrapes, and other damage to its pipes and facilities during construction and operation or by third parties. Enbridge has a comprehensive public awareness program in place to engage landowners, community members, and first responders to ensure they are aware of our pipelines and related facilities. The program focuses on identifying the presence of the pipeline by installing markers above ground and how to prevent damage to the pipeline from excavating equipment. Enbridge supports and is a member of the Gopher State One-Call System.

5. Integrity Threat Mitigation

Threat prevention occurs over the complete lifecycle of a pipeline, and Enbridge assesses the "fitness" of the pipeline for the service it is intended to perform, considering hazards and risks. The need for remedial action or repair work is based on the goal of ensuring a long-life asset and preventing failures.

When Enbridge's ILI program identifies anomalies that require excavation and visual inspection, Enbridge obtains the required environmental and regulatory permits, notifies affected landowners, and identifies all existing utilities in the vicinity of the area to be excavated. Enbridge then excavates around the section of buried pipe so that it can be cleaned and examined and then repaired, as needed. This is referred to as a dig and repair program, and individual digs are referred to as "integrity digs." Repair methods include cleaning the pipe, addressing corrosion and/or crack features, and recoating the pipe with modern epoxy coating. Integrity features that cannot be sufficiently addressed in this manner may be encapsulated by another layer of pipe, called a sleeve, before being recoated with modern epoxy coating. In

some rare cases, a section of pipe may be cut out to remove an anomaly and a new piece of pipe welded in its place. Upon completion of the examination and repair, subsoil and top soil are replaced, and the site is restored by grading, planting, and reseeding, as necessary. Integrity digs involve disturbance of the land, which may interfere with the landowner's use of the property. However, integrity digs are necessary to maintain the safety of the pipeline.

To ensure the safe operation of a pipeline, it may be necessary to reduce the pipeline pressure below its MOP. Temporary pressure restrictions may be imposed when an ILI reports a severe anomaly that necessitates a pressure reduction to ensure a factor of safety is maintained. The restriction may be removed after the anomaly is excavated, examined, and repaired. Temporary pressure restrictions may also be imposed if Enbridge is unable to verify the reliability of the ILI data. These restrictions may be removed after evaluating the pipe using additional inspection methods such as performing more ILI, completing more dig and repair programs, integrity digs, pressure testing, and/or completing an engineering assessment.

When it is determined that on-going maintenance activities will not feasibly restore the pipeline back to its MOP, a permanent pressure restriction may be imposed. The lowered MOP enables the continued operation of the pipeline, at a lower pressure, while maintaining a factor of safety on the condition of the pipeline. Pressure restrictions can cause significant operational challenges and typically limit capacity and operating flexibility.

Replacement is another mitigation measure that Enbridge employs. Enbridge has a formalized procedure for assessing pipeline replacement, which is continuously updated and refined based on increased knowledge and improved technologies. Enbridge's replacement analysis involves forecasting integrity digs required to address integrity threats, and also takes into account factors such as the impact to the environment and landowners, risk reduction, and operating reliability requirements, among others. Pipe replacement is neither an easy decision nor a last resort. Instead, it is a calculated decision that takes into consideration the costs and benefits given the circumstances of the specific pipeline.

6. Internal Corrosion Prevention

Internal pipeline cleanliness is important for preventing internal corrosion. Cleaning tools, liquid inhibitors, and biocides can be used throughout the life cycle of pipelines to prevent the development of internal corrosion.

IV. Release Detection and Emergency Response

As the operator of vital energy infrastructure across North America, including renewable power generation, power transmission, gas transmission, gas transportation and distribution, and the world's largest and most complex petroleum pipeline network, Enbridge knows the public has entrusted it with the responsibility to deliver energy safely and reliably. That responsibility includes preventing an incident and having a comprehensive Emergency Response Plan in the event that an incident occurs to minimize any impact to people or the environment.

A. Release Detection

Release detection is accomplished through pipeline monitoring and inspections. The Project will be monitored 24 hours a day, seven days a week, and 365 days a year from the Control Center Operations ("Control Center") facility located near Edmonton, Alberta.

The state-of-the-art Control Center was constructed in 2011 and was purposefully designed to enhance the safety and reliability of our pipeline operations by creating optimal working conditions while supporting our operations team as they conduct critical around-the-clock activities. The Enbridge Control Center facility allows for greater interaction and enhanced support, with design measures to address fatigue management in conjunction with maximizing human performance through such features as ergonomic consoles, improved circadian lighting, and noise reduction paneling equipment.

Controllers are supported by additional on shift 24/7 peer support, Senior Technical Advisor support, and Shift Supervisor support. In addition, Controllers have access to the Control Center Technical Services group, and Engineering and Management teams. The Control Center Engineering and Management teams are also available 24/7 through a rotational, on-call program.

The systems operated by the Control Center include approximately 15,380 miles of pipe segregated into 59 distinct pipeline assets, 26 of which are located in the United States. Enbridge also maintains a fully functional back-up Control Center in the Edmonton area that can assume full control of the Enbridge system in the unlikely event the primary Control Center is unable to function properly.

1. Monitoring Systems

The Control Center employs multiple redundant systems that have been designed and optimized to prevent the release of hydrocarbons and mitigate the magnitude of a release in the unlikely event of a pipeline failure. The following methods are used by the Control Center to monitor and assess whether a release may have occurred:

(a) Computational Pipeline Monitoring ("CPM")

The Project will be protected by a computer-based pipeline monitoring system that utilizes measurements and pipeline data to detect operational anomalies that indicate possible leaks. This system employs a sophisticated computer model that applies a sequential probability ratio test to the corrected flow balance system. This system continuously calculates the statistical probability of a release based on fluid flow and pressure measured at the inlets and outlets of a pipeline. The expected pressures and liquid flow rate in each section of the pipeline are compared to the actual measured pressures and flow rate. Discrepancies between the expected and actual values result in a leak alarm that precipitates shutdown.

(b) Supervisory Control and Data Acquisition ("SCADA")

In addition to keeping in close contact with field operators via telephone and computer, Controllers use the SCADA computer system to monitor what is occurring within our pipeline and terminal systems. Using the SCADA system, computers in the control room and at remote sites continually relay information back and forth, enabling our Controllers to constantly monitor pressures, flow rates and other conditions on our pipelines and terminals, allowing for a quick response when abnormal or emergency conditions are identified. The system is designed to remotely control the line, detect anomalies, issue controller alarms, and initiate a station shutdown or line stop when allowable operating limits are exceeded or logical arguments fail.

Examples of SCADA controller alarms include:

- Explosive vapor alarms;
- Pump seal failure alarms;
- Equipment vibration alarms; and
- Station fire alarms.

Examples of SCADA initiated station shutdown or stop line commands include:

- High pressure limits;
- Low pressure limits; and
- Unintentional valve closures.

(c) Line Balance Calculations

Controllers will employ line balance calculations that compare the volume of oil injected into the pipeline with the volume of oil delivered from the line to identify unexpected losses of oil that would indicate a leak. Line balance calculations are performed every two hours using both two hour and 24 hour balance intervals. Enbridge also maintains a rolling 24 hour calculation based on the calculations done at the prescribed set times. These calculations identify unexpected losses of pipeline inventory during pipeline operation. Negative line balances that exceed the detection thresholds may indicate a release and result in the line being shut down.

(d) Controller Monitoring

The Project will be monitored 24/7 by specially trained and qualified Enbridge employees located in the Control Center. Controllers are trained to monitor the operating parameters of the line and react to operational anomalies, CPM alarms, discrepancies in line balance calculations, SCADA alarms, SCADA station shutdown commands, and SCADA stop line commands.

Controllers continuously monitor SCADA data to identify the pipeline leak triggers. Pipeline leak triggers from the upstream side of a suspected leak site include:

- Sudden drop in upstream discharge pressure;
- Sudden change in upstream control valve throttling or pump speed;
- Upstream unit(s) shut down (or lock out) in combination with a sudden drop in upstream discharge pressure and/or a sudden change in upstream control valve throttling (or a sudden change in percentage Variable Frequency Drive ("VFD") control); and
- Sudden increase in upstream flow rate.

Pipeline leak triggers from the downstream side of a suspected leak site include:

- Sudden drop in downstream suction pressure;
- Sudden change in downstream control valve throttling or pump speed;
- Downstream unit(s) shut down (or lock out) in combination with a sudden drop in downstream suction pressure and/or a sudden change in downstream control valve throttling (or a sudden change in percentage VFD control);
- Sudden drop in holding pressure at a delivery location; and
- Sudden decrease in downstream flow rate.

Controllers also consider alarms from the CPM system and line imbalances that exceed the line balance thresholds from the line balance calculations as independent leak triggers.

The Control Center actively monitors all pipeline and terminal systems, including systems that are operating and systems that are shut down. The Control Center monitors all field work and maintenance activities taking place on Enbridge assets. It has processes in place to ensure that these activities are considered and that alternate monitoring strategies are developed when required. In addition to monitoring and controlling the pipeline systems, the Control Center monitors the incoming and outgoing terminal flows and individual tank levels. The Control Center also performs volume balance checks on the Project while also monitoring gas alarms and fire alarms.

2. Enbridge Inspections

Visual inspections are also very important. Enbridge patrols all pipeline ROW by air at least 26 times per year (not to exceed a three-week interval) to assess the ROW for potential damage or other release threats. Typically, aerial inspections are made on a weekly basis, weather and other factors permitting. These inspections review conditions on or adjacent to the ROW. Line walking inspections are used, as necessary, to supplement aerial inspections in congested areas. To facilitate these regular inspections, Enbridge is required to maintain a ROW clear of woody vegetation.

Enbridge also inspects its facilities, such as pump stations and terminals, through targeted tankage, equipment, and piping inspections. A team of subject-matter experts in Engineering, Operations, and Integrity implement a release detection program for all facilities throughout the liquids pipeline system.

In addition, Enbridge checks the operation of isolating valves at least twice per year and regularly reviews the equipment used to limit, regulate, control, or relieve pipeline pressure.

3. Third-Party Reports

Enbridge operates an emergency telephone line whereby members of the public and public officials can notify Enbridge of any issues related to its pipelines. The emergency phone number is communicated to emergency officials and the public as part of a continuing public awareness program. The number is also advertised on the www.enbridge.com website and on Enbridge ROW signage. The Control Center continuously monitors the Enbridge emergency telephone line for reports of oil on the ground or reports of odor provided by third parties.

B. Emergency Response

1. Emergency Response Plans

(a) Integrated Contingency Plan

Enbridge's emergency response plan, referred to as the Integrated Contingency Plan ("ICP"), was approved by PHMSA on July 11, 2013, and was formally put into place on August 30, 2013. Enbridge reviews the ICP at least annually. PHMSA's letter approving the current ICP is included in Attachment A. Enbridge's current ICP serves as the emergency response plan for all Enbridge Liquids Pipelines.

The ICP was developed in consultation with PHMSA and was the first industry plan to undergo an extensive, multi-agency peer review process. Agencies that participated in the review of the Enbridge ICP included, but were not limited to, the United States Environmental Protection Agency ("EPA"), the United States Coast Guard ("USCG"), the Occupational Safety and Health Administration ("OSHA"), and PHMSA. The Enbridge ICP follows the format of a document prepared by the National Response Team ("NRT"), which provides technical assistance, resources and coordination on preparedness, planning, response and recovery activities for emergencies involving hazardous substances That document, known as the ICP Guidance, was developed by the EPA, USCG, OSHA, PHMSA, and the Minerals Management Service in the Department of the Interior ("DOI") to provide a sample contingency plan outline that addresses the requirements of various federal regulations. The ICP Guidance format is the federally-preferred method of response planning, and plans prepared in accordance with the ICP Guidance are viewed favorably by the NRT and reviewing federal agencies. Using the ICP Guidance document allowed Enbridge to create a single plan that serves as the primary emergency response tool.

The ICP consists of two parts. Part 1 is the Core Plan that serves as the overall plan and is consistent across all operating regions. Part 2 is an annex based on the geographical Response Zone (or Region), which provides detailed supporting information and regulatory compliance documentation for each of the nine Enbridge Response Regions. In the United States, the regions consist of North Dakota, Superior, Chicago, and Mid-Continent. In Canada, the regions are Eastern, Central, Western, Athabasca, and Northern. The Project will be within the Superior Region.

The ICP utilizes the Incident Command System ("ICS"), which is a system used by both public and private sector emergency responders to coordinate objectives and actions when responding to an incident. ICS is a management system that uses a Unified Command structure to set objectives for a response to any type of incident. A Unified Command is established when representatives from Enbridge, federal agencies, state agencies, and local agencies form a single chain of command to issue instructions relating to the response. Each leader is responsible for a limited number of workers, which increases safety and makes response management easier. Resources from the company and response agencies are also coordinated for maximum efficiency and effectiveness. All activities are documented in an Incident Action Plan, which is a written document created for each phase of the response.

The ICP is used by Enbridge responders to manage an emergency anywhere within Enbridge's United States system. Those responders include the Regional Incident Management Teams ("IMTs"), which are groups of Enbridge employees located in each region with training in the ICS, and the Field Response Teams ("FRT"), which are groups of Enbridge employees in each region with specialized training in containment and recovery operations.

The ICP's primary purpose is to ensure an effective, safe, and comprehensive response to all types of incidents, regardless of where the incident occurs, or what type of resource may be impacted. Accordingly, Enbridge is prepared to respond to any incident, regardless of the type of oil, the location, or type of incident, such as fire or a security event. The two primary goals of any incident response are to prevent injury or damage to the public and Enbridge employees and mitigate any possible impact on the environment. The specific objectives of the ICP are to:

- Provide guidelines for handling an emergency response operation;
- Develop alert and notification procedures to be followed when an emergency response incident occurs;
- Document equipment, personnel, and other resources available to assist with an emergency response to an incident;
- Describe response teams, assign individuals to fill the positions on the team, and define the roles and responsibilities of team members;
- Define organizational lines of responsibility to be adhered to during an emergency response;

- Outline specific response procedures and techniques to be used during an emergency response incident; and
- Comply with United States Homeland Security Presidential Directive 8 to take an "All Hazards" approach to emergency response, which means having a response plan to address not only a product release, but also a tank fire, power outage, or security incident.

The ICP may undergo additional revisions in connection with a change in regulations or due to operational changes that require reporting per applicable regulations.

(b) Field Emergency Response Plan

Each of the nine regional annexes to the ICP contains a Field Emergency Response Plan ("FERP"), which is a region-specific, condensed version of the ICP tailored to the unique features of the region. Each FERP is publicly-available and specifically designed to be used by first responders and Enbridge personnel in the field. The current FERP for the Superior Region, which will govern emergency response for the Project, is included as Attachment B. The FERPs are also available to the public at www.emergencyresponderinfo.com. Registration is required to obtain a copy of the FERP so that Enbridge can provide any updates to the FERP to those individuals that have requested the FERP in the past.

The FERPs include, but are not limited to:

1. HCA maps, which show areas of high population, other population, water, and environmentally sensitive areas;
2. Control point maps, which show downstream water access and collection points;
3. Facility Response Plans, which address pumping and terminal areas;
4. Line information, which includes valve locations;
5. Response maps; and
6. Equipment lists.

The FERP will be updated to include Project-specific information once the route is finalized and final construction design of the Project has been completed.

Enbridge's ICP and FERP meet or exceed all local, state, and federal requirements, including PHMSA's pipeline safety regulations specified in 49 C.F.R Parts 194 and 195, and applicable OSHA, USCG, API national technical standards, and Minnesota Statute Chapter 115E and API 1174 recommended practices for Liquid Pipelines Emergency Response.

2. Emergency Response Resources

In Minnesota, Enbridge has established Pipeline Maintenance ("PLM") shops located in Superior, Wisconsin, Bemidji, Minnesota and Thief River Falls, Minnesota. Assuming the Preferred Route is approved, Enbridge plans to add one new PLM Shop in the Project area east of Clearbrook.

PLM shops are equipped with emergency response equipment and pre-positioned and packed response trailers. These are the main repositories of Enbridge-owned emergency response equipment. Detailed lists of equipment maintained at each station are provided in the FERP for each region. Examples of maintained equipment at these locations include containment boom and related equipment, skimmers, pumps, trailers, boats, generators, specialized vehicles, and trucks. Similar equipment will be available at the new PLM location.

Enbridge does not limit its response resources to only those located at staffed stations within the region where an incident occurs. Enbridge will mobilize any response asset that may be required, regardless of where the asset is located. Enbridge maintains its own Tier 1 response resources as defined in the USCG Oil Spill Removal Organization ("OSRO") classification regulations. Enbridge will also mobilize resources from contracted OSRO companies and other OSRO companies as needed. Local suppliers are also used for equipment rentals and purchases of ATVs and boats. Additionally, Enbridge has an Enbridge Enterprise Emergency Response Team ("E3RT"), which is a cross-business unit response team that responds to large-scale events anywhere in North America that require more resources than a single region could provide.

Enbridge continually invests in response equipment. From 2012 to 2013, Enbridge invested $50 million to improve its equipment, training, and overall response capabilities. This investment includes new equipment – ranging from containment booms to boats – that is deployed across its systems. In 2016, Enbridge completed the initial purchase of approximately $7 million in new equipment for the Great Lakes region.

Enbridge spent over $4.5 million in the Superior Region to improve response capabilities. Major items purchased include:

- Excavator, including truck and trailer to haul excavator, for Thief River Falls;
- Marsh Master utility vehicle for Bemidji;
- Wildlife Response Trailer for Bemidji, which contains bird deterrents, cages, pools, and other equipment used to keep animals away from any released product or to rehabilitate a contaminated animal;
- ASV skid loader for Bemidji;
- Vacuum truck for Bemidji; and
- Lake assault boom vessels for Superior and Escanaba.

Additionally, Enbridge has stationed a helicopter in Bemidji, Minnesota. The helicopter is used for pipeline inspections and emergency response.

Enbridge has invested significant financial resources in public emergency response agencies along the routes of its pipelines. For example, in 2016:

- Through its Safe Community Program, Enbridge donated more than $34,899 to Minnesota, $33,001 to North Dakota, and $74,564 to Wisconsin, for a total of $142,464 donated to emergency response agencies;

- Enbridge's North Dakota Response Region donated an additional $40,015 to first response agencies for equipment and training; and

- Enbridge's Superior Response Region donated an additional $8,292 for equipment and training.

Over the past four years, Enbridge has also donated 11 vehicles to ER agencies in Minnesota, including various fire departments and a health center. A map showing a sample of Enbridge's Safe Community Program grants, as well as other community investments, is available at: www.enbridge.com/map#map:community.

In addition, in the event that the ICP Team determines additional resources are required to respond, Enbridge has developed a relationship with other contractors along the route who have been trained and have agreed to provide resources and participate in responding to any incident when called upon by Enbridge. For example, to assist with clean up, Enbridge could call on those companies that Enbridge contracts with on a regular basis, such as vacuum truck vendors and rental companies to provide additional equipment and personnel.

All of these resources described above have been identified and have agreed to participate or assist in the event Enbridge asks for their assistance. Any contractor involved in a response will first be trained and, at the incident, will be part of the ICS response. Enbridge enters into arrangements with hotels so that housing and conference space used during regular business operations is also available during emergency response.

3. Emergency Response Timing and Processes

Enbridge treats all incidents, regardless of type or location, in a uniform manner to ensure a consistent, effective response. An incident is any event that is outside of expected operating procedures and requires an emergency response. Enbridge has made the decision to immediately mobilize more resources than may be necessary to respond to an incident and then scale the response down rather than respond with minimal resources and then have to engage others as response occurs.

(a) Initial Control Center Response

The Control Center is Enbridge's primary incident detection system. When one or two leak triggers are identified, the Controller has 10 minutes to analyze the information and conclusively rule out the possibility of a leak. If the possibility of a leak cannot be irrefutably ruled out within 10 minutes of the first leak trigger being identified, the Controller immediately initiates a shut-down of the affected line segment so that it is sectionalized and isolated. The Controller then notifies the appropriate personnel in Enbridge, who initiate the investigation process.

When three or more leak triggers occur, immediate steps are taken to sectionalize and isolate the pipeline using remote controlled valves. There is little to no time between detection of a release and execution of the line shutdown process.

The amount of time required to identify a leak is dependent on the nature of the release. Full-line ruptures will result in multiple leak triggers and alarms that will notify the Controller almost instantaneously. Small leaks are typically detected by the CPM system and the line balance calculation process (as described above), both of which are tuned to detect large and small leaks. Although the highest sensitivity leak threshold requires 24 hours to trigger an alarm, changes in operations and other monitoring techniques alert the Controller of changes in volume that will also be relied upon to shut the pipeline down and initiate an investigation in a shorter timeframe. Controllers are required to shut the line down in the event that they suspect that there is an issue with the pipeline operations.

(b) Emergency Response Processes

Many activities are undertaken within a short period of time in response to an incident. Enbridge personnel are trained to respond to an incident in accordance with the FERP. The FERP provides specific response steps and tactics to be used within each region, considering the unique topography and features along a pipeline route within the region.

When notified of an incident, the Control Center will shut down the pumps and close the valves in the area of concern. On-call operations personnel and managers are notified internally by the Control Center. These include individuals that are part of the IMT and FRT. Notifications occur for both internal and external parties, including the National Response Center ("NRC"), the state, and local police.

Enbridge first responders work to confirm the nature and location of the incident as notifications occur. Trained Enbridge personnel will also be directed to the site of an incident after receiving notice of the incident.

External first responders will arrive on the scene within minutes of being alerted to an incident secure the scene, undertake evacuations when necessary, and deploy the FERP procedures, which are provided to Enbridge and external first responders. External first responders are public health or safety agents, such as fire or police departments, charged with responding to

an incident during the emergency phase and alleviating any immediate danger to human life, health, safety, or property.

When notified, Enbridge follows the ICP and initiates a response using the ICS model. The goal is to prudently over respond. Initial indications of response needs are based on assessment of the level of emergency (see the Classification of Incident chart is provided in Attachment C to the Safety Report).

One of the first steps under the ICS is for a Qualified Individual, which is a person with specialized training in incident command, to take the role of Incident Commander. That Qualified Individual is charged with ensuring that *more* than the required resources are provided to respond to the incident. The Incident Commander will set incident objectives and Operations will identify tactical objectives for the response. The primary incident objective will always be ensuring the safety of the public and responders.

The IMT will use Enbridge's response plans and processes to create an Incident Action Plan ("IAP") for each period of the incident response. An IAP is a work plan that guides response activities for the next work period, which can vary in duration from 12 hours to several days. The initial response periods are shorter and may increase in length if the objectives and tactics being used do not change. Command objectives and tactical objectives are used to create work plans, order resources, and communicate with those involved in the response.

Enbridge's emergency response plans include pre-determined steps to take in the event of an incident. Maps and tables have been developed by Enbridge that identify HCAs and ESAs along pipeline routes for each region. Response regions maintain control point map sets that identify product containment and recovery sites on high risk water bodies that could be impacted by a pipeline release. The purpose of the control point maps is to identify in advance the best locations for deploying emergency response equipment, such as booms. This allows emergency responders to know exactly what equipment is required and what to do in the event of an incident.

The HCA, ESA, and control point maps and tables allow Enbridge to know where to locate response resources in advance of a release so that emergency responders can get to work immediately upon deployment. For example, Enbridge will have identified the location of sensitive resources, such as aquatic vegetation, sensitive shoreline areas, important habitats, and other features in advance and ensure that there is appropriate equipment in the vicinity, which is to be deployed at pre-determined locations. Emergency responders will use the HCA and control point maps and tables to begin placing booms and taking any other necessary response measures to protect resources and limit the impact of an incident.

These maps and tables are reviewed annually and updated in accordance with Enbridge policy along with the ICP. In addition to updating the maps and information to reflect updates from PHMSA, the management groups in each operating region are responsible for ensuring that a visual field reconnaissance of each control point is carried out at least once every three years.

From an emergency response perspective, if a pipeline can be built in an area, emergency responders can reach the pipeline. Enbridge has a wide variety of methods to access an emergency site in any terrain or location.

The ROW provides direct access to a pipeline. Enbridge can access the ROW from public roads, or from access roads that will be built during construction and retained for future use to inspect and maintain the pipeline. Federal law requires pipeline ROWs to be kept free of vegetation that would interfere with inspection, so emergency responders will be able to travel down the ROW.

If conditions are not conducive to regular vehicles traveling down the ROW, Enbridge has specialized vehicles that can travel through swamp and marsh areas to access an incident. These vehicles include airboats, Marsh Master utility vehicles (specialized amphibious work vehicles that can transport equipment and personnel through wetlands and other difficult to access areas), ATVs, and work boats. Tracked mini-vacuum systems and portable tanks are also available to respond to incidents. Enbridge has also stationed a helicopter dedicated to aerial inspection and emergency response in Bemidji, Minnesota.

While those vehicles can transport equipment and personnel to a response site quickly, Enbridge can also build temporary access roads or mat roads through difficult terrain along the ROW in short order to bring additional equipment and response personnel to an incident site.

4. Emergency Response Training

Enbridge's emergency response efforts include significant training and exercises for Enbridge employees, as well as emergency responders.

(a) Employee Training

To date, Enbridge has trained more than 1,000 employees – essentially, all personnel anticipated to be involved in responding to incidents – in ICS levels 100-400. ICS is the common system used by first responders, the military and civil authorities across North America for responding to incidents. ICS classes are categorized by the different levels of information provided. ICS 100-200 classes focus on basic ICS and are taken by all responders. ICS 300 and 400 are two-day courses for select personnel. The courses include training on staffing and response organization, reporting requirements, transfer of incident command, unified incident command structure for multi-jurisdictional or multi-agency incidents, documentation, resource management, and related topics. ICS role-specific training is also required for all IMT positions. Role specific training is a class focused on training for a specific ICS positions. Also included in training is ICS 320, a three-day course that focuses on the proactive planning phase of a multi-day incident. ICS training is conducted on an on-going basis and ever-increasing numbers of Enbridge IMT team members will be trained and available to respond in the event of an incident.

The qualified individuals, who function as Incident Commanders within the ICS system in each region during an emergency response situation, receive additional training focused on their role in developing an ICP for a response, coordinating resources, and identifying the type and quantity of resource required for their respective regions in order to ensure more than the required resources are provided to respond to any incident.

Attachment D includes a figure showing the three other types of levels of response teams at Enbridge. The first level is the Incident Support Team. The team is made up of leadership from Liquids Pipelines and acts as support to the Incident Commander. The next level is the E3RT, a group that responds to large-scale events anywhere in North America that require more resources than Liquid Pipelines could provide. The E3RT conducts major training exercises involving all of Enbridge's business units, emergency response contractors and consultants, and federal, state/provincial, and local emergency response agencies. The last team is the Crisis Management Team, composed of Enterprise Leadership, which supports incidents related to the highest level of crisis interventions and social license to operate.

Enbridge's exercise programs follow the National Preparedness for Response Exercise Program ("NPREP") standards, which were developed by PHMSA, the USCG, the EPA and DOI to establish a preparedness exercise program for federally-regulated companies. The NPREP standards require a minimum number of different exercise types over a three year period, including at least one spill IMT exercise and one FRT exercise annually. Also included is a Full Scale Exercise ("FSE") at a minimum of every three years. A FSE is an exercise that includes both equipment deployment and the IMT responding to the same scenario. Enbridge employees participate in regular emergency response drills and simulations to provide training, test, and improve upon Enbridge's preparedness procedures. Enbridge's exercise and drill program far exceeds federal standards.

Exercises are planned annually for employees and first responders to participate in hands-on training in their primary response area. Employees are trained through workshops, equipment deployment drills, and tabletop exercises where various scenarios are discussed. In 2015, Enbridge and its affiliates staged more than 360 exercises, drills, and equipment deployments. In 2016, Enbridge participated in 320 exercises, drills, and equipment deployments. The following exercises took place in the Superior Response Region in 2015 and 2016:

- 2015: 10 tabletop exercises, 6 equipment deployment exercises, and 5 notification exercises.
- 2016: 7 tabletop exercises, 5 equipment deployment exercises, 4 notification exercises, and 21 miscellaneous exercises (such as tank fire exercises).

These training events occur regularly and frequently across all Enbridge Response Regions to ensure that personnel are trained to respond to an incident and able to address the unique features of their environment. Many of these exercises involve local emergency responders using emergency response equipment to practice recovery and cleanup in various terrains and/or on water.

(b) First Responder Training

Enbridge's training is not limited to its employees. Enbridge currently bears the cost of training first responders and will continue to do so. Enbridge offers a free online Emergency Responder Education Program, which has been launched to more than 8,000 response agencies in North America, including those along the Preferred Route of the Project. The online program is for all public sector first responders. There is also a specific program for 911 dispatchers, which was created with the assistance of the National Emergency Number Association ("NENA"). The content for both programs is based on "Pipeline Emergencies," an industry-leading pipeline emergency response training program developed by the National Association of State Fire Marshals. The purpose of this training is to make sure that first responders know their role and are prepared to fulfill that role in the event of an incident. To that end, Enbridge works with first responders so that they know the following information:

- Names of companies operating pipelines in their community;
- Emergency and non-emergency contact information for all operators;
- The approximate location of the pipelines;
- What materials or products are being transported in the pipelines;
- The physical indications of an unintended release;
- Potential impacts of an unintended release; and
- Steps that should be taken to protect the public.

Some Enbridge employees are also trained as Emergency Response Ambassadors in each Response Region to provide additional face-to-face training and information to 911 operators and emergency responders at Enbridge's expense. Enbridge's primary focus is on those agencies and responders within a five minute response time of an Enbridge pipeline because those are the agencies and individuals that will likely be first on scene for an incident. The goal of this additional training and information is to provide further, specific, practical information to be used by first responders when interacting with the public in response to an incident.

The level of training that incident response personnel receive, regardless of whether they work for a non-company agency or for Enbridge, is commensurate with the respective personnel's role in the incident response plan. First responders are therefore trained to be able to perform the following functions as part of an emergency response:

- Secure the scene;
- Deploy or initiate the FERP procedures;
- Respond to protect people, property, and the environment, including isolation of the area, rescue, and evacuation;
- Call for assistance; and
- Work with Enbridge to remedy the situation.

While non-company agency personnel fulfill important incident response roles, such as ensuring the safety of the public by controlling access to the area, implementing the procedures set forth in the FERP, providing medical support if necessary, and, if required, responding to fires or other immediate hazards to life or property, they are not expected to fulfill the role of halting or remediating a release. Enbridge employees and contractors with more specialized training will be used to perform those functions. As a result, Enbridge ensures that non-company agency personnel are trained to make sure they are, among other things, (i) aware of Enbridge and Enbridge assets in their areas, (ii) aware of and able to implement the FERP, and (iii) able to coordinate response efforts with Enbridge, using ICS and Unified Command, as effectively as possible during all phases of incident response, from first response through remediation. In this way, Enbridge ensures that everyone who is expected to respond to an incident is equipped with the information and resources necessary to fulfill their respective roles.

Enbridge sponsors annual emergency response information and training meetings that focus on pipeline response and response safety, such as annual meetings with the emergency response personnel along Enbridge's pipelines, to ensure they have the latest information on our operations. These emergency responders include Emergency Medical Services ("EMS"), fire chiefs, sheriffs, police chiefs, and state and county emergency managers. Enbridge offers training and, if requested, goes to the department's training night to give a presentation. For example, Enbridge conducted training for the Minnesota Federal Dam Volunteer Fire Department. Enbridge has also hosted pipeline emergency workshops and exercise drills for local first responders, including the Beltrami County Emergency responders, and conducted tank fire drills with the Clearbrook and Gonvick Volunteer Fire Departments. In 2016, the Superior Region completed 50 training events for fire fighters, which included a total of 831 fire fighters from 69 different departments.

5. Emergency Response Funding

Enbridge's first priority and primary objective is to prevent incidents from occurring through its comprehensive operational risk management practices and processes. The safe operation of our pipelines is Enbridge's top priority; however, in the event of a release, Enbridge remains committed to returning affected areas to their pre-existing conditions. Enbridge has the financial capability to ensure that Enbridge responds to an incident and satisfies its commitments.

As the Project owner, Enbridge is responsible for emergency response. Enbridge has access to multiple sources of financial resources to fund the response to and remediation of a release. Enbridge is able to draw down cash from operations, issue debt, or acquire commercial paper as a result of its exceptionally strong credit rating. Enbridge is also well-capitalized to absorb unforeseen operational costs, maintains adequate insurance for operations, and has exceptional access to public debt markets to fund operational needs, including those stemming from pipeline releases or leaks. For example, Enbridge has spent more than $1 billion

responding to the release at Kalamazoo, Michigan, demonstrating Enbridge's responsibility and ability to perform response and remediation operations.

In addition to Enbridge's ability to fully fund all response needs, during the Project operations, Enbridge will maintain a comprehensive insurance program that includes commercial general liability insurance consistent with coverage considered customary for its industry. Enbridge's general liability program provides insurance coverage under which Enbridge may submit claims to recover its incurred costs responding and cleaning up a release. Currently, the Commercial General Liability insurance program has an annual aggregate coverage limit of USD $700 million and renews in May of each year.

V. Lessons Learned

Enbridge seeks to continuously improve the safety of its operations. Enbridge maintains a comprehensive procedure and policy for investigating incidents and near-incidents in order to use them as education opportunities, with the purpose being to identify the root cause and preventative and/or corrective measures to prevent reoccurrence. Enbridge also partners with others in its industry to share our learnings and learn from the incidents of others. In addition to investigations, Enbridge maintains a comprehensive procedure for internal health checks, inspections, and audits, which produce lessons learned that work to continuously improve the safety of our operations.

In July 2010, Enbridge's Line 6B failure released crude oil into Talmadge Creek and the Kalamazoo River near Marshall, Michigan. Based on the findings and recommendations of the National Transportation Safety Board investigation into the Marshall incident, and Enbridge's own investigation, Enbridge has made significant changes to improve the safety and reliability of its operations.

Since Marshall, Enbridge has invested heavily and enacted many fundamental changes to its operation and philosophy related to safety and operational reliability. Enbridge has taken the following steps, either in direct response to Marshall, or as part of our ongoing improvement initiatives and activities:

<u>Organizational Structure</u>

- Created new senior management roles focused on safety and operational reliability in each business area.
- Established the Operations and Integrity Committee, the most senior committee within Enbridge, which is chaired by Al Monaco, President and CEO. The committee meets monthly and has representation from the Executive Leadership Team and senior safety leaders from across the company. The committee is supported by several cross-enterprise working committees focused on areas of safety, such as emergency response, process safety, and integrity.

- Created the Board's Safety and Reliability Committee, resulting in enhanced governance for safety, integrity, and operational risk management within Enbridge.
- Created the role of Senior Vice President, Enterprise Safety & Operational Reliability, and established a dedicated team to support and drive company-wide safety and reliability performance.

Safety Culture

- Undertook a company-wide safety perception survey to measure the strength of Enbridge's safety culture, our progress towards a strong and interdependent safety culture, and areas where we need to focus and improve. These safety culture assessments have continued on a biennial basis as a means to monitor our progress toward a continually-improving safety culture.
- Launched the Enbridge Health and Safety principles and the biennial recertification of all employees and contractors on the Lifesaving Rules.
- Created foundational safety stories based on four incidents from Enbridge's past to highlight the human impact and toll of safety failures for all employees by building on the power of story-telling.
- Created human factors training, which is mandatory for everyone within Enbridge and equips them with the tools and knowledge to recognize and mitigate the impact of human factors in our safety performance.
- Developed and launched the first annual Operational Reliability Review in 2013, creating a new standard for open and transparent communications with internal and external stakeholders about our safety and reliability performance and how we are working to become an industry leader.
- Conducted multiple safety culture assessments of our Control Center over the previous four years.

Pipeline and Facility Integrity

- Between 2010 and 2016, Enbridge ramped up its pipeline integrity programs to improve system safety and reliability. Enbridge conducted more than 900 ILIs, over 14,000 digs, and approximately 340 miles of pipeline replacement on the entire Enbridge pipeline system.

Leak Detection

- Established a Pipeline Control Systems and Leak Detection department, doubling the number of employees and contractors dedicated to leak detection and pipeline control.

Control Center Operations

- Revised and enhanced all Control Center procedures related to decision-making, handling pipeline start-ups and shut-downs, leak detection system alarms, communication protocols, and suspected column separations (a bubble of vapor in the pipeline in an area of low pressure).
- Enhanced Enbridge's Control Center organization structures to better support our operators and manage workloads.
- Augmented Control Center staff by adding training, technical support, engineering, and operator positions.
- Consolidated Control Center facilities in Edmonton, Alberta, to improve Enbridge's ability to safely and efficiently operate its pipelines and terminal systems.

Public Awareness

- Reviewed and strengthened Enbridge's public awareness programs in the United States and Canada.
- Developed the Emergency Responder Education Program, an industry-leading online training tool, to help emergency responders and 911 call center personnel quickly and effectively respond to a pipeline emergency.

Emergency Response

- Created and implemented the ICP to govern all emergency response preparedness and activities.
- Invested $50 million to deploy new response equipment company-wide since 2012.
- Bolstered our emergency response and preparedness efforts by holding 360 company-wide exercises, drills, and equipment deployment events in 2015, and 320 in 2016.
- Created the E3RT, a company-wide team of employees trained in emergency response and the Incident Command System, to respond to large-scale, long-term incidents beyond the response capacity of a single region or business unit.

VI. Conclusion

Pipeline safety is at the core of Enbridge's values. Enbridge's primary goal is to safely deliver crude oil with zero incidents, while maintaining the safety of its work force, the public, and the environment. By continuously improving existing practices and processes, Enbridge strives to provide world-class performance, resulting in public and personal safety, care for the environment, reliability, and efficiency.

Attachment A

U.S. Department
of Transportation
**Pipeline and Hazardous
Materials Safety Administration**

1200 New Jersey Avenue, S.E.
Washington, D.C. 20590

July 6, 2015

Femke Pennings
Manager, Emergency Management
Enbridge (U.S.), Inc.
10201 Jasper Avenue
Edmonton, AB Canada T5J 3N7

RE: LETTER OF APPROVAL: Superior Region Response Zone Integrated Contingency Plan Sequence Number: 0866, May 2015

Dear Ms. Pennings:

The Pipeline and Hazardous Materials Safety Administration (PHMSA) has received and reviewed Enbridge (U.S.). Inc.'s oil spill response plan for the Superior Region Response Zone dated May 2015. We conclude that the Plan complies with PHMSA's regulations concerning onshore oil pipelines found at 49 Code of Federal Regulations (CFR) Part 194. Your Response Plan has been approved.

This approval is valid for five years from the date of this letter. You must revise and resubmit a Response Plan for approval by **July 6, 2020.** If discrepancies are found during PHMSA inspections, or if new or different operating conditions or information would substantially affect the implementation of this plan, you will be required to resubmit a revised plan. See 49 CFR § 194.121(b).

Should you have any questions or concerns, please contact me at (202) 366-4595 or by email at PHMSA.OPA90@dot.gov. Please include the sequence number and your PHMSA Operator Identification Number on any future correspondence.

Sincerely,

David K. Lehman, Director
Emergency Support and Security Division
Office of Pipeline Safety

cc: PHMSA Central Region

Attachment B

Field Emergency Response Plan

Superior Region (#866) Response Zone

Version: Core 4.0 | Annex 4.1
2016/2017

ENBRIDGE®

Emergency Reporting
Edmonton Control Center 1-800-858-5252
Enbirdge Media Line 1-877-496-8142

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1.0 ACRONYMS / GLOSSARY

1.1 Acronyms

Terminology specific to the U.S. is shaded in grey.

Acronym	Description
AAR/IP	After Action Report/ Improvement Plan
AER	Alberta Energy Regulator
ACP	Area Contingency Plan
API	American Petroleum Institute
ATV	All-Terrain Vehicle
AVP	Automated Valve Placement System
BBL	Barrel (Unit of Volume Equal to 42 Gallons)
BPD	Barrels per Day
C	Degrees Centigrade
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator
CMT	Crisis Management Team
CNW	Commercially Navigable Waterway (High Consequence Area)
COTP	Captain of the Port
CP	Control Point
CPM	Computational Pipeline Monitoring
CSA	Canadian Standards Association
CWA	Clean Water Act
DOCL	Documentation Unit Leader
DOSC	Deputy Operations Section Chief
DOT	U.S. Department of Transportation
DW	Drinking Water (High Consequence Area)

Acronym	Description
EAS	Emergency Alert System
EEC	Environmental Evaluation Coordinator
EH&S	Environment, Health, & Safety
EMS	Emergency Medical System
EMT	Emergency Medical Technician
ENR	Environment & Natural Resources (Northwest Territories Government)
ENVL	Environmental Unit Leader
EOC	Emergency Operations Center
EPA	U.S. Environmental Protection Agency
ERD	Emergency Response Directory
ERG	Emergency Response Guidebook
ERP	Emergency Response Plan
ERT	Emergency Response Team
ESA	Environmentally Sensitive Area (High Consequence Area)
E3RT	Enbridge Enterprise Emergency Response Team
ESD	Emergency Shutdown
FAA	Federal Aviation Administration
FE	Functional Exercise
FEMA	Federal Emergency Management Agency
FID	Flame Ionization Detector
FOSC	Federal On-Scene Coordinator
FP	Flashpoint
FRP	Facility Response Plan
FRT	Field Response Team
FSC	Finance Section Chief
FSE	Full Scale Exercises
FWPCA	Federal Water Pollution Control Act (as amended) (33

Acronym	Description
	U.S.C. 1251 et seq.)
GIS	Geographic Information System
GIUE	Government-Initiated Unannounced Exercise in U.S.
GNWT	Government of Northwest Territories
GPM	Gallons Per Minute
GRP	Geographical Response Plans
HAZMAT	Hazardous Materials
HAZWOPER	Hazardous Waste Operations and Emergency Response
HCA	High Consequence Area
HPA	High Population Area (High Consequence Area)
IAP	Incident Action Plan
IC	Incident Commander
ICP	Integrated Contingency Plan
ICS	Incident Command System
IDLH	Immediately Dangerous to Life and Health
IMH	Incident Management Handbook
IMT	Incident Management Team
ISB-MGS	In-situ Burn Monitoring Group Supervisor
JIC	Joint Information Center
LEL	Lower Exposure Limit
LEPC	Local Emergency Planning Committee
LMS	Learning Management System
LNO	Liaison Officer
LOC	Level of Concern
LOSC	Local On Scene Coordinator
LPM	Line Pressure Monitor
LSC	Logistics Section Chief

Acronym	Description
MAOP	Maximum Allowable Operating Pressure
MBS	Material Balance System
NCP	National Contingency Plan
NGL	Natural Gas Liquids
NEB	National Energy Board
NIMS	National Incident Management System
NIOSH	National Institute for Occupational Safety and Health
NPDES	National Pollutant Discharge Elimination System
NPMS	National Pipeline Mapping System
NRC	National Response Center
NRDA	Natural Resources Damage Assessment
NRS	National Response System
NRT	National Response Team
OPA	Other Populated Area (High Consequence Area)
OPA 90	Oil Pollution Act of 1990
OPR	Onshore Pipeline Regulations
ORM	Operational Risk Management
OSC	Operations Section Chief
OSHA	Federal Occupational Safety and Health Administration
OSRO	Oil Spill Response Organization
PAC	Public Awareness Committee
PAP	Public Awareness Program
PEP	Public Emergency Program
PIA	Post-Incident Analysis
PIO	Public Information Officer
PHMSA	Pipeline and Hazardous Materials Safety Administration
PLC	Programmable Logic Controller

Acronym	Description
PLM	Pipeline Maintenance
POLREP	Pollution Report
PPE	Personal Protective Equipment
PPM	Parts Per Million
PREP	National Preparedness for Response Exercise Program
PSC	Planning Section Chief
PSI	Pounds per square inch
PSIA	Pipeline Safety Improvement Act
QA/QC	Quality Assurance/ Quality Control
QI	Qualified Individual
RCP	Regional Contingency Plan
RCRA	Resource Conservation and Recovery Act
RICP	Regional Integrated Contingency Plan
ROW	Right-of-Way
RP	Recommended Practice
RRT	Regional Response Team
RSO	Radiation Safety Officer
RTTM	Real Time Transient Model
SARA	Superfund Amendments and Reauthorization Act
SCADA	Supervisory Control & Data Acquisition
SCAT	Shoreline Clean-up Assessment Team
SCBA	Self-Contained Breathing Apparatus
SDS	Safety Data Sheet (also known as Material Safety Data Sheet)
SERC	State Emergency Response Commission
SMART	Special Monitoring for Applied Response Technologies
SML	Subject Matter Lead

Acronym	Description
SOFR	Safety Officer
SONS	Spill of National Significance
SOP	Standard Operating Procedure
SOSC	State On-Scene Commander
SPC	Statistical Process Control
SPCC	Spill Prevention, Control, and Countermeasures
SSHP	Site Safety and Health Plan
SUBD	Support Branch Director
TFR	Temporary Flight Restrictions
TSB	Transportation Safety Board
TTX	Table Top Exercise
UC	Unified Command
UEL	Upper Exposure Limit
USA	Unusually Sensitive Areas
USC	U.S. Code
WCD	Worst-Case Discharge

1.2 Glossary

Terminology specific to the U.S. is shaded in grey.

Term	Definition
A	
Absorbent Material	Any of several materials designed to absorb oil, both hydrocarbon and non-hydrocarbon.
Access/Staging Areas	Designated areas offering access to spill sites for the gathering and deployment of spill response equipment and personnel.
Adversary	Any individual, group, organization or government that conducts, or has the intention and capability to conduct, activities detrimental to critical assets (e.g., intelligence services of host nations, political terrorist groups, criminals, rogue employees, private interest, site insiders/outsiders).
Adverse Weather	The weather conditions that will be considered when identifying response systems and equipment in a response plan for the applicable operation environment. Factors to consider include significant wave height, ice, temperature, weather-related visibility, and currents within the COTP zone under the U.S. Coast Guard / or Canadian Coast Guard in which the systems or equipment are intended to function.
Alert Levels	A progressive, qualitative measure of the likelihood of terrorist actions, from negligible to imminent, based on government or Company intelligence information. Different fixed or variable security measures may be implemented based on the level of threat to the facility.
Area Contingency Plan	A reference document prepared for the use by all agencies engaged in responding to environmental emergencies in a defined geographic area as described in the Oil Pollution Act of 1990.
Assisting Agency	An agency directly contributing tactical or service resources to another agency.
B	
Barrel (“bbl”)	A barrel of crude oil is equal to 42 gallons (approximately 159 liters).
Boom	A temporary floating barrier used to contain an oil *spill*.

Term	Definition
Boom Deployment	The placement of a boom on land or in water to contain a product release.
Business Critical Facilities	Facilities and assets, whether physical or virtual, so vital to the Company that the incapacity or destruction of such systems and assets would have a debilitating impact on people, the environment, property or economic viability of the Company.
C	
Cache	A pre-determined complement of tools, equipment, and/or supplies stored in a designated location, and available for incident use.
CERCLA	The Comprehensive Environmental Response, Compensation and Liability Act, (U.S.) regarding hazardous substance releases into the environment and the clean-up of inactive hazardous waste disposal sites.
Clean-Up Contractor	Non-Company person contractually engaged to respond to and clean-up an oil spill.
Command Post	A site located in the cold zone where response decisions and activities can be planned, coordinated, and managed. The Incident Commander and regulatory bodies may operate from this location.
Company	Includes companies in the United States and in Canada.
Competent Worker	A person who, because of training and experience, is capable of identifying hazardous or dangerous conditions and has the authority to take prompt corrective measures to eliminate them.
Containment Boom	A flotation/freeboard device, made with a skirt/curtain, longitudinal strength member, and ballast unit/weight designed to entrap and contain the product for recovery.
Contamination Reduction Zone	The area between the contaminated zone and the clean zone. This area is designed to reduce the probability that in the future the area would become contaminated. Also known as the warm zone.

Term	Definition
Contingency Plan	A document used by (1) Federal, Provincial/State, local and territorial agencies to guide entities' planning and response procedures regarding spill of oil, hazardous substances, or other emergencies; (2) a document used by industry as a response plan to spills of oil, hazardous substances, or other emergencies. 1.
Contract or Other Approved Means	2. A written contractual agreement with a response contractor. The agreement should identify and ensure the availability of the specified personnel and equipment described under this plan within stipulated response times in the specified geographic areas; 3. Certification by the facility owner or operator that the specified personnel and equipment described under this plan are owned, operated, or under the direct control of the facility owner or operator, and are available within the stipulated times in the specified geographic areas; 4. Active membership in a local or regional oil spill removal organization that has identified specific personnel and equipment described under this plan that are available to respond to a discharge within stipulated times in the specified geographic areas.
Contractor	A company hired to complete specific work and paid directly by the Company.
Control Point ("CP")	A location downstream of a spill site on a stream or river where containment and recovery operations can occur.
Cooperating Agency	An agency supplying assistance other than direct tactical, support, or service functions or resources to the incident control effort.
Crisis	An incident, emergency, or combination of circumstances that could have a significant negative impact on the public, the environment, or the Company's employees, operations, reputation, earnings, or share value.

Term	Definition
Crisis Management Team ("CMT")	The executive group within the Company that functions away from the scene to support the Incident Management Team, facilitate planning, manage business recovery projects and address the implications of the problems and the potential impacts on the Company's viability, operability and credibility. Provides off-site strategic support.
Critical Facility	A facility that meets one or more of the following criteria: • May be considered a viable terrorist target, and a release from the facility has the potential for mass casualties or significant impact on public drinking water affecting a major population center if damaged or destroyed, would have a detrimental impact on the reliability or operability of the pipeline system, significantly impairing the ability to service a large number of customers for an extended period • If damaged or destroyed, would significantly impair other modes of transportation or other critical infrastructures (e.g., electrical power generation, telecommunications, public utility)
Critical Infrastructure	Systems and assets, whether physical or virtual, so vital to the Company that the incapacity or destruction of such systems and assets would have a debilitating impact on security, national economic security, national public health and safety or any combination thereof.
Crude Oil	Any liquid hydrocarbon mixture occurring naturally in the earth, whether or not treated to render it suitable for transportation, and includes crude oil from which certain distillate fractions may have been removed and crude oil to which certain distillate fractions may have been added.
Culturally Sensitive Areas	Current, historic, prehistoric, and archaeological resources which include deposits, structures, sites, ruins, buildings, graves, artifacts, fossils, or other objects of antiquity which provide information pertaining to historical or prehistoric culture of people as well as the natural history of the area.

Term	Definition
D	
Damage Assessment	The process of determining and measuring damages and injury to the human environment and natural resources, including cultural resources. Damages include differences between the conditions and use of natural resources and the human environment that would have occurred without the incident, and the conditions and use that ensued following the incident. Damage assessment includes planning for restoration and determining the costs of restoration.
Dark Site	Activated to manage internal/ external communications related to any emergency.
Decontamination ("Decon")	The removal of hazardous substances from personnel and equipment necessary to prevent adverse health effects.
Diluents	A generic term that encompasses any mixture of light liquid hydrocarbons used to dilute a heavier petroleum product (such as bitumen). As a common carrier, Enbridge may transport several different mixtures of diluents.
Discharge	Any spilling, leaking, pumping, pouring, emitting, emptying, or dumping.
Dispersants	Those chemical agents that emulsify, disperse, or solubilize oil into the water column or promote the surface spreading of oil slicks to facilitate dispersal of the oil into the water column.
Diversion Boom	A flotation/freeboard device, made with a skirt/curtain, longitudinal strength member, and ballast unit/weight designed to deflect or divert floating product towards a pick up point or away from certain areas.
Dredging	Underwater excavation activity where heavy equipment is used to collect and remove bottom sediments by scraping or sucking.
E	
Enbridge Enterprise Emergency Response Team ("E3RT")	Comprised of individuals from each business unit (Liquids Pipelines, Gas Processing and Pipelines, Gas Distribution) to ensure that the Company has a highly trained team of that can be called upon within the organization to respond to large scale incidents anywhere within the Company.

Term	Definition
Emergency	An unforeseen combination of circumstances or a disruption of normal operating conditions that poses a potential threat to human life, health, property, and/or the environment if not contained, controlled, or eliminated immediately.
Emergency Operations Center ("EOC")	A pre-designated facility established by an agency or jurisdiction to coordinate the overall agency or jurisdictional response and support to an emergency response.
Emergency Organization	The chain of command used during emergency operations to provide effective management of the emergency and available resources.
Emergency Response Guidebook ("ERG")	This Guidebook is for Enbridge responders during the initial phase of a dangerous goods/hazardous materials transportation incident. It is a joint publication by the PHMSA, Transport Canada and the Secretariat of Transport and Communications of the Mexican Government.
Emergency Service	Those activities provided by the provincial/state and local governments to prepare for and carry out any activity to prevent, minimize, respond to, or recover from an emergency.
Enbridge Responder	Individual(s) employed by Enbridge who responds to a release or a potential release of hazardous substances as part of the initial response to the site for purposes of protecting nearby persons, property or the environment from the effects of the release.
Environmentally Sensitive Areas ("ESA")	Streams and water bodies, aquifer recharge zones, springs, wetlands, agricultural areas, bird rookeries, endangered or threatened species (flora and fauna) habitat, wildlife preserves or conservation areas, parks, beaches, dunes, or any other area protected or managed for its natural resource value.

Term	Definition
Exercise Design Team	A team comprised of federal, provincial/state and industry representatives with responsibility for designing an Area Exercise. The exercise design team is charged with working with the lead plan holder to develop the scope, parameters and exercise scenario, although the lead plan holder retains the final decision on these.
External First Responders, First Response Agency	A public health or safety agency (e.g. fire service or police department) charged with responding to a spill during the emergency phase and alleviating immediate danger to human life, health, safety, or property.
F	
Field Response Team ("FRT")	A team of tactical Enbridge responders who take actions at an incident scene to directly respond to the problem and its consequence. Provides on-site tactical support. This team is made up of the Pipeline Maintenance ("PLM") crew or other similar group. Also known as Spill Management Team.

Term	Definition
Fish and Wildlife and Sensitive Environments	Areas that may be identified by either their legal designation or by evaluations of Area Committees (for planning) or members of the jurisdiction having authority in the spill response structure (during responses). These areas may include wetlands, National and Provincial/State parks, critical habitats for endangered/threatened species, wilderness and natural resource areas, marine sanctuaries and estuarine reserves, conservation areas, reserves, wildlife areas, wildlife refuges, wild and scenic rivers, recreational areas, national forests, Federal and provincial/state lands that are research national areas, heritage program areas, land trust areas, and historical and archeological sites and parks.These areas may also include unique habitats such as aquaculture sites and agricultural surface water intakes, bird nesting areas, critical biological resource areas, designated migratory routes, and designated seasonal habitats.
Function	In ICS, function refers to the five major activities in the ICS, i.e., Command, Operations, Planning, Logistics, and Finance/Administration. The term function is also used when describing the activity involved, e.g., "the planning function."
G	
Geographic Information System (“GIS”)	An electronic information system that provides a geo-referenced database to support management decision-making.
H	
Handle	To transfer, transport, pump, treat, process, store, dispose of, drill for, or produce.

Term	Definition
Harmful Quantity of Oil	The presence of oil from an unauthorized discharge in a quantity sufficient either to create a visible film or sheen or discoloration upon water, shoreline, tidal flat, beach, or marsh, or to cause a sludge or emulsion to be deposited beneath the surface of the water or on a shoreline, tidal flat, beach, or marsh.
Hazardous Substance / Material	Dangerous goods (solids, liquids or gases) that can harm people, other living organisms, property, or the environment, including but not limited to substances otherwise defined as hazardous wastes, dangerous wastes, extremely hazardous wastes, oil, or pollutants that are classified by CERCLA in the U.S and Environment Canada.
Hazardous Waste Operations and Emergency Response ("HAZWOPER")	Training required in the U.S under OSHA *29CFR§1910.120*. for responders who are exposed to or potentially exposed to hazardous substances including hazardous waste. Canadian employees will be required to complete the appropriate training course based on their potential job duties in a cross border response.
Health Hazard	A chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed persons.
I	
Incident	An event affecting Company operations that may be an emergency or crisis.
Incident Action Plan ("IAP")	A document Is initially prepared at the first planning meeting that contains general control objectives reflecting the overall incident strategy, and specific action plans for the next operational period. When complete, the Incident Action Plans will include a number of attachments.
Incident Commander ("IC")	Person responsible for all aspects of the response, including developing incident objectives and managing all incident operations. This means the most qualified person, not necessarily the most senior person, on scene.
Incident Command Post	The location at which the primary command functions are executed; may be collocated with the incident base.

Term	Definition
Incident Command System ("ICS")	A standardized on-scene emergency management system specifically designed to allow its user(s) to adopt an integrated organizational structure equal to the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries.
Incident Management Handbook ("IMH")	The IMH is intended to be used as an easy reference job aid for responders; designed to assist responders in the use of the National Incident Management System (Incident Command) during response operations.
Incident Management Team ("IMT")	A team that functions at and/or away from the incident scene to support tactical response operations, facilitates planning, and addresses the concerns of public and government agencies.
Incident Objectives	Statements of guidance and direction necessary for the selection of appropriate strategies, and the tactical direction of resources. Incident objectives are based on realistic expectations of what can be accomplished when all allocated resources have been effectively deployed. Incident objectives must be achievable and measurable, yet flexible enough to allow for strategic and tactical alternatives.
Industry	For the purpose of these guidelines, industry means the oil and hazardous substance industry required to submit response plans and comply with exercise requirements, as specified in appropriate vessel, facility, pipeline, and Outer Continental Shelf platform regulations. The USCG, EPA, PHMSA, NEB and AER administer these regulations.
Initial Notification	The process of notifying necessary Company personnel and necessary agencies having jurisdictional authority that a spill has occurred and including all pertinent available information surrounding the incident.
Initial Remediation	Remedial action at a site to eliminate acute hazards associated with a spill. An initial clean-up action is implemented at a site when a spill of material is an actual or potentially imminent threat to public health or the environment, or difficulty of clean-up increases significantly without timely remedial action. All sites must be evaluated to determine whether initial clean-up is total clean-up; however, this will not be possible in all cases due to site conditions (e.g., a site where overland transport or flooding may occur).

Term	Definition
Injury	A measurable adverse change, either long- or short-term, in the chemical or physical quality of the viability of a natural resource resulting either directly or indirectly from exposure to a discharge of oil, or exposure to a product of reactions resulting from a discharge of oil.
In-Situ Burning	A technique that involves the controlled burning of an oil spill at the location of the spill.
Integrated Contingency Plan ("ICP")	A plan to provide guidance to Company personnel on the immediate procedures, notifications and sustained operations in the event of an emergency response incident.
Interim Storage Site	A site used to temporarily store recovered oil or oily waste until the recovered oil or oily waste is disposed of at a permanent disposal site. Interim storage sites include trucks, barges, and other vehicles, used to store waste until the transport begins.
J	
Joint Information Center ("JIC")	A facility established within, or near, the Incident Command Post where the Information Officer and staff can coordinate and provide incident information to the public, news media, and other agencies or organizations. The JIC is normally staffed with representatives from the jurisdiction having authority and the Responsible Party.
Jurisdiction	A range or sphere of authority. At an incident, public agencies have jurisdiction related to their legal responsibilities and authority for incident mitigation. Jurisdictional authority at an incident can be political/geographical (e.g., city, county, provincial/state, or Federal boundary lines), or functional (e.g., police department, health department, etc.). (See Multi-Jurisdiction).
Jurisdictional Agency	The agency having jurisdiction and responsibility for a specific geographical area, or a mandated function.
L	
Lead Agency	The government agency that assumes the lead for directing response.
Lead Provincial/ State Agency	The agency that coordinates provincial/state support to Federal and/or Local governments or assumes the lead in the absence of Federal response.
Liquid Wastes	Liquids contaminated with solids or mixed with other liquids (e.g., emulsion, contaminated soil).

Term	Definition
Local Emergency Planning Committees ("LEPC")	A local governmental entity that identifies and catalogues potential hazards, identifies available resources, mitigates hazards when feasible, and has input into emergency plans for operations occurring in their geographical jurisdiction. According to the U.S. National Response Plan the initial response to an emergency incident or disaster is by local officials. The role of the LEPC is to anticipate and plan the initial response for foreseeable disasters in their jurisdiction.
Local On-Scene Coordinator ("LOSC")	Local Government Representative.
Location Boundaries	Areas where oil may be expected to impact during the first day of a spill event.
Lower Explosive Limit ("LEL")	Air measurement to determine the lowest concentration of vapours that support combustion. This measurement must be made prior to entry into a spill area.
N	
National Contingency Plan ("NCP")	The plan prepared in the U.S. under the FWPCA and CERCLA, and revised from time to time.
National Response Center ("NRC")	The U.S. Federal authorities to be the first notified in the event of an incident.
Natural Resource	Land, fish, wildlife, biota, air, water, groundwater, drinking water supplies, and other resources belonging to, managed by, held in trust by, appertaining to or otherwise controlled by the province/state, federal government, private parties, or a municipality.
Natural Resource Damage Assessment ("NRDA")	The process of collecting and analyzing information to evaluate the nature and extent of injuries resulting from an incident, and determine the restoration actions needed to bring injured natural resources and services back to baseline and make the environment whole for interim losses. (15CFR§990.30)
National Incident Management System ("NIMS")	Identifies concepts and principles that answer how to manage emergencies from preparedness regardless of their cause, size, location or complexity.

Term	Definition
Non-Persistent or Group I Oil	Refers to a petroleum-based oil that, at the time of shipment, consists of hydrocarbon fractions -- a) At least 50% of which by volume, distill at a temperature of 340° C (645° F); and b) At least 95% of which by volume distill at a temperature of 370° C (700° F).
Non-Petroleum Oil	Oil of any kind that is not petroleum-based. It includes, but is not limited to, animal and vegetable oils.
O	
Oil or Oils	Naturally occurring liquid hydrocarbons at atmospheric temperature and pressure coming from the earth, including condensate and natural gasoline, and any fractionation thereof, including, but not limited to, crude oil, petroleum gasoline, fuel oil diesel oil, oil sludge, oil refuse, and oil mixed with wastes other than dredged spoil.
Oil Spill Cooperative (Mutual Aid)	Multi-company cooperative organization developed by industry to assist with oil spill response and clean up. Typically, manpower and equipment are identified by a company on a voluntary basis.
Oil Spill Response Organization ("OSRO")	An entity that provides oil spill response resources, and includes any for-profit or not-for-profit contractor, cooperative, or in-house response resources that have been established in a geographic area to provide required response resources.
Oil Spill Response Contractors	Persons/Companies contracted to undertake a response action to contain and/or clean up a spill.
Oily Waste	Oil-contaminated waste resulting from an oil spill or spill response operations.
Operations Section Chief	A member of the General Staff who establishes the tactics to meet the incident objectives and directs all operational resources.
Owner or Operator	Any person, individual, partnership, corporation, association, governmental unit or public or private organization of any character.

Term	Definition
P	
Persistent Oil	Under OPA 90, persistent oils are petroleum-based oils that do not meet the distillation criteria for non-persistent oil. Persistent oils are classified based on specific gravities as follows: • Group II – specific gravity less than .85; • Group III – specific gravity between .85 and less than .95; • Group IV – specific gravity .95 to and including 1.0.; and • Group V – specific gravity greater than 1.0.
Physical Security	Security systems and architectural features that are intended to improve protection (e.g., fencing, doors, gates, walls, turnstiles, locks, motion detectors, vehicle barriers, hardened glass).
Post-Emergency Response	The portion of a response performed after the immediate threat of a release has been stabilized or eliminated and clean-up of the sites has begun.
PREP	National Preparedness for Response Exercise Program – workable exercise program which meets the intent of section 4202(a) of the Oil Pollution Act of 1990 (OPA 90) in the United States. Enbridge follows PREP guidelines across the system in both the United States and Canada.
Procurement Unit	Functional unit within the Finance/Administration Section responsible for financial matters involving vendor contracts.
Q	
Qualified Individual ("QI")	A qualified individual is the person who is authorized to do the following: (1) activate and engage in contracting with oil spill removal organizations; (2) act as a liaison with the on-scene coordinator; and (3) obligate funds required to effectuate response activates. For Enbridge, this person is typically the Incident Commander.

Term	Definition
R	
Regional Response Team ("RRT")	A U.S. Federal response organization, consisting of representatives from specific Federal and state agencies, responsible for regional planning and preparedness before an oil spill occurs and for providing advice to the FOSC in the event of a major or substantial spill.
Response Activities	Refers to the containment and removal of oil from the water and shorelines, the temporary storage and disposal of recovered oil, and the taking of other actions as necessary to minimize or mitigate damage to the environment.
Response Guidelines	Guidelines for initial response that are based on the types of product involved in the spill; these guidelines are utilized to determine clean-up methods and equipment.
Response Plan	A practical plan used by Industry for responding to a spill. Its features include (1) identifying the notification sequence, responsibilities, response techniques, etc. in an easy to use format; (2) using decision trees, flowcharts, and checklists to ensure the proper response for spills with varying characteristics; and (3) segregating information needed during the response from that required by regulatory agencies to prevent confusion during a spill incident.
Response Resources	The personnel, equipment, supplies and other capability necessary to perform the Response Activities identified in a Response Plan.
Responsible Party	The Owner/Operator of the vessel or facility that is the spill source.
Risk	Potential for damage to or loss of an asset. Risk, in the context of process security, is the potential for a catastrophic outcome.
Rivers and Canals	A body of water confined within the Inland area that has a projected depth of 12 feet or less, including the Intracoastal Waterway and other waterways artificially created for navigation.

Term	Definition
S	
Safety-Related Condition (Gas Only)	Any condition on a jurisdictional pipeline facility that lies within 220 yards of any building intended for human occupancy or an outdoor place of assembly or is within the right-of-way (ROW) of an active railroad or an asphalt/concrete paved road/ street / highway that meets one of the following criteria: • A material defect, physical damage or localized pitting on an effectively coated and cathodically protected pipeline operating at or above 20% SMYS and required repair as per Company procedure, • A leak in a pipeline that is characterized by the need for immediate corrective action to protect the public or property, • Unintended movement or abnormal loading by an environmental cause (e.g., earthquake, landslide, flood) that impairs the serviceability of a pipeline, applying sudden occurring movement in particular, • Any equipment malfunction or operating error that causes the pressure in a pipeline to exceed the maximum allowable operating pressure (MAOP) and the plus allowed build-up or overpressure, and • A shutdown of the pipeline or a reduction in operating pressure of 20% or more that is done in reaction to an imminent hazard or a known unsafe condition.
Site Conditions	Details of the area surrounding the facility, including shoreline descriptions, typical weather conditions, socioeconomic breakdowns, etc.
Site Emergency	Means an incident has occurred and the entire terminal, with the exception of critical employees has been sheltered on-site or evacuated.

Term	Definition
Site Safety and Health Plan ("SSHP")	The SSHP, at minimum, addresses, includes, or contains the following elements: health and safety hazard analysis for each site task or operation, comprehensive operations work plan, personnel training requirements, personal protection equipment ("PPE") selection criteria, site-specific occupational medical monitoring requirements, air monitoring plan, site control measures, confined space entry procedures (if needed), pre-entry briefings (tailgate meetings, initial and as needed), pre-operations commencement health and safety briefing for all incident participants, and quality assurance of SSHP effectiveness.
Site Security and Control	Steps that must be taken to provide safeguards needed to protect personnel and property, as well as the general public, to ensure an efficient clean-up operation.
Site Supervisor	A generic term that refers to the employee responsible for the location (i.e., Pipeline Maintenance ("PLM") coordinator/supervisor, technician, terminal supervisor), or designate.
Skimmers	Mechanical devices used to skim the surface of water and recover floating oil. There are four basic categories of skimmers; suction heads, floating weirs, oleophilic surface units, and hydrodynamic devices. These vary in efficiency depending on the type of oil and size of spill.
Sorbents	Materials ranging from natural products to synthetic polymeric foams placed in confined areas to soak up small quantities of oil. Sorbents are very effective in protecting walkways, boat decks, working areas, and previously uncontaminated or cleaned areas.
Source Control	Actions necessary to control the spill source and prevent the continued release of oil or hazardous substance(s) into the environment.
Span of Control	The number of organizational elements that may be directly managed by one person. Span of Control may vary from three to seven, and a ratio of one to five reporting elements is recommended.
Spill Observer	The first Company individual who discovers an oil spill. This individual must function as the responsible person-in-charge until relieved by an authorized supervisor.

Term	Definition
Spill Response	All actions taken in responding to spills of oil and hazardous materials (HAZMAT), i.e., receiving and making notifications; information gathering and technical advisory phone calls; preparation for and travel to and from spill sites; direction of clean-up activities; damage assessments; report writing, enforcement investigations and actions; cost recovery; and program development.
Spill Response Personnel	Federal, Provincial/State, Local agency, and industry personnel responsible for participating in or otherwise involved in spill response. All spill response personnel will be preapproved on a list maintained in each Company region.
Staging Area	Location established where resources can be placed while awaiting a tactical assignment. The Operations Section manages Staging Areas.
Stakeholders	Any person, group, or organization affected by, and having a vested interest in, the incident and/or the response operation.
State Emergency Response Commission ("SERC")	A group of officials in the U.S. appointed by the Governor to implement the provisions of Title III of the Federal Superfund Amendments and Reauthorization Act of 1986 ("SARA"). The SERC approves the State Oil and Hazardous Substance Discharge Prevention and Contingency Plan and Local ERPs.
Strategy	The general plan or direction selected to accomplish incident objectives.
Submerged Oil	Oil suspended beneath the surface or that sinks to the bottom of a body of water.
Substantial Threat of a Discharge	Any incident or condition involving a facility that may create a risk of discharge of Crude Oil and Oil. Such incidents include, but are not limited to storage tank or piping failures, above ground or underground leaks, fires, explosions, flooding, spills contained within the facility, or other similar occurrences.
State Emergency Response Commission ("SERC")	A group of officials in the U.S. appointed by the Governor to implement the provisions of Title III of the Federal Superfund Amendments and Reauthorization Act of 1986 ("SARA"). The SERC approves the State Oil and Hazardous Substance Discharge Prevention and Contingency Plan and Local ERPs.

Term	Definition
Strategy	The general plan or direction selected to accomplish incident objectives.
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T	
Tactical Direction	Directions given by the Operations Section Chief including: the tactics appropriate for the selected strategy; the selection and assignment of resources; tactics implementation; and performance monitoring for each operational period.
Tactics	Deploying and directing resources during an incident to accomplish the desired objective.
Technical Specialists	Personnel with special skills or technical expertise who can be used anywhere within the ICS organization.
Temporary Flight Restrictions ("TFR")	Temporary airspace restrictions for non-emergency aircraft in the incident area. TFRs are established by the FAA to ensure aircraft safety and are normally limited to a five-nautical-mile radius and 2000 feet in altitude.
Transfer of Command	An ICS term which means the process of moving the responsibility from one incident command team to another. This term primarily relates to the Incident Commander.
U	
Unusually Sensitive Area ("USA")	A drinking water or ecological resources area that is unusually sensitive to environmental damage from a hazardous liquid pipeline release.

Term	Definition
V	
Vendors	Vendors are defined as external parties that provide HAZWOPER training following OSHA standards in *29CFR§1910.120* and also satisfy the OSHA recommendations for instructors in *29CFR§1910.120*; Appendix E "*Training Curriculum Guidelines*".
W	
Wildlife Rescue	Efforts made in conjunction with the appropriate jurisdictional agencies to retrieve, clean, and rehabilitate birds and wildlife affected by an oil spill.
Workers	Company employees and contract workers.

2.0 INITIAL RESPONSE CHECKLIST

Purpose: To be used when exploring a suspected or reported emergency. Safe work practices will be followed per the following guidelines (the order of these actions will depend on the situation).	
EXPLORE- To be reviewed by the First Responder prior to taking any immediate action.	
☐	Notify Senior staff on-site immediately if a pressure drop has been observed or a leak is suspected and stop all product transfers. Close all automatic isolation valves, if available.
☐	Conduct a field level hazard assessment to identify and mitigate all hazards including potential for fire, explosion, and hazardous toxic vapors. • Determine the wind direction and approach cautiously from upwind. • Explore the suspected release area only when wearing appropriate PPE using the buddy system if possible. • Ensure safety of personnel in the area. • Eliminate or shut off all potential ignition sources in the immediate area • Use intrinsically safe equipment (e.g., flashlights, two-way radios, gas detectors with audible alarms).
☐	If appropriate, request surveillance fly-over to determine: • If there is any abnormal activity and dead vegetation in the vicinity of a pipeline; • Size and description of oil slick; • Direction of movement; • Coordinates of leading and trailing edge of oil slick; • Sensitivities endangered; and • Areas of population that are threatened. • If radio contact cannot be made; the line flyer will land report to Company management by telephone
☐	Maintain regular/scheduled communication with the Control Centre and Regional Management/on-call person.
APPROACH	
☐	If hazards cannot be safely mitigated, move to a safe upwind location, monitor the incident, and keep people out the hot zone.
☐	Are people injured or trapped? Are there outside people involved in rescue or evacuation?

	APPROACH (con't)
☐	Are there immediate signs of potential hazards such as: • Electrical lines down or overhead? • Unidentified liquid or solid products visible? • Vapors visible? • Smells or breathing hazards evident? • Fires, sparks or ignition sources visible? • Holes, caverns, deep ditches, fast water or cliffs nearby? • Is local traffic a potential problem? • Ground conditions (select one) ☐ Dry ☐ Wet ☐ Icy
	CONFIRM & CONTROL
☐	Begin a 214A Individual log when notified of an incident and continue documenting key actions throughout the response.
☐	Determine level of response needed, hazards of product(s) involved and proper response guidelines to be followed. Confirm identification of spilled material and check the SDS sheets. Consider the following: • Assess the spill threat, site safety, and parameters such as spill volume, extent and direction of movement. • Has pipeline(s) been shut down? • Has wind direction been confirmed and windsock erected? • Has the public been protected or evacuation considered if necessary? • Have all ignition sources been identified and eliminated? • Have personal protection and safety requirements been established and communicated? • Is adequate fire protection equipment available and in place? • Are tank and VAC-truck electrical equipment properly grounded? • Have decontamination sites and procedures been established? • Are activities and events being logged/ documented? • Eliminate sources of vapor cloud ignition, consider the ignition of NGL. Shut down all engines and motors. • Establish Exclusion zone and Safe Work Areas (Hot, Warm, and Cold).
☐	If on water, consult Control Point and HCA maps for appropriate response strategies for incoming resources. • Review pipeline alignment sheets to become familiar with the location of mainline valves and elevation characteristics. • Review ESA maps for the location of any sensitive area that may be impacted (Annex 3).
☐	Once support has arrived conduct transfer of command and start preparing for tactical and planning meetings.

	COMMUNICATION/NOTIFICATIONS
☐	Initiate actions to notify government agencies including local authorities of area affected or at risk areas via the Control Centre, Regional Management or designate. • Complete notifications for emergency call-out, including regulatory agencies. This will be done by Regional Management or designate. • If excavating, has One-Call agency been notified? • Has a Preliminary Incident Report been issued? • Has a radio channel been established for communication between the site and other personnel in field? • Notify External Emergency Services as appropriate. Work with local law enforcement to make sure all personnel/citizens are a safe distance away from the hazard area. • Notify the appropriate Company management. • Advise neighboring property owners and operators of any threat to their property or personnel. • Notify appropriate federal, state and local government agencies, including local utilities.
	INCIDENT COMMAND
☐	Once it has been determined to activate the ICS, the IC will initiate the following actions: • Confirm that containment equipment and oil spill contractors have been deployed. • Integrate local evacuation plans into the Unified Command decision-making process. Work with response team once they arrive on site to establish a workable Incident Command Post and Communications Center. • Direct initial response actions • Begin development of an initial incident action plan (ICS 201 Forms).

EMERGENCY SHUT DOWN PROCEDURES	
☐	The following emergency shutdown procedures should be initiated if company personnel are threatened by the release of product from a pipeline to the environment or when coordinating activities for prompt and safe repair of the pipeline and the return to normal operating conditions: • Shutting in the line at the nearest block valves. • Notifying the nearest pump station and/or the appropriate Control Center. • Maintenance crewmembers should notify their immediate supervisor who will in turn notify appropriate Company contacts. • If the exact location of the leak is unknown, the immediate supervisor will request a line flyer, or if it is at night, manpower might be used to walk the line. Once a leak site has been located, the following information should be obtained: • Have all ignition sources been eliminated? • Are any water intakes at risk? • Are any schools, homes or commercial properties at risk and should they be evacuated? • Should access to the area be restricted (roads blocked)? If so, assistance should be requested from law enforcement agencies. • Have local response agencies been advised of the product's characteristics and handling precautions which are described in the SDSs? • Are railroads or utility companies in the area and have they been notified? • Will product flow into any waterways or roadways? • In the U.S. work with Company Environmental Department to conduct a Natural Resource Damage Assessment. The Control Center should be notified following an assessment of the release site; an evaluation should be made regarding the effect of downtime on product scheduling. Appropriate report, logs & notifications will be made.

3.0 RESPONSE ZONE DESCRIPTION (INFORMATION SUMMARY)

The Superior Region Response Zone consists of two entities: Enbridge Energy, Limited Partnership and Enbridge Pipelines (Southern Lights) L.L.C. This response zone begins at the Canadian border near Neche, North Dakota and continues across northern Minnesota into Wisconsin and Michigan. The first section of this response zone includes seven pipelines (Lines 1, 2, 3, 4, 13, 65, and 67) that transport crude oil and natural gas south and diluent condensate north. The response zone continues south of Superior to the U. S. Highway 8 crossing near Ladysmith, WI with four pipelines (Lines 6A, 13, 14, and 61) transporting crude oil and diluent condensate from the Manhattan Terminal in Illinois. A 30-inch pipeline (Line 5) originates in Superior, WI that transports crude oil and natural gas liquids east across northern Wisconsin, the Upper Peninsula of Michigan and into lower Michigan with the Superior Region ending south of Indian River, MI.

Superior Region Pipelines Beginning and Ending Stationing

Line	Pipeline Sections	Begin Stationing	End Stationing	Miles	Pipeline Diameter	Product
1	Gretna, Manitoba to Clearbrook, MN	0	716,232	135.7	20”	Crude Oil & Natural Gas Liquids
1	Clearbrook, MN to Superior, WI	716,232	1,712,883	188.8	18”	Crude Oil & Natural Gas Liquids
2	Gretna, Manitoba to Superior, WI	0	1,712,887	324.4	26”	Crude Oil
3	Gretna, Manitoba to Superior, WI	0	1,712,887	324.4	34”	Crude Oil
4	Gretna, Manitoba to Donaldson, MN (MP814)	0	168,408	31.9	36”	Crude Oil
4	Donaldson, MN to Viking, MN	168,041	213,109	8.5	48”	Crude Oil
4	Donaldson, MN to Viking, MN (MP 834)	213,461	322,423	20.6	36”	Crude Oil
4	Donaldson, MN to Plummer, MN	320,971	393,021	13.6	48”	Crude Oil
4	Viking, MN to Plummer, MN (MP 874)	394,395	527,703	25.2	36”	Crude Oil
4	Viking, MN to Clearbrook, MN	526,404	545,840	3.7	48”	Crude Oil
4	Plummer, MN to Clearbrook, MN (MP 909)	547,141	647,345	19.0	36”	Crude Oil
4	Plummer, MN to Clearbrook, MN	645,406	716,261	13.4	48”	Crude Oil

Line	Pipeline Sections	Begin Stationing	End Stationing	Miles	Pipeline Diameter	Product
4	Clearbrook, MN to Cass Lake, MN Loop (MP 940)	716,411	878,927	30.8	36”	Crude Oil
4	Cass Lake, MN Loop (MP939.87 to MP 953.04)	877,981	946,695	13.1	48”	Crude Oil
4	Clearbrook, MN to Deer River ,MN Loop (MP 996)	946,641	1,059,570	21.4	36”	Crude Oil
4	Deer River, MN Loop (MP 974.73 to MP995.83)	(127,102)*	1,173,196	22.0	48”	Crude Oil
4	Cass Lake, MN to Floodwood, MN Loop (MP1044)	1,173,151	1,306,304	25.2	36”	Crude Oil
4	Floodwood, MN Loop (MP1019.73 to MP1044.33)	1,299,654	(47,009)*	24.6	48”	Crude Oil
4	Deer River, MN to Wrenshall, MN Loop (MP 1080)	1,429,072	1,512,231	15.7	36”	Crude Oil
4	Wrenshall, MN Loop (MP1060.11 to MP1079.91)	1,512,091	1,616,806	20.0	48”	Crude Oil
4	Wrenshall, MN Loop to Superior, WI (MP 1098)	1,616,840	1,712,760	19.8	36”	Crude Oil
13	Gretna, Manitoba to Clearbrook, MN	0	715,074	135.4	18”	Diluent Condensate
13	Clearbrook, MN to Superior, WI	0	1,003,300	190	20”	Diluent Condensate
13	Superior, WI to U.S. HWY 8 (Ladysmith, WI)	0	524,052	99	20”	Diluent Condensate

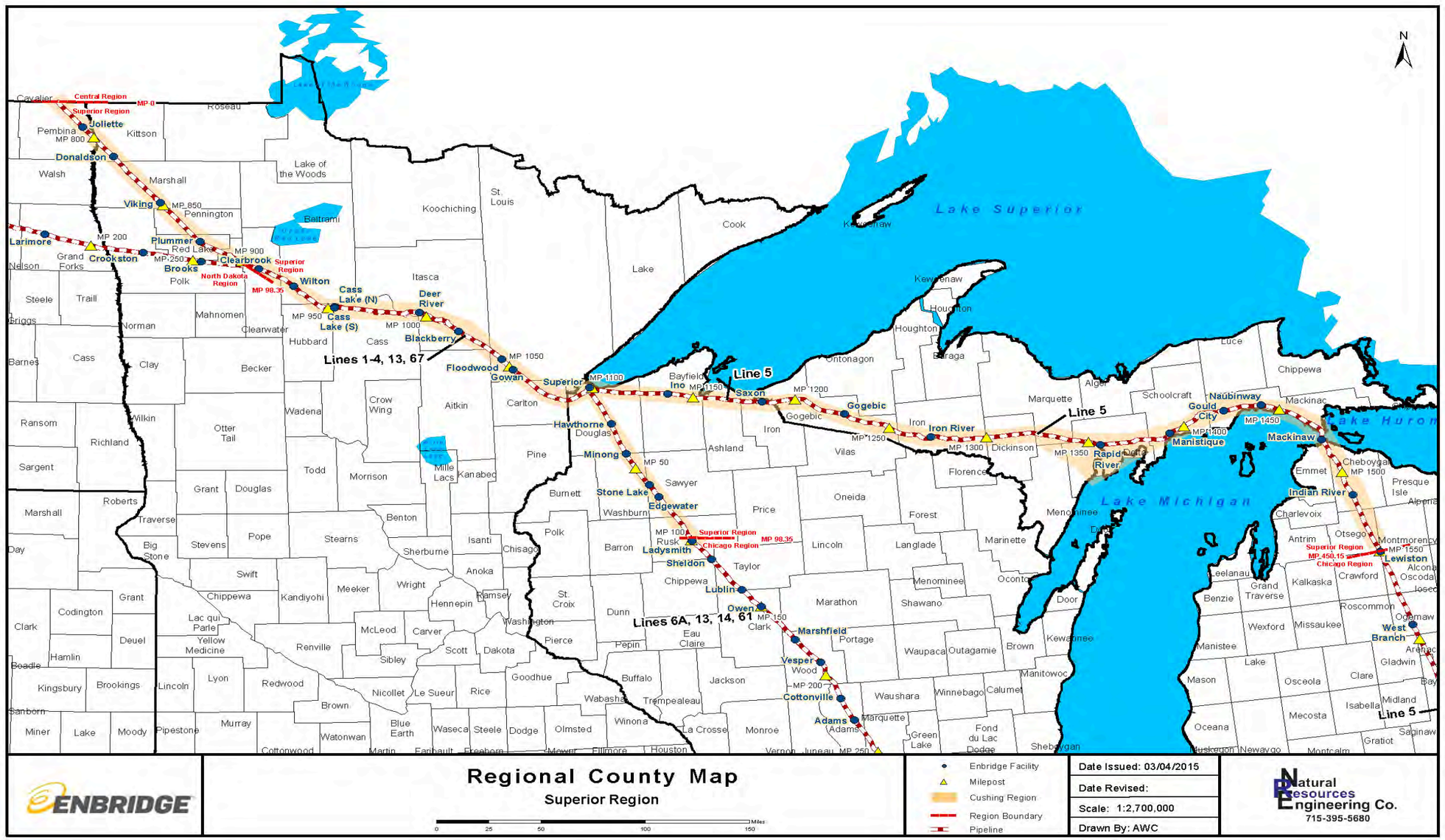
Line	Pipeline Sections	Begin Stationing	End Stationing	Miles	Pipeline Diameter	Product
5	Superior, WI to Mackinaw, MI	0	1,993,306	377.5	30”	Crude Oil & Natural Gas Liquids
5	Straits of Mackinac East and West 2	1,993,306	2,015,016	8.2	20”	Crude Oil & Natural Gas Liquids
5	Straits of Mackinac to Lewiston Pump Station (MP1544.3)	2,015,016	2,378,371	68.8	30”	Crude Oil & Natural Gas
6A	Superior, WI to U.S. HWY 8 (Ladysmith, WI)	0	513,368	97.2	34”	Crude Oil
14	Superior, WI to U.S. HWY 8 (Ladysmith, WI)	0	512,719	97.1	24”	Crude Oil
61**	Superior, WI to U.S. HWY 8 (Ladysmith WI)	0	523,170	99.08	42”	Crude Oil
65	Gretna, Manitoba to Clearbrook, MN	0	721,140	136.6	20”	Crude Oil
67	Gretna, Manitoba to Superior, WI	0	1,723,800	326.7	36”	Crude Oil
	Total Pipeline Miles			**2937.38**		

Tank Table

TANK NO.	LOCATION	DATE BUILT	TOTAL VOLUME	Total Facility Capacity (Bbls)
56	Clearbrook	1960	54,000	1,264,000
57		1960	120,000	
58		1960	80,000	
59		1972	80,000	
60		1972	80,000	
61		1994	200,000	
62		1995	200,000	
63		1995	200,000	
64		1996	250,000	
1	Superior	1973	390,000	See Below
2		1973	390,000	
3		1989	150,000	
4		1989	150,000	
5		1951	150,000	
6		1951	150,000	
7		1951	150,000	
8		1951	150,000	
9		1951	150,000	
10		1951	150,000	
11		1951	150,000	
12		1951	150,000	
13		1952	217,000	
14		1952	217,000	
15		1952	217,000	
16		1952	217,000	
17		1952	217,000	
18		1952	217,000	
19		1968	217,000	
20		1952	217,000	
21		1952	217,000	
22	Superior	1952	217,000	11,841,000
23		1971	217,000	
24		1971	217,000	
25		1990	217,000	
26		1994	217,000	
27		1995	217,000	
28		1969	217,000	

TANK NO.	LOCATION	DATE BUILT	TOTAL VOLUME	Total Facility Capacity (Bbls)
29		1969	217,000	
30		2000	250,000	
31		2000	250,000	
32		2003	180,000	
33		2003	180,000	
34		2007	390,000	
35		2008	250,000	
36		2010	250,000	
37		2010	250,000	
38		2010	250,000	
39		2010	250,000	
40		2010	250,000	
41		2014	550,000	
42		2014	640,000	
43		2015	644,000	
44		2015	644,000	
45		2015	644,000	
Total Region Capacity		**13,105,000 bbls**		

3.1 Superior Regional County Map



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4.0 DISCOVERY/DETECTION

4.1 Observation & Detection

The detection of a discharge from the Company pipeline system may occur in a number of ways, including:

- Discharge detection by Company personnel, pipeline patrols, or the general public.
- Automated discharge detection by the SCADA system at the Control Center which monitors flow and pressure on most lines as well as breakout tank oil levels.

4.2 Pressure Alarm

In the event of a change in pressure beyond a specified range, the operator will be signaled by an alarm which may result in the operator shutting down the associated pipeline or process equipment.

Control Center Alarm Procedures	
✓	Ensure that the pipeline/terminal is in a safe state
✓	Notify supervisor/manager of any abnormal operation
✓	Once a shutdown decision has been made personnel will be dispatched to assess situation
✓	The supervisor/manager may request a field inspection of the pipeline ROW in question to identify the source of the suspected leak
✓	In the event a release is discovered along the pipeline, this Plan will be activated
✓	In the event a release is not found, an investigation into the cause of the pressure change will continue until determined.

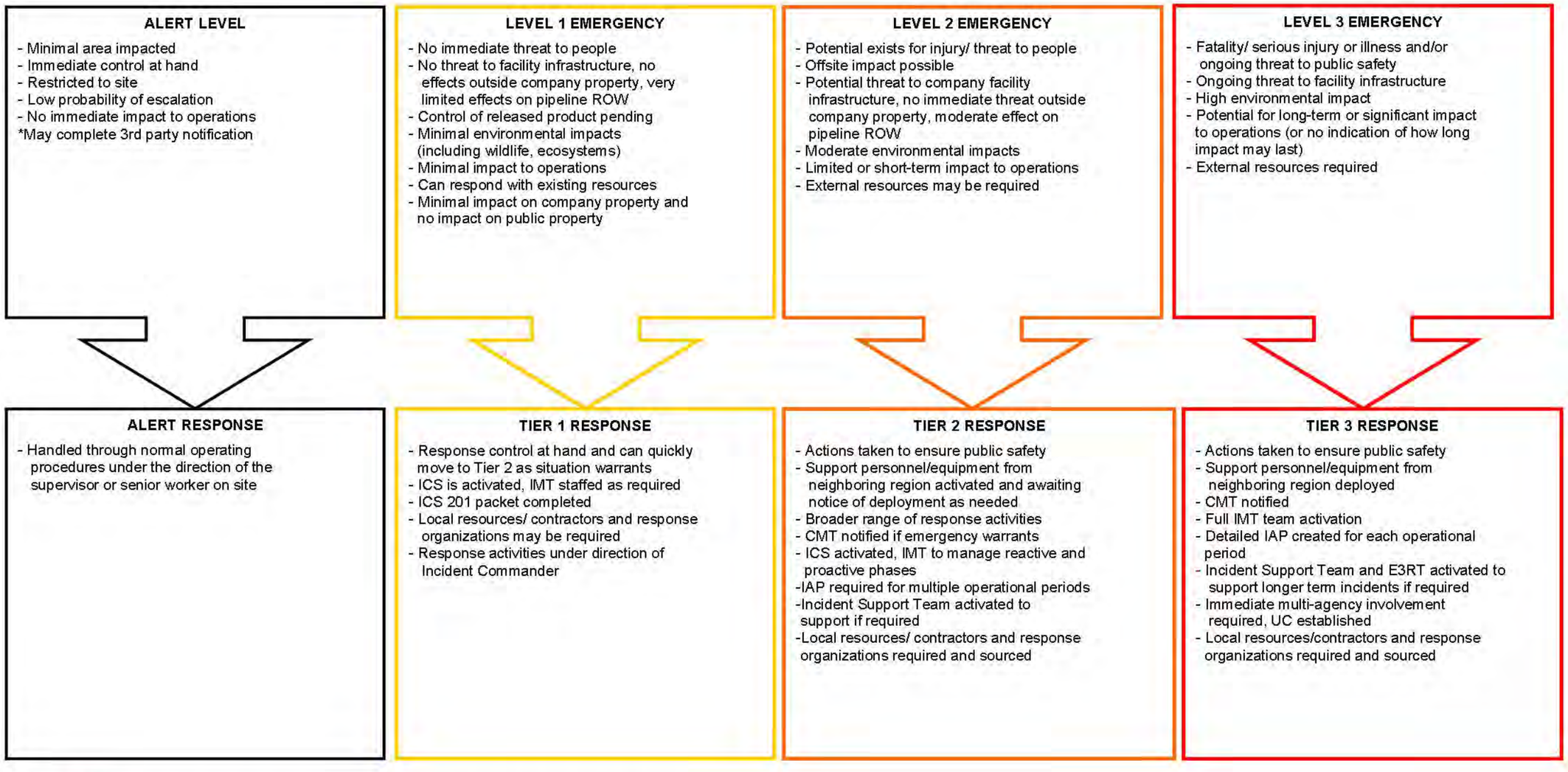
If a release is detected, personnel are directed to notify the proper authorities (see *Section 5.5- Notification Procedures*).

4.3 Facility Discharge Detection (Tanks, Terminals and Piping)

Enbridge facilities are equipped with high level alarms including mechanical switches.. The Control Center also receives an alarm if this "high level" is reached. When the Company receives these alarms, the alarming tank is shut down, and immediate contact with the facility operator on duty or on-call personnel is established. The high level alarm is set below the tank overfill height to ensure adequate time to shut down the line before overfilling occurs.

For all Spill Detection and Mitigation Procedures refer to Core Section 1 of the Integrated Contingency Plan (“ICP”).

Figure 1



Note:
1) Regulatory classification levels may not align with Enbridge Classifications
2) In Eastern Region, 3rd party notifications will be reported for alert level incidents

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5.0 NOTIFICATION PROCEDURES

5.1 Required Notifications

The information provided herein focuses primarily on general notifications and reporting. Relevant internal and external notifications will be found in the geographic specific Integrated Contingency Plan ("ICP") Geographical Annex along with all notification checklists applicable to that area.

The purpose of the notification process is to:

- Protect the safety of the public and responders;
- Control potential environmental effects as effectively and quickly as possible; and
- Meet regulatory requirements.

The notification process is triggered by an emergency or suspected emergency that is detected by, or reported to, the Control Center by the public, contractors, external first responders or an employee.

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Superior Region Notification Chart

ENBRIDGE

Last Updated 2016-12-08

Incident Observer

Member of the Public calls the toll free number

→ **Industrial User or Local Police contacts Control Center**

→ **Enbridge Employee discovery**

→ **Edmonton Control Center**
Local/Long Distance Number
780-420-8890
24 Hr. Toll Free
888-838-5253

→ **Internal Alarm is Sounded**

Control Center Operations

Document incoming call from incident observer

→ **Contact Regional Management On-Call Person to dispatch company first responder**

→ **Alert Police**

→ **Implement CCO notifications**

Regional Management

During Regular Work Hours:
Trent Wetmore
W (715) 394-1493
C (918) 285-0386

Alternates
Tony Hommerding
W (715) 394-1415
C (218) 393-1308
John Pechin
W (218) 755-6710
C (218) 393-3180

→ **Alternates/Outside- Regular Work Hours:**
See Superior Region On-Call Schedule

→ **Notify Senior Management**

→ **Dispatch First Responder**
(nearest employee or on-call person)

→ **Subsequent Notification**
(Call Police & Fire Dept. if required)

→ **Gov't Notification**

National Response Center (NRC)
24 Hr. Toll-Free **800-424-8802**

Edmonton Senior Management

Primary
Brad Shamla
Sr. VP US Operations
W (952) 607-3430
C (218) 269-5458

Alternate
David Bryson
Sr. VP Operations
W (403) 718-3524
C (403) 462-3663

→ **Crisis Management**

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5.3 Field Notifications

Any person who observes or becomes aware of a release shall immediately report the incident to the Control Center and Regional Management. Information should be documented on the Receiving Emergency Information form, located in *Section 13 - Forms*.

Enbridge First Responder

The Enbridge Responder on-scene will:

- Contact Regional Manager on call – see Regional Manager On Call Schedule
- Contact Control Center
- Follow Notification Procedures to activate the Regional IMT; and
- Work with the first responding agency on scene to ensure a coordinated response.

Regional Management/Representative

As the scope of the incident requires, Regional Management will:

- Dispatch Enbridge Responder to investigate the report;
- Notify the Control Center if an Enbridge Responder has been dispatched;
- Depending on the circumstances of the emergency, consider launching aircraft for situational awareness; and
- Activated Incident Management Team as required.
- Notification Procedures for required regulatory Notifications
- Call response agencies/oil spill removal agencies

5.4 Control Center

Any abnormal operating condition detected by the Control Center, or any reported or observed emergency or possible emergency situation, will be given an emergency status until the report is confirmed or negated. Follow up investigation and confirmation of a spill, or threat of spill, will be done immediately.

The Control Center personnel will notify:

- Regional on-call representative,
- Others identified in the Control Center operations procedures; and
- The Municipal/Community emergency services will be notified at the request of Regional Management);

The Control Center and IMT will confirm that additional notifications are completed, including those to:

- Government agencies
- Local authorities
- Response contractors
- Aboriginal groups in Canada, or Tribal Representatives in the U.S.
- Stakeholders

5.5 Emergency Contact Information

In Case of Emergency – 24 hr. Contacts	
Edmonton Control Center	**1-800-858-5253 OR 780-420-5221** **Gas- 888-427-7777**
Enbridge Media Hotline	1-877-496-5253 US

National Response Center (“NRC”)
For a pipeline emergency, call the NRC 24 hours hotline 800-824-8802

5.6 Emergency Contact Information

5.6a Emergency Contacts

Local / Long Distance	780-420-5221		
ENBRIDGE MEDIA HOTLINE			
United States	877-496-8142		
Canada	888-992-0997		
ENBRIDGE QUALIFIED INDIVIDUALS			
Director, Superior Region Ops Svcs (QI)	Trent Wetmore	715-394-1493	918-285-0386
Manager, Regional Services	Tony Hommerding	715-394-1415	218-393-1308
Manager, Bemidji Operations	John Pechin	218-755-6711	218-393-3180
Oil Spill Response Organizations (OSRO)			
CERTIFIED			
Marine Pollution Control Corp. (MPC) - (Superior)		24 Hr. 313-849-2333	
T & T Marine Salvage, Inc. (Chicago & Superior)		24 Hr. 713-534-0700	
ADDITIONAL			
1. Clean Harbors (Chicago)		24 Hr. 800-645-8265	
2. Clean Harbors (North Dakota)		24 Hr. 800-645-8265	
3. Future Environmental (Cushing)		24 Hr. 866-579-6900	
4. HazMat Response, Inc. (Cushing)		24 Hr. 800-229-5252	
5. ACEME Environmental (Cushing)		24 Hr. 855-563-2666	
6. Environmental Restoration, LLC (Cushing)		24 Hr. 888-814-7477	
To request Emergency Assistance, the Requesting Party or its Affiliate shall contact the Designated Representative of the Responding Party. A formal written request from the Requesting Party's Designated Representative shall follow in the form set out in the Schedule "B" within twenty-four (24 hours). Designated Representative means the person(s) authorized to request or release company resources to receive or provide Emergency Assistance as requested, as set out in the Designated Representative Contact List.			

5.6b Incident Management Team List

ICS Position	Normal Job Title	Name	Office Number	Alt. Number
Command Staff				
Incident Commander (IC)	Regional Director	Trent Wetmore	715-394-1493	918-285-0386
Alternate IC	Manager, Regional Services	Tony Hommerding	715-394-1415	218-393-1308
Alternate IC	Manager, Bemidji Area	John Pechin	218-755-6710	218-393-3180
Deputy IC	Manager, Superior Area	Jerry Christoff	715-398-8357	218-391-6710
Deputy IC	Manager, Fort Atkinson	Joe Kackos	608-756-0071	918-285-6224
Liaison Officer (LNO)	Compliance Advisor	Theresa Picton	715-398-4779	715-718-1208
Alternate (LNO)	Community Engagement Advisor	Laura Kircher	715-394-1825	715-817-6102
Alternate (LNO)	Project Coordinator	Rob Holte	715-394-1585	715-817-8096
Public Information Officer (PIO)	Sr. Community Engagement Advisor	Becky Haase	218-464-5722	218-721-2476
Safety Officer (SOFR)	Regional Safety Advisor	Troy Bertagnoli	715-398-8368	715-969-4704
Alternate SOFR	Regional Safety Advisor	Kevin Halverson	608-756-0071	920-397-6450
Incident Advisor	ER Coordinator	Josh Sanders	715-394-0727	715-817-1812
Operations Section				
Operations Section Chief (OSC)	Manager, PLM	Tim Pollock	218-755-6723	218-766-0619
Alternate OSC	Supervisor, Clearbrook	Bill Palmer	218-776-6101	218-390-7901
Alternate OSC	Supervisor, Pipeline Svcs.	Dean Will	715-398-8348	218-930-5228
Deputy OSC	Spvsr, Pipeline Srvc, Thief River Falls	Jamie Nelson	218-681-7195	218-689-6842
Deputy OSC	Regional Engineer, Bemidji	Kyle Oraskovich	218-755-6719	218-766-5611

Operations Section (con't)				
Staging Area Manager	Supervisor, Pipeline Svcs.	Marty Feil	218-755-6729	218-766-5012
Alternate STAM	PLM Coordinator	Lance Novacek	218-681-7195	218-689-9205
Alternate STAM	Technical Services Coord	Eric Beck	715-398-5326	715-817-2928
Planning Section				
Planning Section Chief	Engineering Specialist	Chris Zupancich	715-398-4737	218-340-9877
Alternate PSC	Sr. Region Engineer	Tom Prew	715-398-4703	715-817-8125
Alternate PSC	Operations Specialist	Eric Petersen	715-398-4581	918-285-6898
Deputy PSC	Technical Supervisor	Brendan Fouts	715-718-5310	715-718-1268
Deputy PSC	Region Engineer	Brent Eliason	715-394-1545	715-817-6829
Deputy PSC	Technical Supervisor	Jim Sojka	715-634-7616	920-728-2629
Situation Unit Leader	Operations Project Coord.	Kyle Bridell	715-398-4744	715-817-4754
Alternate SITL	Technical Supervisor	Kevin Warbalow	715-398-8363	218-391-9585
Alternate SITL	Outage Coord.	Nick Compton	715-394-0706	715-817-8612
Environmental Unit	Environmental Analyst	Alex Smith	715-398-4795	715-817-8322
Alternate ENVL	Environmental Advisor	Crystal Smith	715-394-0709	715-817-0253
Alternate ENVL	Supervisor, Regional Support	Shane Yokom	715-398-4751	218-269-0369
Documentation Unit Leader (DOCL)	Admin Assistant III	Charlene Boeselager	715-398-4630	218-428-4577
Alternate DOCL	Admin Assistant	Megan Hansen	715-394-1548	218-428-5863
Alternate DOCL	Admin Assistant	Brittany Holmes	715-718-5319	
Alternate DOCL	Field Clerk	Kim Solberg	218-776-6107	218-556-4802
Resource Unit Leader	PLM Coordinator	Joseph Seacotte	715-398-8344	218-390-2815
Alternate RESL	PLM Coordinator	Daniel Hinrichs	715-398-8377	218-269-4702
Alternate RESL	PLM Project Coordinator	Paul Snobl	218-755-6715	218-689-8906
Alternate RESL	PLM Coordinator	Dean Hamnes	218-776-6582	218-308-3751

Planning Section (con't)				
Alternate RESL	Terminal Coordinator	Dale Bergquist	218-776-6123	218-533-0786
Logistics Section				
Logistics Section Chief (LSC)	Supervisor, Sup Terminal	Tom Peterson	715-398-8327	715-718-1572
Alternate LSC	Terminal Coord Gauger	Jason Peterson	715-398-8364	715-718-1893
Alternate LSC	Supervisor, Technical Srvcs	Jon Cleveland	218-623-7621	715-817-2159
Deputy LSC	Technical Supervisor	Steve Haubrich	218-681-1817	218-689-2616
Deputy LSC	Region Engineer	James Lawson	715-398-4880	715-817-8449
Finance Section				
Finance Section Chief (FSC)	Regional Accountant	Megan Michelizzi	952-607-3444	715-817-3759
Alternate FSC	Business System Coord.	Stacie Hanson	715-398-8326	

5.6c Emergency Services

EMERGENCY SERVICES							
County/City/ Station	**Sheriff 911**	**Police 911**	**Fire 911**	**DEM**	**Ambulance 911**	**Hospital 911**	**Highway Patrol/ State Police**
NORTH DAKOTA							
Thief River Falls Area - L1-4 & 67 MP773.72 to 896.0							
Gretna, Manitoba, CA	204-945-5555						*
Pembina- Neche	701-265-4122		Neche 701-886-7422 Pembina 701-825-6625		701-265-8259		
Pembina- Cavalier, Joliette Station	701-265-4122		Cavalier 701-265-4342 Drayton 701-454-3599	701-265-4849	701-265-8259	Neche 701-265-8461 Grand Forks 701-780-5000	701-795-3832
MINNESOTA							
Kittson- Hallock, Joliette Station	218-843-3535		Hallock 218-843-3535 Kennedy 218-674-4485	218-843-2113	218-843-3535	218-843-3612	218-681-0943
MINNESOTA (con't)							

County/City/ Station	Sheriff 911	Police 911	Fire 911	DEM	Ambulance 911	Hospital 911	Highway Patrol/ State Police
Marshall-Warren, Viking Station	218-745-5411		Argyle 218-478-3314 Warren 218-745-5411 Newfolden 218-874-7135	218-745-5841	218-478-3314	Warren 218-745-4211 Thief River Falls 218-681-4240	218-681-0943
Pennington-Thief River Falls, PLM	218-681-6161		218-681-3943	218-681-6161	218-681-4084	218-681-4240	218-681-0943
Pennington- St. Hilaire			218-964-5280				218-681-0943
Polk-Crookston	218-281-0431			218-281-0437			
Red Lake-Plummer, Plummer Station	218-253-2996		Plummer 218-465-4231 Red Lake Falls 218-253-2105 Oklee 218-796-5788	218-253-2996	Red Lake Falls 218-253-2996 Thief River Falls 218-681-4240	218-681-4240	218-681-0943

MINNESOTA (cont.)						
County/City/ Station	**Sheriff 911**		**Police 911**	**Fire 911**	**DEM**	**Ambulance 911**
Bemidji Area - L1-4 & 67 MP 896.0 to 1032						
Clearwater- Clearbrook, Clearbrook Terminal	218-694-6226	218-776-3490	Clearbrook 218-776-3335 Shevlin 218-785-2101 Bagley 218-694-2686 Gonvick 218-487-5770	218-694-6226	218-694-6501	218-681-0943
Beltrami- Bemidji, Wilton Station, Bem PLM	218-333-9111		Bemidji 218-751-8001 Shevlin 218-243-2175 Solway 218-467-3350	218-333-8320	218-444-3328	218-751-5430
Bemidji Area - L1-4 & 67 MP 896.0 to 1032 (cont.)						
Hubbard- Park Rapids	218-732-3331			218-732-2588		218-828-2230
Cass- Cass Lake, N. & S. Cass Lake Stations	218-547-1424	218-335-2351 Tribal 218-335-8277 888-622-9225	218-335-6195	218-547-1424	218-335-6363	218-751-5430	218-828-2230

MINNESOTA (con't)							
County/City/ Station	**Sheriff 911**	**Police 911**	**Fire 911**	**DEM**	**Ambulance 911**	**County/City/ Station**	**Sheriff 911**
Itasca- Deer River, Deer River Station	218-326-3477	218-246-2525	Grand Rapids 218-326-7639 Deer River 218-246-8261 Cohasset 218-328-5723	218-327-4496	218-326-3477	Deer River 218-246-2900 Grand Rapids 218-326-3401	218-749-7720
Itasca- Grand Rapids, Blackberry Station	218-326-3477		Grand Rapids 218-326-7639 Warba 218-492-1445 Goodland 218-492-1420	218-327-4496	218-326-3477	218-326-3401	218-749-7720
Aitkin- Jacobson	218-927-7435		218-752-6631	218-927-7435			218-749-7720
WISCONSIN							
Superior Area - L1-4 & 67 MP 1032 to 1096.95							
Itasca- Warba	218-326-3477		218-492-1445	218-327-4496	218-326-3477	218-326-3401	218-749-7720
Aitkin- Aitkin	218-927-7435			218-927-7435			218-749-7720
St. Louis- Floodwood, Floodwood Station	218-726-2340	218-476-2239	218-476-2238	218-625-3960	218-476-2238	Grand Rapids 218-326-3401 Duluth 218-786-4020	218-723-4885
St. Louis- Floodwood, Gowan Station	218-726-2340	218-476-2239	218-476-2238	218-625-3960	218-476-2238	218-786-4020	218-723-4885
St. Louis- Brookston			218-879-6916				

WISCONSIN, (cont.)							
County/City/ Station	**Sheriff 911**	**Police 911**	**Fire 911**	**DEM**	**Ambulance 911**	**County/City/ Station**	**Sheriff 911**
St. Louis- Duluth	218-726-2340	218-730-5400 USCG 218-720-5286	218-730-4390	218-625-3960	218-722-0807	218-786-4020 218-249-5555	218-723-4885
Carlton- Cloquet	218-384-3236	218-879-1247	Cloquet 218-879-6514 Culver Twp 218-879-5053	218-384-9141	218-384-4158	218-879-4641	218-723-4885
Carlton- Carlton	218-384-3236		218-384-4158	218-384-9141	218-384-4158	218-879-4641	218-723-4885
Carlton- Wrenshall	218-384-3236		218-384-4670	218-384-9141	218-384-4158	218-879-4641	218-723-4885
Douglas- Superior, Terminal & PLM	715-395-1371	715-395-7234	715-394-0227	715-395-1391	715-722-0807	715-817-7000	715-635-2141
Superior Area - L-5 MP 0 to 1137.3							
Bayfield	715-373-6120		Maple 715-363-2520 Iron River 715-372-4394	715-373-6113	715-372-4394	715-685-5500	715-635-2141
Superior Area - Superior Terminal L-6A & L-14 MP 0 to MP 97.23							
Douglas- Superior, Superior Terminal & PLM	715-395-1371	715-395-7234	715-394-0227	715-395-1391	715-394-4432	715-817-7000	715-635-2141
Douglas- Solon Springs, Hawthorne Station	715-395-1371		715-378-4111	715-395-1391	Gordon,WI 715-394-4432 Superior,WI 715-376-2640	715-817-7000	715-635-2141

WISCONSIN (con't)							
County/City/ Station	**Sheriff 911**	**Police 911**	**Fire 911**	**DEM**	**Ambulance 911**	**County/City/ Station**	**Sheriff 911**
Washburn- Minong, Minong Station	715-468-4720	715-466-2266	Minong 715-466-2324 Gordon 715-376-2221	715-468-4730	Minong 715-466-2324 Spooner 715-635-6179	Hayward 715-934-4321 Spooner 715-635-2111	715-635-2141
Sawyer- Stone Lake, Stone Lake Station	715-634-4858		Stone Lake 715-865-2616 Hayward 715-634-1311 LCO 715-634-9800	715-634-5213	715-634-4322	715-934-4321	715-635-2141
Sawyer- Stone Lake, Edgewater Station	715-634-4858		Stone Lake 715-865-2616 Hayward 715-634-1311 LCO 715-634-9800	715-634-5213	715-634-4322	715-934-4321	715-635-2141
Rusk- Ladysmith	715-532-2189	715-532-2186	715-532-2186	715-532-2121	715-532-2121	715-532-5561	715-635-2141

WISCONSIN, (cont.)							
Ironwood Area - L-5 MP 1137.3 to 1318.54							
County/City/ Station	**Sheriff 911**	**Police 911**	**Fire 911**	**DEM**	**Ambulance 911**	**County/City/ Station**	**Sheriff 911**
Bayfield- Iron River, Ino Station	715-373-6120		715-373-6120	715-373-6113	715-373-6120	715-685-5500	715-635-2141 or 715-635-7725 (ER)
Ashland- Ashland	715-685-7640	715-682-7062	715-682-7052	715-685-7640 X456	715-682-7052	715-685-5500	715-635-2141 or 715-635-7725 (ER)
Ashland- Odanah		715-682-7023	715-682-7155	715-682-7111	715-682-7052	715-685-5500	715-635-2141 or 715-635-7725 (ER)
Iron- Saxon, Saxon Station	715-561-3800		715-561-2121	715-561-3266	715-561-4444	715-685-5500	715-635-2141 or 715-635-7725 (ER)
MICHIGAN							
Gogebic- Ironwood, Ironwood PLM	906-667-0203	906-932-1234	906-932-1235	906-667-0204	906-932-4444	906-932-2525	906-229-5372
Gogebic- Bessemer	906-667-0203	906-224-9691	906-364-3706	906-667-0203	906-932-4444	906-932-2525	906-229-5372
Gogebic- Wakefield	906-667-0203	906-224-9691		906-667-0203	906-932-4444	906-932-2525	906-229-5372
Gogebic- Marenisco, Gogebic Station	906-667-0203	906-458-4539	906-787-2463	906-667-0203	906-932-4444	906-932-2525	906-229-5372

MICHIGAN (con't)							
County/City/ Station	**Sheriff 911**	**Police 911**	**Fire 911**	**DEM**	**Ambulance 911**	**County/City/ Station**	**Sheriff 911**
Gogebic- Watersmeet	906-667-0203	906-224-9691 Tribal Police 906-358-4313	906-358-4623	906-667-0203	906-667-0203	906-265-6121	906-229-5372
Iron- Iron River, Iron River Station	906-875-6669	906-265-4321	906-265-5720	906-875-6669	906-265-0412	906-265-0412	906-774-2122
Iron- Crystal Falls	906-875-6669	906-875-3012	906-875-5555	906-875-6669	906-265-0412	906-265-0412	906-774-2122
Dickenson- Iron Mountain	906-774-6262		906-774-6262	906-774-6262	906-774-6262		906-774-2122
Escanaba Area - L-5 MP1318.54 to 1548.57							
Marquette- Marquette	906-225-8435			906-475-1134	906-475-9912	906-228-9440	906-475-9922
Delta- Escanaba, Rapid River Station		906-786-5911	906-786-5911	906-786-5911	906-786-5911	906-786-3311	906-428-4412
Schoolcraft- Manistique, Manistique Station	906-341-2122	906-341-2134	906-341-2134	906-789-5173	906-341-2134	906-341-3200	906-387-4550
Mackinac- Gould City, Gould Station	800-643-1911	906-293-5151	906-293-5151	906-643-6731	906-293-5151	906-293-9200	906-387-4550

MICHIGAN (con't)							
County/City/ Station	**Sheriff 911**	**Police 911**	**Fire 911**	**DEM**	**Ambulance 911**	**County/City/ Station**	**Sheriff 911**
Mackinac, Naubinway, Naubinway Station	800-643-1911	906-293-5151	906-293-5151	906-643-6731	906-293-5151	906-293-9200	906-387-4550
Mackinac, St. Ignace, N. Straits Valve Yard	800-643-1911	906-643-6077	906-643-8754	DEM 906-643-6731 USCG 906-635-3233	800-643-1911	906-643-8585	231-627-9974
Emmet. Mackinaw City, Mackinaw Station	231-347-2036	231-436-7861 Tri-County Dispatch 231-439-3300	231-347-2500	DEM 855-515-1624 USCG 906-635-3233	231-533-8040	231-627-5601	231-627-9974
Cheboygan, Indian River, Indian River Station	231-627-3155	231-238-9481	231-625-2097	855-515-1624	231-627-5601	231-627-5601	231-627-9974
Otsego, Vanderbilt/Gaylord	989-732-7858	*	*	989-731-0290	*	989-731-2140(24 Hr.)	989-732-2778

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5.6d Government Agencies

GOVERNMENT CONTACTS		
See Annex 6.5.5 Notification Tab for reporting criteria.		
NATIONAL WEATHER SERVICE-	www.weather.gov	
(Duluth,MN)	**(24 hr)**	218-729-6697
FEDERAL		
NATIONAL RESPONSE CENTER (NRC)	**(24 hr)**	**800-424-8802**
(in Washington DC)		202-267-2675
Army Corps of Engineers		"
Environmental Protection Agency – Region 5-Chicago		800-621-8431
Transportation Security Administration (TSA)		866-289-9673
U. S. Department of Homeland Security (U.S Coast Guard)		410-576-2525
NOAA-National Oceanic & Atmospheric Admin		206-526-6317
PHMSA- Central Region (ND/MN) - Karen Butler	Office:	816-214-3027
	Cell:	816-329-3835
PHMSA- Central Region (ND/MN) - Brian Pierzina	Office:	816-329-3827
	Cell:	816-589-8293
OSHA - 877-470-6742		
OSHA (Federal) Eau Claire,WI		715-832-9019
OSHA (Federal) Milwaukee,WI		414-297-3315
OSHA – Chicago, IL- Regional Administrator - John C. Kluczynski		312-353-2220
OSHA – Madison, WI		608-441-5388
OSHA – Appleton,WI		920-734-4521
OSHA – (Federal) Lansing, MI		517-487-4996
MIOSHA Hotline (in case of fatality or catastrophic		800-858-0397
OSHA - St. Paul, MN		651-284-5050
OSHA – Madison, WI		608-441-5388
UNITED STATES COAST GUARD		
USCG – Marine Safety Office –Milwaukee, WI Sector Command		414-747-7182
USCG – Great Lakes- 9th District (MN, IL, IN, MI, NY)		800-321-4400

USCG – Great Lakes- Duluth, MN		218-720-5286
STATES		
Michigan		
Michigan Dept. of Environmental Quality(DEQ) PEAS	(24 hr)	800-292-4706
Michigan Dept. of Environmental Quality (Divisions)		800-662-9278
Michigan Public Service Commission - (Gas Operations Section)		517-284-8220
DEQ District Office-Jackson		517-780-7690
DNR **Field Offices:**		
Crystal Falls		906-875-6622
Marquette		906-228-6561
Newberry		906-293-5131
Gaylord		989-732-3541
Bay City		989-684-9141
USCG – Marine Safety Offices:		
Detroit		313-568-9580
Sault Ste. Marie		906-635-3233
Duluth		218-720-5286
Minnesota		
State Duty Officer – Division of Emergency Management	(24 hr)	800-422-0798
State Duty Officer (out of state)		651-649-5451
MN Department of Health, Northwest Region, Public Health Preparedness	(24 hr)	218-340-0543
Duluth Port Captain – Lake Superior - Press 1 after hrs.		218-720-5286
Minnesota Pollution Control Agency (MPCA)		800-657-3864
Switchboard		651-296-6300
Spills Unit St. Paul		651-649-5451
Duluth Branch		218-723-4660
Detroit Lakes Office		218-847-1519
Brainerd Office		218-828-2492
Carlton County Public Health		218-879-4511 or 888-818-4511

St. Louis County Public Health		218-726-2450
North Dakota		
North Dakota Dep.t of Health – Div. of ER Mgmt. Section Chief	(Out of State)	701-328-2270
State-Wide Sheriff Depts (In State-24hr)		800-472-2121
U.S. EPA Region VIII Office (Denver)		800-227-8917 or 303-312-6312
U.S. EPA Region V Office (Chicago)		800-621-8431 or 312-353-2000
Upper Souris Nat'l. Wildlife Refuge		701-468-5467
Grand Forks Public Works		701-738-8746
North Dakota Industrial Commission- NDIC-Oil & Gas Div.		701-328-8020
Division of Environmental Engineering (burn permits)		701-328-5188
Army Corps of Engineers		701-255-0015
Wisconsin		
Wisconsin Division of Emergency Management-Madison		608-242-3232
Wisconsin DNR- Emergency Spill Hotline	(24 hr)	800-943-0003
	Office:	608-267-7454
NATIONAL FORESTS		
***Cheguamegon*-Rhinelander, WI**	Daytime:	715-362-1300
After Hrs.: Dispatcher	Dispatch :	715-358-6863
	Cell:	715-493-6934
***Chippewa*-Cass Lake, MN**	Daytime:	218-335-8600
After Hours: Same (answering machine)		

ONE-CALL NOTIFICATION AGENCIES Nationwide One-Call Number - 811		
Michigan		800-482-7171
"Miss Dig"		
Minnesota	(In State)	800-252-1166
"Gopher State One-Call"		651-454-0002
North Dakota		800-795-0555
"One Call"		701-610-1057
Wisconsin		800-242-8511
"Diggers Hotline"		262-785-5300

5.6e State Emergency Response Commission & Local Planning Committees

SERC	Address	City	State	Zip Code	Name	Phone	Verified
STATE EMERGENCY RESPONSE COMMISSION (SERC)							
Michigan- Michigan SARA Title III Program Dept. of Environmental Quality	401 Ketchum St.	Bay City	MI	48708	Michael Young, Specialist	984-894-6238	7/15/2016
Michigan- Emergency Management & Homeland Security Division - MI Dept. of State Police	4000 Collins Rd. PO Box 30636	Lansing	MI	48909-8136	Jay Eickholt	517-333-4416	7/15/2016
Minnesota- Minnesota Homeland Security & Emergency Management	445 Minnesota St. Ste. 223	St. Paul	MN	55101-6223	Kevin Reed	651-201-7408	7/15/2016
North Dakota- Haz-Chem Program for ND Dept. of Emergency Services	Fraine Barracks Lane Bld. 35 PO Box 5511	Bismarck	ND	58504	Ray DeBoer, Coordinator	701-328-8100 701-328-8112	7/15/2016
North Dakota- Haz-Chem Program for ND Dept. of Emergency Services	Fraine Barracks Lane Bld. 35 PO Box 5511	Bismarck	ND	58504	Jeff Thompson, Officer	701-328-8216 701-328-9921	7/15/2016

SERC	Address	City	State	Zip Code	Name	Phone	Verified
Wisconsin- Wisconsin Emergency Management	2400 Wright St., Rm 213 PO Box 7865	Madison	WI	53704	Brian M. Satula, Administrator	608-242-3210	7/15/2016
MICHIGAN LEPC							
Cheboygan	PO Box 480	Petoskey	MI	49770	Megan Anderson	855-515-1624	7/16/2015
Delta- Delta County Emergency Management	310 Ludington St. Ste. 113	Escanaba	MI	49829	Bob Berbohm	906-789-5173	7/16/2015
Dickinson	300 E. D St. P.O. Box 609	Iron Mountain	MI	49801	Sheriff Scott Celello	906-774-6262	7/16/2015
Emmet	PO Box 480	Petoskey	MI	49770	Megan Anderson	855-515-1624	7/16/2015
Gogebic	100 W. Iron St.	Bessemer	MI	49911	James Loeper	906-667-1118	7/16/2015
Iron- Iron County Courthouse	2 S. Sixth St. Ste. 2	Crystal Falls	MI	49920	Steven Gagnea	906-875-0602	7/16/2015
Mackinac	100 S. Marley St.	St. Ignace	MI	49781	Mike Kasper	906-430-1466	7/16/2015
Marquette	180 US Hwy. 41 E.	Negaunee	MI	49866	Teresa Schwalbach, EMS	906-475-1134	7/16/2015
WISCONSIN LEPC							
Rusk	311 Miner Ave. E.	Ladysmith	WI	54848	Thomas Hall, EMS	715-532-2121	7/16/2016
Iron	300 Taconite St.	Hurley	WI	54534	Stacy Ofstad, EMS	715-561-3266	7/16/2016
Douglas	1316 N. 14th St. Ste. 10	Superior	WI	54880-1674	Keith Kesler	715-395-1391	7/16/2016
Bayfield	117 E Sixth St. PO Box 423	Washburn	WI	54891	Jan Victorson	715-373-6113	7/16/2016

WISCONSIN LEPC (con't)							
SERC	**Address**	**City**	**State**	**Zip Code**	**Name**	**Phone**	**Verified**
Ashland	220 6th St. E.	Ashland	WI	54806	Dorothy Tank	715-685-7640 X456	7/16/2016
Sawyer	10610 Main St. Ste 89	Hayward	WI	54843	Patricia Sanchez, Director EMS	715-634-2004	7/16/2016
Washburn	PO Box 429 421 Hwy. 63	Shell Lake	WI	54871	Carol Buck	715-468-4730	7/16/2016
MINNESOTA LEPC							
Region 2 LEPC	402 SE 11th St.	Grand Rapids	MN	55744	Roy Holmes, Coordinator	218-259-2221	7/16/2016
St. Louis	2030 N Arlington Ave N	Duluth	MN	55803	Paul Lee, Coordinator	218-625-3960 218-336-4341	7/16/2016
					Steve Steblay, Director	218-336-4340	7/16/2016
St. Louis	100 N 5th Ave W Room 103	Duluth	MN	55802	Ross Litman, Sheriff	218-625-2341	7/16/2016
Carlton	317 Walnut Ave PO Box 530	Carlton	MN	55718	Brian Belich	218-384-9518	7/16/2016
Itasca	440 First Ave NE	Grand Rapids	MN	55744	Victor Williams, Coordinator	218-326-3477	7/16/2016
Aitkin	217 Second St NW Ste. 185	Aitkin	MN	56431	Scott Turner	218-927-7420	7/16/2016
					Karla White	218-927-7436	7/16/2016
Cass	300 Minnesota Ave PO Box 1119	Walker	MN	56484	Kerry Swenson	218-547-7437	7/16/2016
Region 3 LEPC	12337 152nd St.	Park Rapids	MN	56470	Heather Winkleblack	218-766-2301 (cell)	7/16/2016
Region 3 RRC		Warren	MN		Mark Jones, Chair	218-201-0098 218-745-4211	7/16/2016

MINNESOTA LEPC (con't)							
SERC	**Address**	**City**	**State**	**Zip Code**	**Name**	**Phone**	**Verified**
Kittson	410 South 5th, Suite 104 PO Box 504	Hallock	MN	56728	Barb O'Hara	218-843-2113	7/16/2016
Marshall	208 E. Colvin, Courthouse Ste. 5	Warren	MN	56762	Josh Johnston, Director	218-745-5841	7/16/2016
Pennington	101 Main Ave N	Thief River Falls	MN	56701	Erik Beitel	218-683-7087	7/16/2016
Red Lake	124 Main Ave N PO Box 306	Red Lake Falls	MN	56750	Mitch Bernstein	218-253-2996	7/16/2016
Polk	600 Bruce St PO Box 416	Crookston	MN	56716	Jody Beauchane, Director	218-470-8263	7/16/2016
Clearwater	213 Main Ave N Dept. 102	Bagley	MN	56621	Larry Olson	218-694-6226	7/16/2016
Beltrami	613 Minnesota Ave NW	Bemidji	MN	56601	Chris Muller	218-333-8386	7/16/2016
Hubbard	301 Court Ave	Park Rapids	MN	56470	Brian Halbasch	218-732-2588 218-732-2502	7/16/2016
NORTH DAKOTA LEPC							
Pembina	301 Dakota St. W. #8	Cavalier	ND	58220	Andrew Kirking	701-265-4849	7/16/2016

5.7 External Communications (Media Releases)

All Public statements and notification must be pre-approved by the Public Information Officer (PIO) if appointed, and approved by the Incident Commander (IC).

Regional Management (or designate) should notify On-call PIO of any of any emergency situation where external public communication may be required. The PIO may be activated at any time by the Incident Commander in any operational incident or emergency.

Refer all media and general public inquiries to the PIO.

The Liaison Officer (LNO) also works with the PIO to develop messaging. The LNO is responsible to communicate with specific stakeholder groups as determined by the size, scale and complexity of the incident. This may include but is not limited to:

- Aboriginal / Tribes/ Indigenous groups
- Community Leaders
- Government Representatives (elected and public service, various jurisdictions)
- Regulators

External Communications should:

1. Focus on Priorities

The company's priority in an emergency is to protect the public and responders, limit environmental impact and resolve the problem calmly, professionally and safely while ensuring stakeholders are kept informed.

2. Coordinate with Local Resources

Local fire, police and emergency medical service (EMS) officials will be requested to communicate the emergency situation to those in proximity to the incident. The LNO role (which may be filled by groups such as Community Relations, Stakeholder Relations and Aboriginal Relations representatives or Land Agents for the area) will also contact/follow up with local landowners, municipal representatives, government, regulators, Aboriginal/Indigenous groups and other stakeholders.

Initial Response Phase - Enbridge First Responders

Enbridge First Responders should use the following to respond to the Media until a Public Information officer is available:

- Provide media members with the toll free media line 877-496-8142 in the US
- Communicate with the public and media in a calm, professional and respectful manner, showing concern for their safety.
- State that you are not an official spokesperson for the company but a representative will respond to their inquiry as quickly as possible

6.0 Protective Zones

6.1 Isolation Distance

Establish initial control perimeters based on the following guidelines (see *Figure 1*):

- Hot Zone
- Warm Zone– could initially be considered containment area
- Cold Zone

The following table depicts safe distancing as recommended by the latest edition of the
Emergency Response Guidebook (ERG) by the Department of Transportation and Transport Canada. Reference to the latest edition of the ERG is further recommended to confirm safe distancing relative to the site specific conditions.

Set up a Command Post, Staging Areas, and Decontamination Stations as necessary for the circumstances.

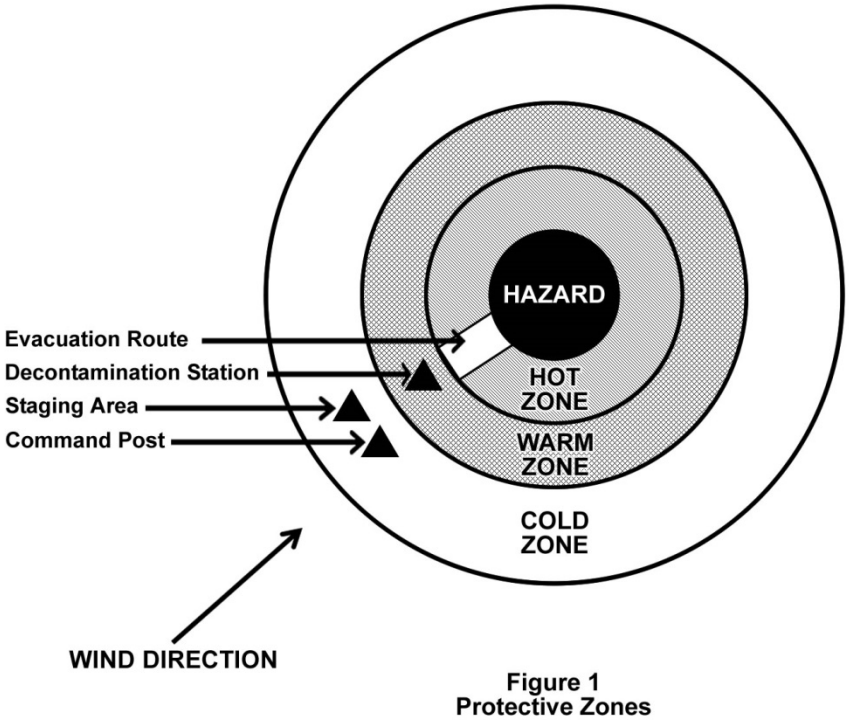


Figure 1
Protective Zones

6.1 Isolation Distance, continued

Isolation Distance / Emergency Response Guidebook

Product	Guide #	ID #	Immediate Precautionary Evacuation Measure	Large Spill Evacuation	Evacuation in the Event of a Fire
Condensate(Diluent), Natural Gas, Butane, Ethane, Methane, Propane	115	1971, 1011, 1075, 1035, 1078	100 meters (330 feet)	800 meters (½ mile)	1,600 meters (1 mile)
Napthalene Crude	133	1334	25 meters (75 feet)	100 meters (330 feet)	800 meters (½ mile)
Petroleum Crude Oil, Petroleum products, Pentane, Hexane, Heptane, Octane, Nonane, Decane	128	1270, 1267, 1265,1268, 1208, 1206, 1262, 1920, 2247	50 meters (150 feet)	300 meters (1,000 feet)	800 meters (½ mile)
Petroleum sour crude oil, flammable, toxic	131	3494	60 meters (200 feet)	800 meters (½ mile)	800 meters (½ mile)
Benzene, Toulene, Xylene	130	1114, 1294, 1307	50 meters (150 feet)	300 meters (1,000 feet)	800 meters (½ mile)
Hydrogen Sulfide Gas	117	1053	100 meters (330 feet)	300 meters (1,000 feet)	1,600 meters (1 mile)

Isolation Distance, continued

***** Flash Fire and Vapor Cloud Explosion should be considered potential hazards in structurally condensed areas (heavy urban areas) especially under low wind, stable weather conditions. Pool Fires should be considered potential hazards in structurally condensed areas (heavy urban areas) especially if wind speed is high and ignition is delayed (product has pooled significantly). These hazards may result in a travelling flame front, damaging overpressure or exposure to thermal radiation, therefore responders should use the distances identified for "Evacuation in the Event of a Fire" even if no fire is present. In a full bore rupture where there is a risk of Flash Fire or Vapor Cloud Explosion, these distances should be doubled.

****** Additional conditions that should be considered when determining an evacuation zone include weather, full bore rupture, wind speed, overcast/clear sky and day/night

******* These substances may also present a Toxic Inhalation Hazard (TIH) and night time distances will defer from above

6.2 Setting Up Work Areas

The IC or designate will assess the accessibility of the site and will separate the site into three distinct areas to clearly identify the high risk areas and to reduce the hazards to the on-site responders. The three areas could be defined as the safe area, the hazardous area and the decontamination (or "Decon") area.

Protective Zones
To minimize spreading contamination from an emergency site to unaffected areas, the Safety Officer must record protective zones (see Figure 1) on the ICS 201-5 Site Safety and Control Form. Protective zones should identify:

- Hot Zone
- Warm Zone
- Cold Zone.

Hot Zone
The hot zone is the release site or site of clean-up operations. Any area that requires respiratory protection must be within the boundary of a designated hot zone. Access to the hot zone is restricted to trained and properly equipped emergency response personnel only. Personnel not involved in emergency operations must be prevented from entering and escorted off the site if necessary.

Warm Zone
The warm zone is a transition zone where equipment may be cleaned, and contaminated clothing removed, before leaving the site. Follow the established Decon plan. Appropriate PPE is required.

Cold Zone
The cold zone is the largest zone and includes all areas not immediately involved in the emergency. Take all possible efforts to ensure contamination does not spread to this area.
Air monitoring delineates the perimeter where air contaminants and combustible vapors cease to be detected. The cold zone must be established outside of this perimeter. Locate the Command Post and staging area (pre-deployment staging area for equipment arriving on site) in the cold zone. For large incidents, ensure that the Command Post is not positioned near the incident.

7.0 EVACUATION

7.1 Personnel Evacuation

Evacuation plans will be located in the applicable facility. All evacuation directives will be communicated through an audible signal, either through voice by the Designated Individual, such as PLM supervisor, Emergency Warden, Area Supervisor, Area Manager or Area Coordinator, or by the activation of an alarm system. All facility personnel are trained routinely in evacuation and emergency response procedures. The facility contains no critical equipment that requires employees to continue to operate after the evacuation notification is made.

The purpose of the evacuation plan is to provide some guidance in the event shutdown and evacuation are necessary. In the event of an incident, the facility operator will stop the flow of product by normal operating procedures. The facility supervisor/manager shall be notified immediately of the emergency. All facility personnel should evacuate with the exception of any individuals designated to remain on site. The Fire Department will be notified if there is a fire. Arriving personnel, equipment and fire resources will be met at the main gate or muster point of the facility, unless deemed unsafe to do so. Tactical deployment of arriving resources will depend on the current situation.

Evacuating personnel shall proceed in an orderly manner. The Supervisor/Manager or Designated Individual will account for all employees and arrange for medical assistance as required. When the alarm is sounded or a signal to evacuate is given all personnel should:

Evacuation Checklist	
✓	Immediately stop work activities.
✓	Check the wind direction
✓	Move upwind or cross wind
✓	Check the wind again
✓	Conduct a head count to account for all personnel known to be at the facility
✓	Assist in alerting and escorting personnel, including visitors and contractors to the appropriate muster point
✓	Notify the Control Center
✓	Assist in hazard control activities as requested
✓	Assist in search and rescue of missing persons

Evacuation Checklist (con't)	
✓	Injured personnel will be transported to the nearest emergency medical facility. All other personnel will remain at the evacuation point until the "All Clear" signal is given.
Note: Evacuation should be carried out in an orderly manner. Personnel should walk, NOT run or panic.	

Personnel evacuation direction is further defined as follows:

- **Facility Employees** - All Company employees who are not directly involved with the abatement of the emergency will immediately evacuate the area of the emergency. They will proceed via an unthreatened route to the facility main gate and remain in a "stand by" mode until instructed by the Facility Management to do otherwise. Should access to the facility main gate be threatened by the emergency, proceed to a location on the facility unthreatened by the emergency and notify the Emergency Warden and/or Area Supervisor/Manager and/or Designated Individual of your whereabouts as soon as practical.

- **Contractors, Freight Haulers, Vendors and Other Visitors** - All non-Company personnel will immediately evacuate the area when notified of an emergency. All material loading or unloading will cease. Personnel will proceed to the facility main gate via an unthreatened route. Non-Company personnel will exit immediately upon approval of the Facility Management. Should access to the facility main gate be threatened by the emergency, proceed to a location on the facility unthreatened by the emergency and notify the Emergency Warden and/or Area Supervisor/Manager and/or Designated Individual of your whereabouts as soon as practical. After personnel evacuation is initiated, emergency response agencies and teams will be notified (either from on-site or off-site immediately after the evacuation was completed), and immediate response actions will be initiated to minimize threats to human health and the environment.

7.2 Community Evacuation

Evacuation of the public should only proceed when it is safe to do so and ONLY in cooperation and coordination with Local Emergency Services. As identified under community emergency response plans, the responsibility and decision to evacuate is a community responsibility. The Company will support the evacuation and cover the cost of the response.

It is important to remember that evacuations beyond Company property will have to be initiated and coordinated with local emergency response/management organizations which have the legislative authority to order the movement of persons. State, Provincial, Territorial, First Nation and local authorities have primary responsibility and authority for evacuation planning and for the transportation, sheltering, public safety, and security of persons and non-Federal property within their respective jurisdictions. The unique challenges that might confront State, Provincial, Territorial, First Nation and local governments during a mass evacuation could require them to request additional assistance, of either a logistical or operational nature, from within their province, from other provinces pursuant to mutual aid and assistance compacts, or from the Federal government.

The Company:

- Should ensure that local emergency response/management organizations are provided with a clear recommendation to evacuate the public should the Company become aware of an immediate threat to life and safety that may not be under action by first responders.
- Will serve only in an advisory capacity during an evacuation order and may assist with the logistics of an evacuation.
- Must provide as much product information as possible to any emergency management organization coordinating an evacuation. The latest version of the Emergency Response Guidebook (“ERG”) should be consulted in order to determine safe evacuation distances.

Community Evacuation, continued

The priority for all Company personnel in any emergency is protecting the public and responders.

Prevent public access to the emergency site while there is any danger of explosion, fire, hazardous vapors or other hazardous conditions. For example:

- Seal off routes into the emergency site and establish a security perimeter
- Contact local police to set up road blocks at all access points, as applicable
- Employees/contractors, police and/or security personnel can be used, as well as physical barriers (e.g., barricades, reflective tape) to control access to hazardous areas.

Coordinate with external emergency response agencies (e.g., police, fire and EMS departments) to establish appropriate response measures for public protection as required, including:

- Monitoring for hazardous atmospheres;
- Evacuating people from the area (homes and businesses);
- Eliminating ignition sources near a release site;
- Preventing ignition sources from entering a release site; and
- Stopping traffic (e.g., on roads, rail lines, bridges), as required.

In the unlikely event that evacuation plans were required beyond the boundary of the facility, the designated individual would communicate further directives. These plans will include guidance of where to move potentially affected parties to minimize threats to human health and the environment. This will be accomplished in conjunction with local emergency response officials. The notification mechanisms will be based on monitored air quality and other situations that might arise during the emergency.

Evacuation is recommended for incidents in which the plume is visible and egress can occur in any direction away from the plume. A recommendation to evacuate should be made by a Qualified Individual/Incident Commander with access to LEL monitors and or air quality monitoring.

Under the direction of the IMT, community evacuation will be coordinated with the local authority. The recommendation to evacuate would be the decision of the IC. Refer to the ERG for product/evacuation guidance.

Community Evacuation, continued

If the public must be evacuated before external response agencies arrive or if these agencies are not available, the IC must take all steps necessary to ensure public protection (e.g., assigning Company employees to begin a door to door evacuation), then turn over these duties to community agencies as soon as possible.

For long-term releases, evacuation is preferred to sheltering if public safety can be assured during the evacuation process. Evacuation is a viable public protection measure in circumstances when:

- The location of the plume is known and safe egress routes can be assured.
- The release will not likely be contained in the near future.
- Visibility and road conditions are good.
- The residents clearly understand their directions.

Residents should also be evacuated during ongoing emergency flaring or burning if their health and safety could be affected by the operation.
In planning an evacuation, the following must be considered:

- The size and expected duration of the release;
- Egress routes;
- Current and expected meteorological conditions; and
- The potential for unexpected ignition.

Sheltering is the primary public protection measure for high vapor pressure products and when the hazard is of limited duration. Sheltering within a building creates an indoor buffer to protect affected individuals from higher (more toxic) concentrations that may exist outdoors. The goal is to reduce the movement of air into and out of the building until either the hazard has passed or other appropriate emergency actions can be taken (such as evacuation).

Sheltering indoors is a viable public protection measure in circumstances when:

- There is insufficient time or warning to safely evacuate the public.
- Residents are waiting for evacuation assistance.
- The release will be of a limited size and /or duration.
- The location of the release has not been identified.
- The public would be at a higher risk if evacuated.

Community Evacuation, contiued

In conjunction with shelter-in-place and evacuation strategies, a natural gas release may be ignited at the source in order to reduce public exposure to the hazard. If an immediate threat to human life exists and there is not sufficient time to evacuate the hazard area the IC is authorized to ignite the release.

8.0 Operations

8.1 Enbridge Response Management System

Incident Command System

The ICS enables a well-managed response and limits the effects of an emergency through the rapid, effective, coordinated response of resources. ICS is the standard international practice for emergency management, and clarifies the roles of personnel involved in emergency response. ICS is effective for emergency response because essential information and resources are organized into a logical structure for planning and implementing the required actions. It also provides a flexible preplanned emergency response organizational structure for any type or size of incident. The structure of the ICS required depends on the nature and complexity of the emergency, and is based on need, rather than rigid organizational structure. For Level 1 emergencies, one position may assume many responsibilities, whereas in higher-level emergencies (Levels 2 and 3), several positions may be required. The IMT would be mobilized, as appropriate, to fill ICS roles. The FRT functions under the Operations section in the ICS.

The FRT consists of trained personnel that will respond to all Company emergency incidents. Trained and qualified third-party contractors will be called on to fill the Incident Command System/Unified Command (ICS/UC) roles as required, including but not limited to positions in the Operations, Planning and Logistics sections. Note as well, that if requested by the local governing emergency management agency, Enbridge may provide a technical specialist to a community's Emergency Operations Center.

Key responsibilities for the FRT are aligned with the ICS organizational structure (Refer to ICS 207 Organization Chart).

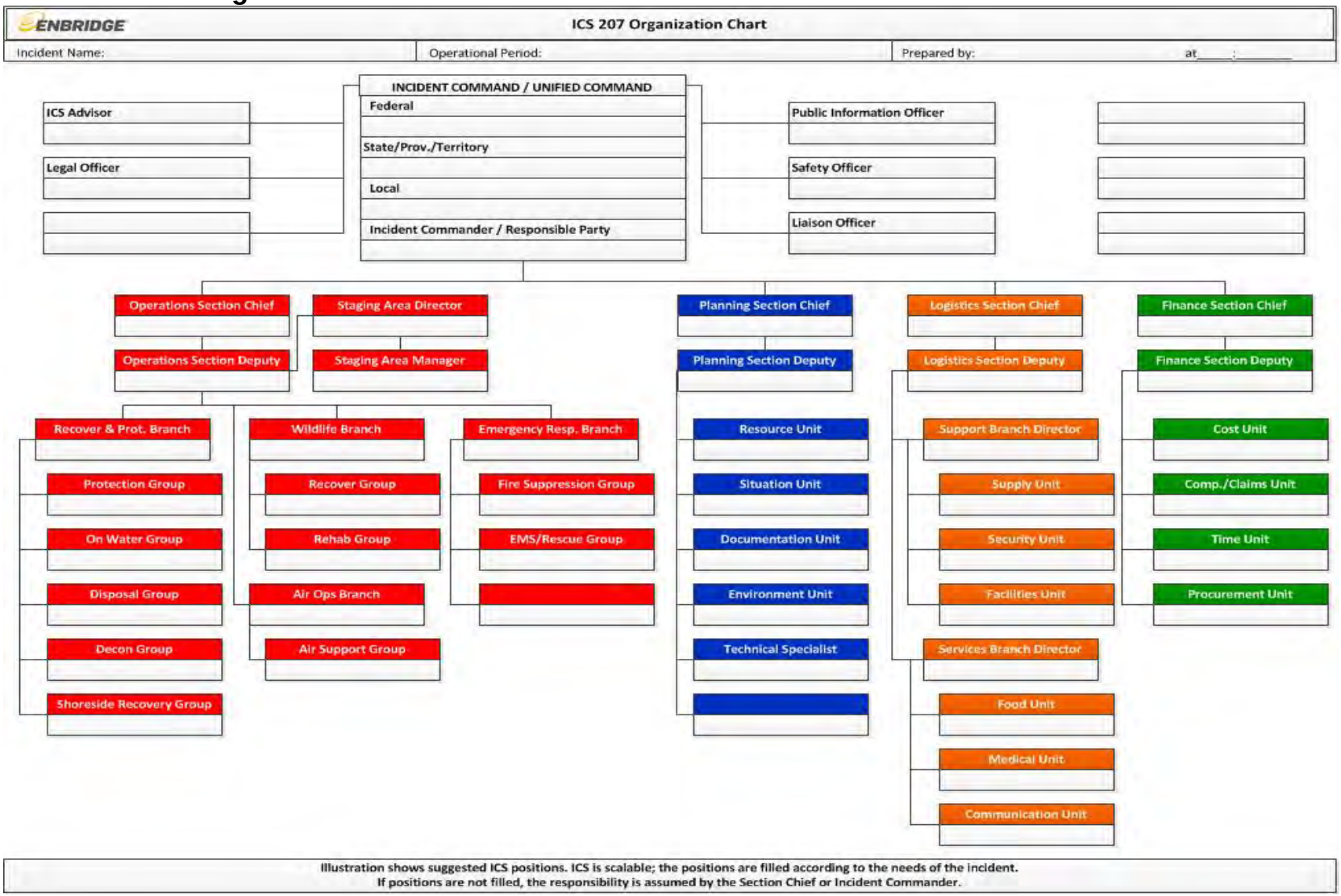
Assignment of responsibilities in the ICS starts with the top position (i.e., IC) and works down, as required. The IC and SOFR roles must be filled at all times during the emergency. The IC would mobilize positions directly beneath, as required. When a position is not mobilized, the position directly above would assume the responsibilities. ICS when activated requires as a minimum an IC and Safety Officer positions.

Determine the level of emergency and tier of response required to effectively manage the response. Refer to the Company Emergency Classification and Tiered Response Chart located in *Section 5.0 Notification Procedures*.

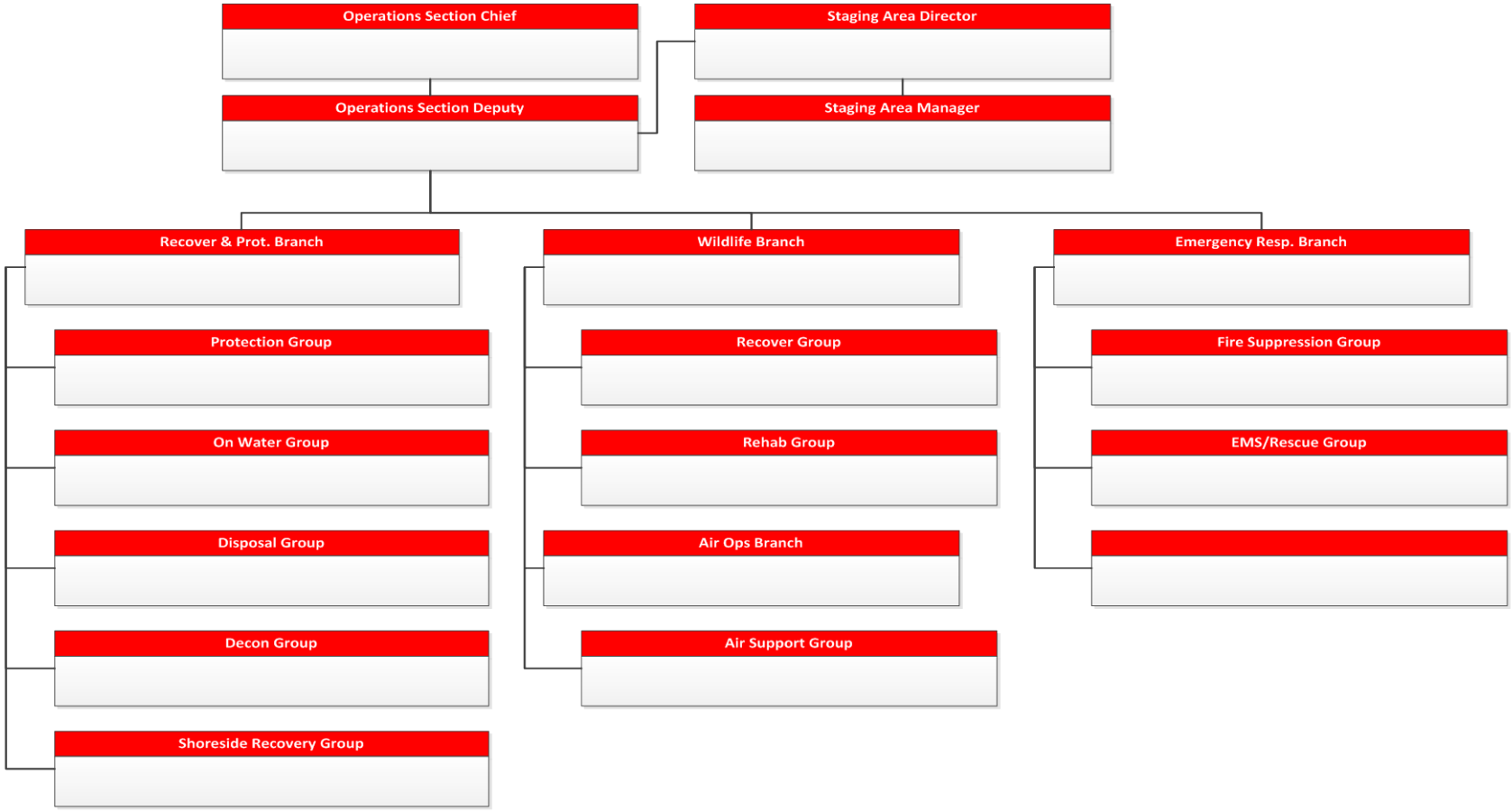
8.2 ICS Activation

ICS Is Scalable And Will Be Activated To Meet The Needs Of An Emergency	
Level 1	ICS is activated, IMT staffed as required, at minimum I/C and Safety Officer will be staffed
Level 2	ICS is activated; IMT to manage reactive and proactive phases. Command and general staff will be required with the potential to fill additional positions. CMT will be notified based on significant incident criteria
Level 3	Full IMT will be activated, CMT is notified.

8.3 ICS 207 Organization Chart

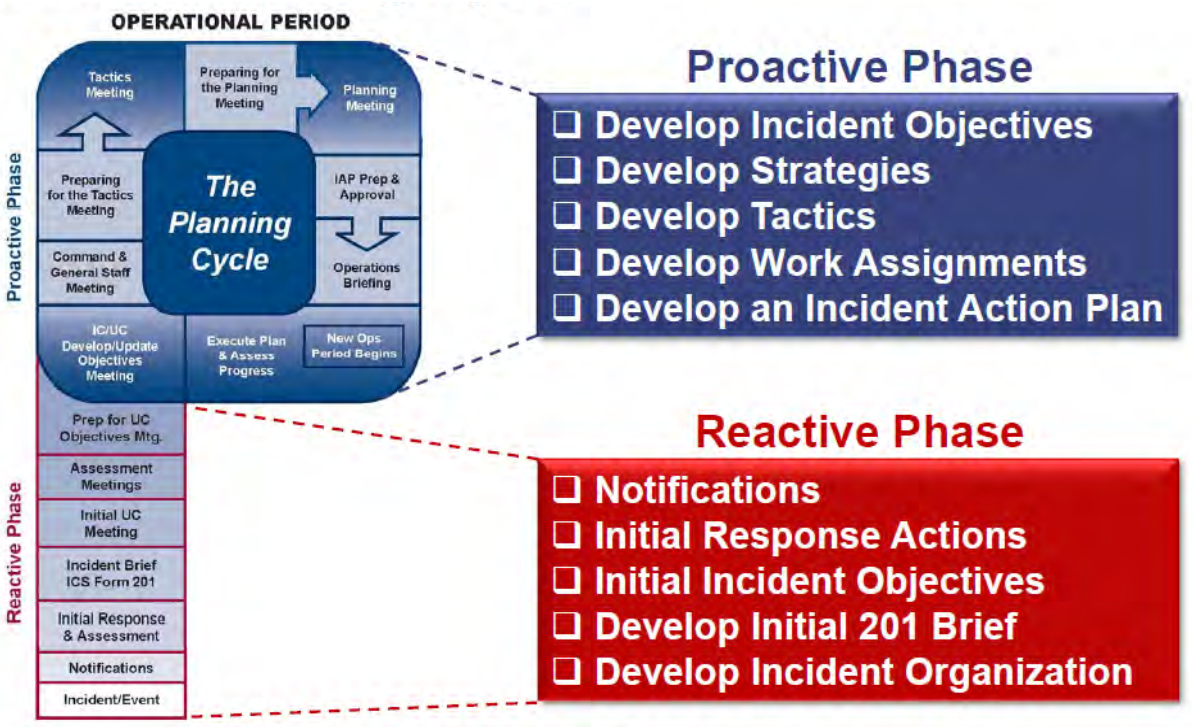


8.4 Operations Sections Organization Chart



8.5 Operational Period Planning Cycle

In more complex Level 2 or 3 emergencies, planning for the next operational period will take place in the proactive phase. The move from reactive to proactive will be situation specific and depends on the incident, skill set and staff available. Once the scale and scope of the event has been determined (a situational assessment is complete and a common operating picture has been established), the IC should discuss with the IMT and determine when a move into the proactive phase would be appropriate. A detailed IAP will be put together and the following meetings will be conducted to ensure all personnel are briefed on the objectives and have the appropriate work plan in hand.



8.6 ICS Common Responsibilities

Common Responsibilities Checklist	
After initial notification and receiving your assignment:	
✓	Review job assignment (e.g., Strike Team designation, position, etc.).
✓	Receive brief overview of type and magnitude of incident.
✓	Receive resource order number and request number.
✓	Receive reporting location & time.
✓	Receive travel instructions.
✓	Receive any special communications instructions (e.g., travel, radio frequency).
✓	Maintain a checklist of items and if possible a personal Go-Kit including medication, computer and climate specific work wear.
✓	Inform your people leader as to where you are going and how to contact you.
✓	Review Incident Management Handbook (IMH) and role specific requirements.
✓	Take advantage of available travel to rest prior to arrival.
✓	Upon arrival at the incident, check-in at the designated check-in location. Check-in may be found at any of the following locations: • Incident Command Post, Base/Camps, Staging Areas, and Heli-bases. • If you are instructed to report directly to a line assignment, check-in with the Division/Group Supervisor.
✓	Receive briefing from immediate supervisor.
✓	Agency Representatives from assisting or cooperating agencies report to the LNO at the Incident Command Post after check-in.
✓	Abide by and champion Enbridge Values and Code Conduct .
✓	Participate in IMT meetings and briefings, as appropriate.
✓	Ensure compliance with all safety practices and procedures. Report unsafe conditions, own it then report it to the SOFR.
✓	Supervisors shall maintain accountability for their assigned personnel with regard as to exact location(s) and personal safety and welfare at all times, especially when working in or around incident operations.
✓	Organize and brief subordinates.
✓	The Command Staff and General Staff shall ensure branches are identified, set up and allocate divisions and groups within them to stay within the recommended span of control (1 Supervisor per 4-7 people).
✓	Know your assigned communication methods and procedures for your area of responsibility and ensure that communication equipment is operating properly.

Common Responsibilities Checklist (Cont'd)	
✓	Use clear text and ICS/UC terminology (no codes) in all radio communications.
✓	Complete forms and reports required of the assigned position and ensure proper disposition of incident documentation as directed by the Documentation Unit Leader (DOCL).
✓	Ensure any equipment your require is operational prior to each work period.
✓	Report any signs/symptoms of extended incident stress, injury, fatigue or illness for yourself or coworkers to your supervisor.
✓	Respond to demobilization orders and brief subordinates regarding demobilization.
✓	Return all assigned equipment to appropriate location.
✓	Complete Demobilization check-out process before returning to home base.
✓	Participate in After-Action activities as directed.
✓	Carry out all assignments as directed.
✓	Wear the appropriate vest and role identification where possible
✓	Understand and enforce safe working hours and lead by example
✓	Consider Human Factors in decision making
✓	Exercise emergency authority to stop and prevent unsafe acts.
✓	Maintain Individual/Activity Log (ICS 214a).

8.7 Hazard-Specific Field Response Team Considerations

Enbridge uses an all hazards approach to mitigate and respond to a variety of hazards and threats. General procedures for response considerations listed below should still be applied where required.

8.7.1 Objectives

We will prudently over respond to any incident with priorities in the following order:

People
- Ensure safety of employees & contractors located in the field
- Ensure safety of staff located inside regional buildings

Environment
- Take mitigative action to prevent impacts of an incident

Assets
- Where possible protect company assets located on regional property; tanks, pipelines, equipment, vehicles, etc.

Reputation

8.7.2 Safety

- Conduct hazard assessment
- Ensure proper documentation has been completed (Safe Work Permit, Field Level Hazard Assessment, etc.)
- Your safety first and then the safety of others
- Stay out of hazard zone
- If performing Recon approach up wind, uphill, up stream
- Determine the immediate hot zone
- Ensure proper levels of PPE
- Ensure PPE is in line with Site Safety and Health Plans (SSHP)
- Establish site control (hot zone, warm zone, cold zone and security).

8.7.3 Notifications

- Follow Notification Procedures (Section 5.0)

8.7.4 Isolate And Deny Entry

- Evacuate the immediate area
- Deny entry to the immediate area
- Ask others to help deny entry into the area
- If on the scene, ask agency resources to help deny entry into immediate area

8.7.5 Command Management

- First Responders assumes the role of the Incident Commander until transfer of command occurs
- Make an announcement to everyone on scene that you have assumed Command
- Set up mobile Incident Command Post (ICP) trailer up wind, uphill and upstream of the incident in the cold zone
- Establish a Staging Area up wind, uphill and upstream of the incident in the cold zone
- Begin assigning ICS positions as per Regional Incident Management Team
- Meet, greet and brief responding Agencies as they arrive at the ICP trailer
- Ensure Safety Officer begins and completes a Site Safety Plan

8.8 Hazard Specific Response Actions

Specific actions to mitigate and respond to following hazards are listed below:

8.8.1 Medical Emergencies

The three basic steps to follow in a medical emergency are as follows:

CHECK the person

- Does the person want your help? If the person is unable to answer, assume you have consent to give first aid
- Check the person's ABCs

CALL for assistance/additional resources

- If the person responds, find out if there is a need to call for additional help (e.g. 911, EMS)
- If the person does not respond, call for help.

CARE for life-threatening conditions first

- Reduce the risk of disease transmission by using protective equipment such as disposable gloves and a barrier device

8.8.2 Pipeline Release

In the event of a pipeline release carry out the following actions:

- Shut off flow
- Isolate leaking section of piping
- Notify Terminal Supervisor, Manager or designee
- Place a container under the leak and attempt to temporarily plug the hole
- Initiate spill containment (if outside containment area)
- Evacuate contents of line with suction pump or flush with water to remove remaining oil
- Block and purge affected equipment
- Initiate recovery/clean-up actions

8.8.3 Tank Failure

In the event of a tank failure carry out the following actions:

- Immediately stop work activity
- If safe, ensure dike drains are closed
- Notify Terminal Supervisor, Manager or designee
- Secure area
- Initiate response actions
- Shut off flow to tank
- Begin transfer of contents to other tankage.

8.8.4 Equipment Failure

In the event of equipment failure carry out the following actions:

- Shut off the flow and transfer pumps. Close header & tank valves
- Notify Terminal Operations/Manager
- Evacuate the area as necessary
- Drain remaining contents to containment tanks
- Secure area if safe to do so
- Tighten leaky valve or fitting, if safe
- Initiate response actions

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ON-WATER SPILL SURVEILLANCE GUIDELINES

- Spill surveillance should begin as soon as possible to aid response personnel with assessing spill size, movement and potential impact locations.
- Cloud shadows, sediment, floating organic matter, submerged sand banks, or wind-induced patterns on the water may resemble an oil slick if viewed from a distance.
- It is difficult to adequately observe oil on the water from a boat, dock or shoreline.
- Spill surveillance is best accomplished using helicopters or small planes. Helicopters are preferred due to their superior visibility and maneuverability characteristics.
- If fixed-wing planes are used, high wing types provide better visibility than low-wing types.
- Document all observations in writing and with photographs and/or videotapes.
- Describe the approximate oil slick dimensions based on available reference points (i.e. vessel, shoreline features, facilities, etc.). Use aircraft or vessel (if safe to do so) to traverse the length and width of the slick while timing each pass. Calculate the approximate size and area of the slick by multiplying speed and time.
- Record aerial observations on detailed maps.
- In the event of reduced visibility, such as dense fog or cloud cover, boats may be used for patrols and documenting the location and movements of the spill. Boats will only be used if safe conditions are present, including on-scene weather and product characteristics.
- Surveillance is also required during spill response operations in order to gauge effectiveness of response operations, to assist in locating skimmers and to continually assess size, movement and impact of spill.

SPILL VOLUME ESTIMATION & METHODS

Early in a spill response, estimation of spill volume is required in order to:

- Report to agencies.
- Determine liquid recovery requirements.
- Assess manpower and equipment requirements.
- Determine disposal and interim storage requirements.
- In the event that actual spill volumes are not available, it may be necessary to estimate this volume (see flowchart)

Initial Estimates:

If available, information provided from the control center can be used to provide an initial estimate of the spill volume. The volume released should match the change in a cutoff inventory measurement.

Tanks:

If the leak source can be isolated to a tank, an initial leak volume estimate can be determined as:
Volume = the change in height of the tank x the volume per inch as found on the tank strapping table

Mainline Releases - An initial release volume can be calculated as:
Volume = (the mainline flow rate x the time to isolate) + the volume of drain-up from the release site to the next high point in the line

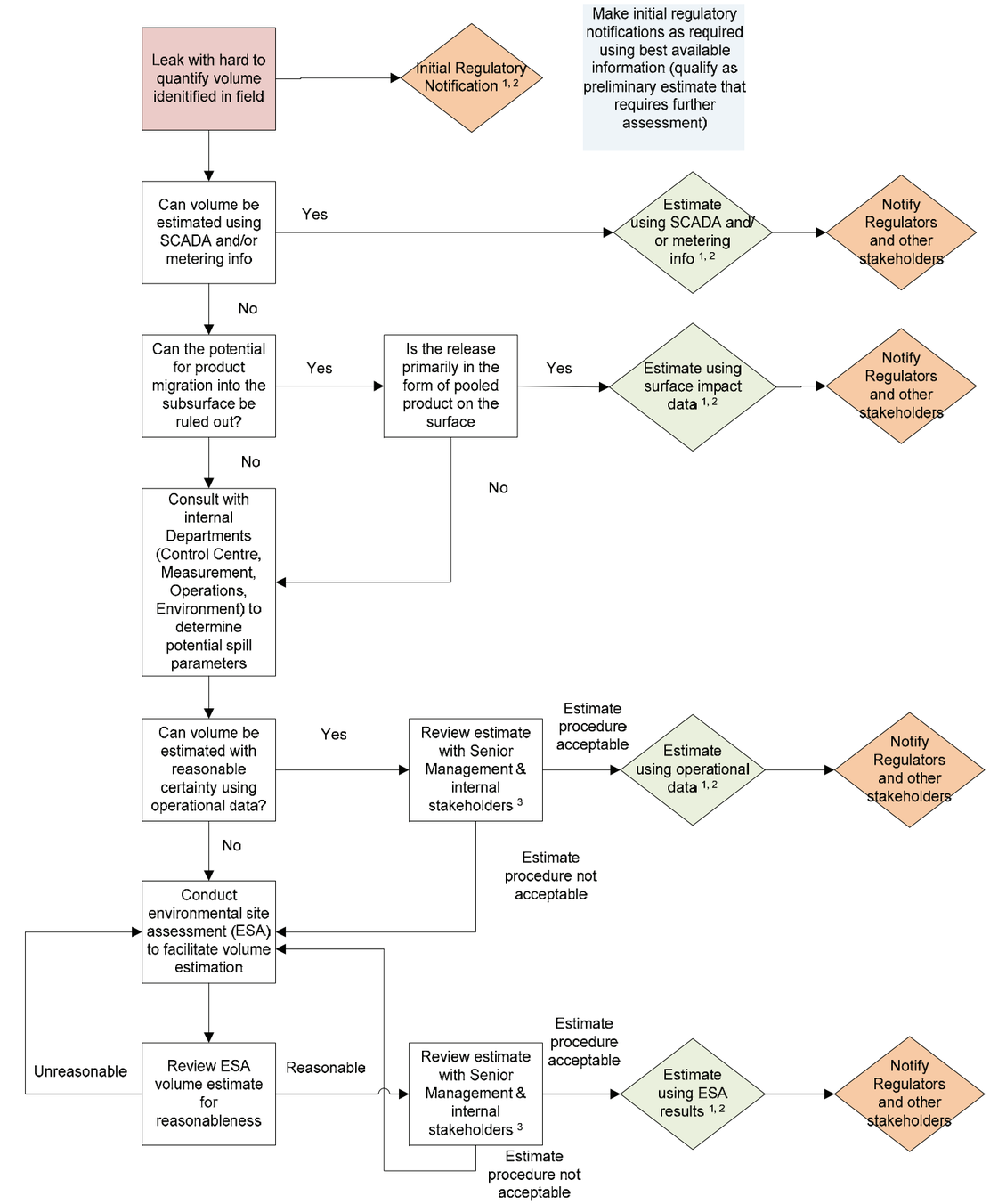
The volume release estimate can be verified by the mismatch in injection and delivery flow meters or tank volume change. In systems where ATMOS pipe is used for leak detection (i.e. gathering system), the estimated leak size is available in the user screen.

Land:

The following is a list of possible tools that can assist with determining a spill volume on land.

Transportation Spill to Land Estimation Tool
SCADA (Control Center calculation)
Tank Data Program

VOLUME ESTIMATES FLOWCHART



Notes:
1. Estimates must take uncertainties (such as extent of subsurface contamination, duration of leak, etc) into account.
2. In situations where there are significant uncertanties, it is preferable to estimate using a range (low case, likely case, and high case).
3. Internal stakeholders typically include Operations, Public & Government Affairs, Environment and Law.

8.8.5 - SPILL VOLUME ESTIMATION

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SPILL VOLUME ESTIMATION & METHODS , cont.

Leak on Land - Field Measurement:
To estimate the volume of a spill in a field location, the spill is segmented to a summation of area calculations. The volume of each area is calculated as the length x the width x the depth.
Conversions:
1 m3 = 6.29 bbls 1 ft3 = 0.178 bbls
1 in = 0.0254 meters 1inch = 0.0833 ft.

Water
Visual observation and calibration with the A.P.I. Task Force on Oil Spill Cleanup, Committee for Air and Water Conservation's Spill Size Estimation Matrix Table. Methods which can be used to determine size and volume of a spill include, but are not limited to:

Vessel / line capacity formulas
Infra-red thermal imaging

Leak on Water - Visual Observation:
Using only visual observation to obtain an accurate volume estimate for a product on water is improbable. When possible, the estimate should be based on one of the above methods (i.e. tank or mainline release calculations with Control Center input). The National Oceanic and Atmospheric Administration (NOAA) does provide a job aid to assist with visually estimating the volume of a release on water, but it is more suitably used to subjectively characterize and describe the spill. It may be found at: http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/resources/open-water-oil-identification-job-aid.html

ESTIMATING SPILL TRAJECTORIES

Oil spill/NGL trajectories may initially be estimated in order to predict direction and speed of the slick movement. Trajectory calculations provide an estimate of where oil slicks may impact shorelines and other sensitive areas and provide an estimate of the most likely locations for protection, containment and recovery.

The following method may be used to predict spill movement:

- Computer trajectory modeling programs (including but not limited to):
  - World Oil Spill Model (WOSM)
  - OilMap
  - General NOAA Oil Modeling Environment (GNOME)

The Company will utilize internal subject matter leads (SML) with consultants as necessary to perform trajectory analysis and fate & effect modeling.

Input variables for proper modeling include, but are not limited to:

- Spill location, volume, and time of spill.
- Nature of the spill - continuous or single incident
- Wind speed & direction.
- Water movement (current) speed & direction.
- Water temperature.
- Atmospheric temperature.
- Characteristics of spilled material

This information can be obtained from many sources, including but not limited to:

- Reports from personnel at the spill site.
- Commercial weather services.
- NOAA.
- Internal company databases.
- Oil Map software.

PRODUCT VOLUME TRACKING

An estimate of the amount of product recovered. In order to provide relevant information, a uniform procedure for sampling, analyzing and calculating the amount of product recovered from remediation activities at the release location should be established for the site.

Product volume tracking requires identification of each waste stream. Examples of typical waste streams from an oil release include:

- Soil and/or sediment impacted by the hydrocarbon product (hazardous and non-hazardous)
- Debris (e.g., impacted sorbents, boom, pads, plastic, PPE, vegetation)
- Water (hazardous and non-hazardous)

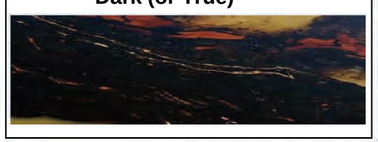
A sampling protocol will be established for each waste stream and will include:

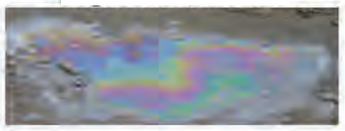
- Number of samples required per volume of waste generated
- Laboratory analysis required
- Data reporting requirements

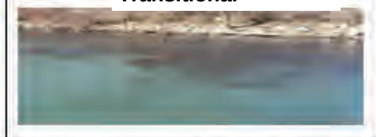
In the case of a crude oil release, the data provided by the waste stream disposal contractors (e.g. volumes converted to mass) and the validated analytical results (Oil and Grease in mg/kg) may be used as a basis to calculate the amount of crude oil recovered per waste load. These calculations will be maintained in a "Daily Waste Load Summary" spreadsheet.

OIL VOLUME CALCULATION TABLE

Visual Color







	Sheen (Silver/Gray)	Rainbow	Metallic	Transitional	Dark (or True) Color
Approximate Thickness	0.04 to 0.3 μm	0.3 to 5.0 μm	5.0 to 50 μm	50 to 200 μm	>200 μm
Area			**Volume (liters)**		
100 m^2	0.004 to 0.03	0.03 to 0.5	0.5 to 5	5 to 20	>20
500 m^2	0.02 to 0.15	0.15 to 2.5	2.5 to 25	25 to 100	>100
1,000 m^2	0.04 to 0.3	0.3 to 5	5 to 50	50 to 200	>200
1,500 m^2	0.06 to 0.45	0.45 to 7.5	7.5 to 75	75 to 300	>300
2,000 m^2	0.08 to 0.6	0.6 to 10	10 to 100	100 to 400	>400
3,000 m^2	0.12 to 0.9	0.9 to 15	15 to 150	150 to 600	>600
5,000 m^2	0.2 to 1.5	1.5 to 25	25 to 250	250 to 1000	>1000
10,000 m^2	0.4 to 3	3 to 50	50 to 500	500 to 2000	>2000
50,000 m^2	2 to 15	15 to 250	250 to 2500	2500 to 10,000	>10,000
100,000 m^2	4 to 30	30 to 500	500 to 5000	5000 to 20,000	>20,000
150,000 m^2	6 to 45	45 to 750	750 to 7500	7500 to 30,000	>30,000
200,000 m^2	8 to 60	60 to 1000	1000 to 10,000	10,000 to 40,000	>40,000
400,000 m^2	16 to 120	120 to 2000	2000 to 20,000	20,000 to 80,000	>80,000
600,000 m^2	24 to 180	180 to 3000	3000 to 30,000	30,000 to 120,000	>120,000
800,000 m^2	32 to 240	240 to 4000	4000 to 40,000	40,000 to 160,000	>160,000
1,000,000 m^2	40 to 300	300 to 5000	5000 to 50,000	50,000 to 200,000	>200,000

	Sheen (Silver/Gray)	Rainbow	Metallic	Transitional	Dark (or True) Color
Approximate Thickness	1.6 x 10^{-6} to 1.2 x 10^{-5} inches	1.2 x 10^{-5} to 2.0 x 10^{-4} inches	2.0 x 10^{-4} to 2.0 x 10^{-3} inches	2.0 x 10^{-3} to 8 x 10^{-3} inches	>8 x 10^{-3} inches
Area			**Volume (gallons)**		
100 yd^2	0.003 to 0.007	0.007 to 0.11	0.11 to 1.1	1.1 to 4.4	>4.4
500 yd^2	0.013 to 0.03	0.03 to 0.56	0.56 to 5.6	5.6 to 22	>22
1,000 yd^2	0.026 to 0.07	0.07 to 1.1	1.1 to 11.1	11.1 to 44	>44
1,500 yd^2	0.039 to 0.10	0.10 to 1.67	1.67 to 16.7	16.7 to 66	>66
2,000 yd^2	0.052 to 0.14	0.14 to 2.2	2.2 to 22.2	22.2 to 88	>88
3,000 yd^2	0.078 to 0.20	0.20 to 3.3	3.3 to 33.3	33.3 to 132	>132
5,000 yd^2	0.13 to 0.34	0.34 to 5.6	5.6 to 55.5	55.5 to 220	>220
10,000 yd^2	0.26 to 0.68	0.68 to 11.1	11.1 to 111	111 to 440	>440
50,000 yd^2	1.3 to 3.4	3.4 to 55.5	55.5 to 555	555 to 2,200	>2,200
100,000 yd^2	2.6 to 6.8	6.8 to 111	111 to 1,110	1,110 to 4,400	>4,400
150,000 yd^2	3.9 to 10.2	10.2 to 167	167 to 1,665	1,665 to 6,600	>6,600
200,000 yd^2	5.2 to 13.6	13.6 to 222	222 to 2,220	2,220 to 8,800	>8,800
400,000 yd^2	10.4 to 27.2	27.2 to 444	444 to 4,440	4,440 to 17,600	>17,600
600,000 yd^2	15.6 to 40.8	40.8 to 666	666 to 6,660	6,660 to 26,400	>26,400
800,000 yd^2	20.8 to 54.4	54.4 to 888	888 to 8,880	8,880 to 35,200	>35,200
1,000,000 yd^2	26 to 68	68 to 1,110	1,110 to 11,100	11,100 to 44,000	>44,000

Table is based off of information in NOAA's *Open Water Oil Identification Job Aid for Aerial Observation*.

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DISCOVERY / INVESTIGATION

The Enbridge Responder will take action to mitigate the situation and prevent escalation if safe to do so. For the initial action it is important to remember:

- Don't try to control more area than can be effectively isolated and controlled ;
- The more time, distance and shielding between the Enbridge Responder and the released product, the lower the risk;
- Designate an emergency evacuation signal and identify muster points if emergency evacuation is necessary;
- Ensure appropriate PPE;
- Ensure compliance to safety and health policies for working alone
- Never permit response personnel to perform activities in areas where un-ignited gasses or vapors may accumulate; and
- Assess the hazards posed by the release (health, physical, chemical, other).

Immediately inform the Control Center and contact the QI/IC and provide a situation report. Assess the emergency level and activate the ICS based on need.

The most qualified Enbridge Responder on scene will assume the role of IC and direct on-scene response activities until otherwise relieved.

IDENTIFYING NGL RELEASES

- Indications of an NGL release include:
- Cloud of steam or mist (caused by condensation and freezing moisture);
- Ice buildup on exposed pipe, or frozen ground around an underground pipe;
- Brown vegetation (indicates soil saturation);
- Yellow-stained snow (may indicate NGL accumulation under the snow); and/or
- Odor (which is the condensate fraction of NGL).

STANDARD SAFETY PRECAUTIONS

- Ensure proper documentation has been completed (Safe Work Permit, Field Level Hazard Assessment, etc.)
- Determine the wind direction and approach cautiously from upwind.
- Park vehicles upwind in vapor-free areas and on high ground, if possible.
- Shut down vehicles when not in use.
- Eliminate or shut off all potential ignition sources in the immediate area.
- Explore the suspected release area only when wearing appropriate PPE; explore on foot, using the buddy system if possible.
- Do not carry ignition sources.
- Do not attempt to walk in product releases or vapors.
- Maintain constant or scheduled communication "buddy" or back-up personnel.
- Use intrinsically safe equipment (e.g., flashlights, two-way radios, gas detectors with audible alarms).

Assess the site for potential impacts, for example:

- Electrical lines down or overhead.
- Unidentified visible liquid or solid products.
- Visible vapors.
- Odors or breathing hazards.
- Fire, sparks or other ignition sources.
- Holes, caverns, deep ditches, fast water or steep slopes nearby.
- Local traffic.
- Ground conditions (dry, wet or icy).

There is no one single barrier that will effectively combine both chemical and thermal protection. Also any type and level of impermeable protective clothing creates the potential for heat stress injuries. Remember that PPE is the LAST line of defense. Enbridge responders have been seriously burned and injured because they did not use their protective clothing and equipment.

Flammable liquids and gases give off a tremendous amount of radiant heat. Responders need to be aware and protect exposed areas as appropriate. No attempt should be made to extinguish a flammable gas fire. Always control or isolate the source of the leak as best as possible. If the source can't be isolated, then attempt to reduce the operating pressure of the pipeline. Try and permit the fire to self-extinguish, if possible and consume any residual fuel that may remain inside or outside the pipeline.

In addition to the standard safety precautions, when exploring outdoors use a gas detector to determine the presence of vapors. Natural gas is odorless and colorless. However, even if there is no odor present or there is an odor, a dangerous concentration may be present.

A combustible gas indicator (CGI) or a gas flame ionization detector (FID) could be used to determine the flammability hazards. Most CGIs and flammable gas detectors are set to alarm at 10% of the LEL of the gas upon which the sensor is calibrated (approximately 4000 ppm). In the natural gas industry, virtually all CGIs and flammable gas sensors are calibrated on pentane.

STANDARD SAFETY PRECAUTIONS, cont.

Natural gas may follow disturbed soil and enter grade areas around the pipe or other venues. The flammability range of natural gas is 4% to 15% in air by volume. Controlling ignition sources is a priority. Some examples you may not have thought about are:

- Doorbells
- Flashlights
- Telephones
- Burglar Alarms
- Heating Systems
- Vehicles and Trucks
- Pagers
- Light Switches
- Garage Door Openers

Since natural gas is extremely flammable the following should be considered:

- With any leak, always anticipate and expect that ignition will occur;
- Natural gas released inside buildings presents one of the greatest flammable hazards to emergency responders. Buildings full of natural gas should only be approached when needed with extreme caution and with a minimum number of personnel;
- Natural Gas / Methane (UN1971) is lighter than air and will rise;
- Do not close main valves or any other large transmission or distribution valves. This can lead to serious problems elsewhere in the natural gas pipeline system;
- Upon ignition, vapors may burn back to the source of gas; therefore make sure source is controlled;
- Vapors may cause dizziness or asphyxiation;
- Establish an effective and safe perimeter;
- Position all response support out of danger zone;
- Secure the scene and deny entry;
- If necessary, evacuate the public to a safe distance;
- Monitor the atmosphere, using multiple monitors where possible;
- Monitor for gas traveling away from source toward exposures;
- Control ignition sources (smoking, open flames, vehicles, internal combustion engines and motors);
- Do not operate electric devices such as switches, etc. Sparks could cause ignition; and
- If safely possible, ventilate the area, keeping in mind that during this process, if the flammable atmosphere is above the UEL the gas may pass back through the flammable range of 4% to 15% gas to air.

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PROMPT & EFFECTIVE MANAGEMENT OF RELEASE

Small Release

If the released NGL is creating a local safety hazard, the NGL may then be ignited following the procedure for igniting NGL (see below). Where available, water fog may be used to break up and disperse small vapor clouds. Air movers are also an effective method of providing air circulation in confined areas or in buildings. Ensure they are safe (intrinsically safe) to use in that environment.

Large Release

If the NGL release is large or the NGL batch cannot be pumped past the release site, ignite the NGL following the standard procedure.

If the vapor plume is moving toward a populated area the area will be evacuated. If the vapor cloud cannot be ignited and repair procedures must begin, all equipment and vehicles will be located a minimum of 0.5 mi (0.8 km) upwind of the leak site. Continuously monitor the perimeter of the vapor cloud to detect any shift in the vapor cloud.

Isolating the Pipeline Section

When NGL is escaping uncontrolled, the affected pipe section will be immediately isolated by closing the appropriate sectionalizing valves.

Relieving Pressure

Use one of the following methods to relieve pressure at a pipeline section releasing NGL:

- If NGL is present at the blowdown valve, install a pipe discharge line and flare the NGL
- Transfer the product to a properly rated pressure containment vessel
- Install a pump complete with a discharge check valve to pump across the downstream sectionalizing valve
- If elevation does not provide a standing head in the isolated section, a transfer pump connected to the blowdown valve will be needed to fill a properly rated pressure containment vessel

Evacuation/Site Security

Due to the high flammability of NGL and the possibility of a vapor plume forming, it may be necessary to evacuate workers and visitors from the area, and to secure the site to protect the public and property.

Digging out a Release Site

Repair operations involving NGL are difficult, slow and hazardous. Pockets of gas may be trapped in the ground. In addition, if NGL has been leaking for some time, the condensate portion may have saturated the soil for a considerable distance around the site. Before beginning excavation or line repairs, active NGL releases are ignited or left burning.

PROMPT & EFFECTIVE MANAGEMENT OF RELEASE , cont.

When digging out an NGL release site, the following methods will be used:

- Ensure liquid has replaced the NGL at the release site;
- Follow appropriate Company standards on pipeline excavation;
- Ensure fire extinguishing equipment is immediately at hand;
- Consider obtaining external firefighting services and equipment;
- If no wind is blowing, use air movers to keep air moving across the worksite and away from workers;
- Continuously monitor air using a gas detector; and
- Constantly monitor wind direction

IGNITING AN NGL PLUME

Before ignition of an NGL plume:

- Ensure the area where people are congregating is and remains a Cold Zone by the use of gas detectors;
- Ensure proper permits for firearm and ignition if applicable;
- The area of the vapor plume is maintained clear of people and vehicles and people are prevented from going near the area;
- The potential impact on adjacent facilities is evaluated;
- Every attempt to obtain clearance from Regional Management and the municipal fire chief has been made;
- Stage fire extinguishers nearby;
- Review flare pistol safe handling procedures (jurisdictional firearm rules apply); and
- Confirm that the available pistol is in working order, verify the number of flares available and ensure that they are the correct type for the firearm.

If contact with the QI/IC cannot be obtained quickly (e.g. no cell phone communication in area or no definite answer given) and there is an immediate risk to the public, the Enbridge Responder or a designee trained in NGL ignition may proceed with ignition.

If applicable have local fire department on-scene prior to any attempt at ignition. Review the Ignition Decision Flowchart on the next page.

Ignition Decision Flowchart

Consider the Impact of Ignition on People, the Environment and Property.

Assess as follows:

If the plume remains un-ignited or the wind direction changes:

- Are responders or the public at risk?
- Is there a greater potential for property and/or environmental damage due to accidental ignition or explosion?

No →

Continuously review:

- Employee and public safety considerations.
- Existing site conditions and changes.
- Site control procedures.
- Monitoring of the Emergency Hazard Area.

Yes ↓

Review pre-ignition considerations:

- Consider safer alternatives (i.e. close valves, ventilate, etc.)
- Assess the area/perimeter of impact
- Proximity to residences, public facilities, towns or urban centers.
- Status of evacuations.
- Wind conditions and general topography.
- The potential for changes in weather and its implications.
- Transition from daylight to night darkness.
- Fire hazard after ignition in relation to adjacent area.
- Safety of all personnel in the Hazard Area.
- The presence of other underground or overhead utilities.De-energize if possible
- Will the situation worsen by burning seals out of adjacent valves or by starting pumps on fire?
- Controlled depressurization at other locations in the damaged section will reduce down time.

IS IGNITION THE MOST FAVORABLE CONTROL OPTION TO MINIMIZE THE HAZARDS?

No →

- Continue with release control procedures onsite.
- Review alternative control procedures.

Yes ↓

- Is there time to discuss the ignition decision with Regional QI/IC, Regional On-Call or People Leader?

No → Go to Ignition Procedures Flowchart.

Yes ↓

- Review decision to Ignite with Regional QI/IC, On Call or People Leader
- Determine post-ignition emergency service requirements.
- Assemble and brief Ignition Team.
- Go to Figure 2: Ignition Procedure Flowchart.

Ignition Procedure Flowchart

Onsite personnel will coordinate and lead the safe ignition of gas release.

PREPLANNING

Prior to ignition the Enbridge Responder will:

- Consider the path of the flair projectable
- Confirm that the area has been checked for habitation and that a complete evacuation of non-essential personnel has been completed.
- Isolate the Warm Zone / Hot Zone using manned roadblocks.
- Assemble ignition Team (2 people when possible).
- Ensure Ignition Team is protected with appropriate personal protective equipment.
- Review wind conditions (direction and speed), and erect windsock and streamer (if time permits).
- Monitor the area for combustible gas.
- Fully discuss ignition procedures.
- Check radio communications.
- Confirm whether overhead wires and electrical sub-stations have been de-energized.

↓

APPROACH

Select position to attempt safe ignition that will:

- Allow for safe retreat.
- Provide cover from the initial flash.
- Be upwind of the gas leak 250m (820 ft) minimum from the edge of identified vapor plume for first attempt – this may be reduced in subsequent attempts as long as it is safe to move forward).
- Be in an area where no combustible gas is detected.
- Shoot for the outer edge of the cloud

↓

ATTEMPT IGNITION

- Aim for the outer edge of plume. The center of the plume is too rich to ignite. Arcing shots or bounce shots can be used.
- Turn away from target to avoid heat flash.

↓

Is the Plume ignited?

No ←

REPEAT IGNITION

- Continue approaching inwards using short distances and repeat (as long as safe to do so) until successful. Do not go closer than 100m (330 ft) from plume.

Yes →

POST IGNITION

- Advise Regional Management.
- Continue to monitor downwind for gas accumulations.
- Maintain security around immediate area.
- Assist emergency service crews with any fire control measures needed.

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FIRE RESPONSE STANDARD FIRES

1. Look or call for help.
2. Notify fire department.
3. Activate fire alarm, if one is available.
4. Implement Emergency Procedures and Evacuation Plan.
5. If safe to do so, shut off sources of fuel to fire and facility electricity and eliminate ignition sources.
6. Shut down pumping only if essential to fight or control the fire to stop a leak.
7. Report fire to the control center and initiate reporting.

FOAM SYSTEMS COMPRESSOR BUILDINGS

If one of the UV/IR fire detection sensors in the compressor building detects a fire:

1. An emergency shutdown (ESD) condition is triggered, which automatically shuts down any operating units, isolates the station from the mainline, and vents all gas from the station.
2. A warning horn sounds.
3. The fire pump starts, drawing water from the concrete tanks and mixing it with the liquid foaming agent.
4. Foam is pumped from the control building to the compressor building, where it is ejected through the foam heads in the ceiling, and continues until it runs out or the foam system is deactivated. Do not use water to extinguish fires in or close to electrical switchgear.

FACILITIES WITH CO2 FIXED SYSTEMS

When a fixed system is triggered, an audible pre-discharge signal sounds as a warning that the system will activate within 30 seconds. In compressor unit enclosures, where there is no delay or audible alarm, there is a visual indication that the CO2 system is activated.

1. As soon as fire is detected or audible pre-discharge signal sounds, evacuate protected area.
2. If extinguishing system does not trigger automatically, manually activate system.
3. Follow standard fire response procedure.

VEHICLE FIRES

1. Sound facility alarm (if applicable).
2. Assess situation.
3. If fire is small and in early stages, and it is safe to do so, attempt to extinguish using dry chemical extinguishers. Otherwise, withdraw and secure area.
4. Call emergency services.

MAINLINE FIRES

1. Assess fire.
2. Initiate fire response:
   - if fire is small and in early stages, and it is safe to do so, attempt to extinguish it using multiple portable extinguishers simultaneously, including 150lb or 350lb wheeled unit.
   - if fire is large or fully involved:
     - follow standard fire response procedure
     - notify nearby tenants, landowners and businesses
     - build a fire break around perimeter of fire if possible
   - if fire is beside a pipeline and pipeline is not leaking, continue pumping to keep pipeline cool.

STATION YARD PIPING OR MANIFOLD FIRES

1. Follow standard fire response procedure.
2. Attempt to contain fire with earth dikes, water fog or foam blanket.
3. Ensure all ignition sources (e.g., electrical short circuits) have been isolated or eliminated.
4. Extinguish fire with foam or dry chemical extinguishers.
5. Cool hot pipes and tanks with water, if possible.

SUMP FIRES

1. Assess fire.
2. Initiate fire response:
   - if fire is small and in early stages, and it is safe to do so, attempt to extinguish it using dry chemical extinguishers
   - to keep fire from spreading or reigniting, use available water to cool adjacent facilities or sump metal
   - if fire is large or fully involved, follow standard fire response procedure
3. Isolate sump and close lid if possible.

NATURAL GAS FIRES

1. Follow standard fire response procedure.
2. Close appropriate valves to isolate pipe section.
3. Consider blowing down pressure at a safe location.
4. Let fire burn down.
5. Do not extinguish a fire involving natural gas until fire burns down, flow of gas can be stopped and there is no chance of re-ignition.

PCB FIRES

1. Evacuate and secure area.
2. Call fire department or HAZMAT representative.
3. Ensure power is off to equipment containing PCB (e.g., transformer or capacitor).
4. If fire is within an enclosed building, close air inlets/outlets and access to building ventilation system.
5. Assist fire fighters and/or HAZMAT officials in extinguishing fire.

DIESEL STORAGE TANK FIRES

1. If possible and safe to do so, isolate diesel tank by closing remote or manually operated valves.
2. Remove any combustible materials (e.g., timber, rags) located near fire.
3. Allow tank to burn itself out.
4. Keep other installations in the vicinity cool with water spray if possible.

TANK FIRES

1. Activate Alarm
2. Evacuate area.
3. Notify the control center.
4. Notify fire department, if applicable.
5. From a safe distance, assess type of fire.
6. Implement emergency procedures and evacuation plan.
7. Activate terminal Pre-Fire Plan for:
   - First Responder actions
   - local fire department contacts and equipment list
   - Safety Data Sheets (SDS)
   - tank fire and tank datasheets

FLASH FIRE, VAPOUR CLOUD EXPLOSION, POOL FIRE

HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient. For mixtures containing alcohol or polar solvent, alcohol- resistant foam may be more effective

1. Do not extinguish fire unless flow can be stopped and it is safe to do so
2. Keep unauthorized personnel away.
3. Use water in flooding quantities as fog. Solid streams of water may spread fire.
4. Cool all affected containers with flooding quantities of water.
5. Apply water from as far a distance as possible.
6. If fire becomes uncontrollable or container is exposed to direct flame - consider evacuation

8.8.7 - FIELD RESPONSE TEAM - FIRE OR EXPLOSION

ENBRIDGE

***Under no circumstances are Enbridge employees to engage in offensive fire-fighting tactics unless they are trained, certified, and have the correct PPE and firefighting equipment**

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8.8.8 - WILDFIRE

Actions Before/During a Wildfire:

- Follow FireSmart principals, continuously manage vegetation in and around facilities
- Identify evacuation staging areas in evacuation plans for use during a wildfire event
- Set up triggers for evacuation
- Establish air monitoring at all manned facilities impacted
- Ensure personnel are aware of evacuation alerts, evacuation routes and evacuation staging areas away from the wildfire.
- Identify methods of transportation for evacuation (air, ground, water)
- Obtain and maintain emergency contact lists
- Decrease the number of personnel onsite during a wildfire event
- Stay tuned to local media for updates on the wildfire conditions

Release Mitigation Actions

Actions that can be taken during a wild fire to mitigate a release include:

- Shutting down the lines, etc.
- Isolation of energized systems
- Reassess the need to further manage vegetation in and around the facilities and cut it back further if required
- Gain situational awareness of fire behavior, monitor fuel spread and wind direction to predict the how the hazard area may change
- Conduct fly-over patrol for fire behavior impact in coordination with local authorities and respecting any NOTAMs (notice to airmen)

Additional Notifications

- Safety Coordinator/Officer
- State/Provincial Wildfire and/or Forestry officials

Additional References

www.ready.gov/wildfires
www.firewise.org/wildfire-preparedness.aspx
www.redcross.org/prepare/disaster/wildfire
www.wildfire.alberta.ca/fire-smart-industry (see oil and gas)

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8.8.9 - EARTHQUAKE

Actions During an Earthquake

If outside:

- Stay outside, do not enter a building
- Stay away from buildings, utility wires and fuel and gas lines
- If outside, stay away from the exterior walls of a building
- Once on the open, get down low (to avoid being knocked down by strong shaking) and stay there until the shaking stops

If in an vehicle:

- Stop as quickly and safely as possible
- Move your vehicle to the shoulder or curb, away from utility wires and under or overpasses
- Stay in the car and set the parking brake
- Turn on the radio for emergency broadcast information
- Watch for hazards created by the earthquake

If inside:

- Do not evacuate outside, stay where you are until the shaking stops
- "Drop, Cover and Hold On"
    - DROP down onto your hands and knees
    - COVER your head and neck
    - HOLD ON to your shelter
- Do not get in a doorway as this doesn't provide protection from falling debris
- Stay away from glass and windows

Additional Notifications

- Enbridge Geohazard Department
- Safety Coordinator/Officer

Actions After an Earthquake

- Check for injuries, administer first aid if required and call for assistance
- Check for secondary hazards that may have resulted after the earthquake, keeping in mind aftershocks may strike at any time
- Extinguish small fires, shut of the water supply if broke pipes are leaking, shut off the electricity when damaged wiring threatens to spark fires, shut of the off the gas if you suspect a leak
- Assess Damage (establish a Damage Assessment Team). Access to buildings that have sustained structural damage should be prohibited until they can be assessed by a structural engineer.
- Evacuate building(s) when any of the above hazards are present or if there is structural damage

Release Mitigation Actions

The following actions could be taken during an earthquake to mitigate further damage:

- Isolate and/or shut down energized systems to anticipate aftershock and/or additional tremors
- **….others from Geohazard group...**

Additional References

- Earthquake Monitoring System, USGS: www.earthquake.usgs.gov/monitoring/
- www.getprepared.gc.ca/cnt/hzd/rthqks-en.aspx
- www.fema.gov/earthquake-safety-home

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PERSONNEL PROTECTIVE ACTIONS

Prevent and mitigate damage to pipeline facilities and ensure public and environmental safety in areas affected by flooding:

Actions to Consider Before a Flood:

- Utilize experts in river flow, such as hydrologists or fluvial geomorphologists, to evaluate a river's potential for scour or channel migration at each pipeline river crossing
- Evaluate each pipeline crossing a river to determine the pipeline's installation method and determine if that method (and the pipeline's current condition) is sufficient to withstand the risks posed by anticipated flood conditions, river scour, or river channel migration. In areas prone to these conditions and risks, consider installing pipelines using horizontal directional drilling to help place pipelines below elevations of maximum scour and outside the limits of lateral channel migration.
- Determine the maximum flow or flooding conditions at rivers where pipeline integrity is at risk in the event of flooding (e.g., where scour can occur) and have contingency plans to shut down and isolate those pipelines when those conditions occur
- Evaluate the accessibility of pipeline facilities and components that may be in jeopardy, such as valve settings, which are needed to isolate water crossings or other sections of pipelines
- Preposition personnel and equipment in the event that emergency action is required including, shutdown, isolations or containment
- Extend regulator vents and relief stacks above the level of anticipated flooding as appropriate
- Coordinate with emergency and spill responders on pipeline locations, crossing conditions, and the commodities transported. Provide maps and other relevant information to such responders so they can develop appropriate response strategies

Actions to Consider During a Flood:

- Coordinate with other pipeline operators in flood areas and establish emergency response centers to act as a liaison for pipeline problems and solutions
- Deploy personnel so that they will be in position to shut down, isolate, contain, or perform any other emergency action on an affected pipeline
- Determine if facilities that are normally above ground (e.g., valves, regulators, relief sets, etc.) have become submerged and are in danger of being struck by vessels or debris and, if possible, mark such facilities with U.S. Coast Guard approval and an appropriate buoy
- Perform frequent patrols, including appropriate overflights, to evaluate right- of-way conditions at water crossings during flooding and after waters subside. Report any flooding, either localized or systemic, to integrity staff to determine if pipeline crossings may have been damaged or would be in imminent jeopardy from future flooding
- Have open communications with local and state officials to address their concerns regarding observed pipeline exposures, localized flooding, ice dams, debris dams, and extensive bank erosion that may affect the integrity of pipeline crossings

Personnel Protective Actions

Actions to Consider After a Flood:

- Following floods, and when safe river access is first available, determine if flooding has exposed or undermined pipelines because of new river channel profiles. This is best done by a depth of cover survey
- Where appropriate, surveys of underwater pipe should include the use of visual inspection by divers or instrumented detection. Pipelines in recently flooded lands adjacent to rivers should also be evaluated to determine the remaining depth of cover. You should share information gathered by these surveys with affected landowners. Agricultural agencies may help to inform farmers of potential hazards from reduced cover over pipelines
- Ensure that line markers are still in place or are replaced in a timely manner. Notify contractors, highway departments, and others involved in post-flood restoration activities of the presence of pipelines and the risks posed by reduced cover

Site Control & Safety

ADDITIONAL FLODDING SAFETY

- Watch for high water, be aware of sudden changing water conditions and/or increased flow rates

Asset Mitigation Actions

Actions that can be taken during a flooding event to mitigate a release include:

- Shutting down the lines, etc.
- Isolation of energized systems

Notifications

Notifications in addition to standard emergency notification procedure:

- Safety Coordinator/Officer
- GeoHazards Program representative

Additional References

www.getprepared.gc.ca/cnt/hzd/flds-en.aspx
www.ready.gov/floods
PHMSA Advisory Bulletin Volume 81, Number 11 issued Jan 18, 2016

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8.8.11 - TORNADO

Actions Before/During a Tornado

- All employees must proceed immediately to the closest storm shelter. See building site maps and terminal evacuation map for shelter locations.
- If you are accompanied by visitors, bring them to your designated shelter.
- If you are caught outside with no shelter:
  * Lie flat in a nearby ditch or depression and cover your head with your hands. Be aware of the potential for flooding.
  * Do not get under an overpass or bridge. You are safer in a low, flat location.
  * Never try to outrun a tornado in urban or congested areas in a car or truck. Instead, leave the vehicle immediately for safe shelter.
  * Watch out for flying debris. Flying debris from tornados cause most fatalities and injuries.

Actions After a Tornado

- Check for injuries, administer first aid if required and call for assistance
- Check for secondary hazards that may have resulted after the tornado
- Extinguish small fires, shut of the water supply if broke pipes are leaking, shut off the electricity when damage wiring threaten to spark fires, shut of the off the gas if you suspect a leak
- Evacuate the building when any of the above hazards are present or if there is structural damage

Additional Notifications

- Enbridge Geohazard Department
- Safety Coordinator/Officer

Asset Mitigation Actions

Actions that can be taken during a tornado to mitigate a release include:

- Shutting down the lines, etc.
- Isolation of energized systems

Additional References

www.ready.gov/tornados
www.redcross.org/prepare/disaster/tornado
www.getprepared.gc.ca/cnt/hzd/trnfs-en.aspx

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SECURITY CLASSIFICATION

Security information is received from multiple sources. They include employees, industry, public, local policing, provincial/state, federal organizations, This intelligence, normally delivered via phone, email, mail and/or media channels is to be assessed by the Enterprise Security. Once information is examined, subsequent advisories or notifications are issued globally or to the regions affected.

Level 1 Security provides guidelines on minimum requirements for facilities. These include access control, fencing, gates, security guards, employee awareness, communications, facility lighting, intrusion detection, closed-circuit video and general policies/practices.

Level 2 Security provides direction in the event security measures require elevating. Changes typically include tighter perimeter control, visitor restrictions and increased perimeter checks.

Level 3 Security provides direction in the event that security measures require elevation based on a credible, imminent threat. Changes typically include Level 2 Security plus further personnel and vehicle restrictions, the use of security guards, more frequent and random perimeter checks, work restrictions and potentially operational restrictions.

Although most anonymous security threats are hoaxes intended to create an atmosphere of anxiety and panic in order to interrupt normal operational activities, all threats must be taken seriously.

SUSPICIOUS PACKAGE

If a threat is received in the mail, (a) place all letters and envelopes associated with the mail in a bag or large envelope, and (b) immediately notify the management/on-call person and local law enforcement.

Indicators of suspicious mail/packages might include:

- No return address, or a return address that does not make sense;
- Unusual rigidity, bulk, or irregularity;
- Handwritten or poorly typed addresses or labels;
- Peculiar odors, especially sweet smells;
- Excessive binding, taping, or tying material;
- Excess postage, lack of postage, or un-canceled postage;
- Mismatching postmark and return address;
- Foreign writing, address, or postage;
- Incorrect spelling of common names, titles, or places;
- Leaks or stains; and/or
- Protruding wires, string, or tape.

If suspicious mail/package is received in the mail or observed at company facilities:

- Immediately notify management/on-call person who in turn should notify local law enforcement.
- Leave the suspicious package in its present location.
- Do not open or physically handle the package, or allow anyone to touch or move the package.
- Do not use two-way radios and cellular telephones within 300 feet of the package.
- Do not cover the package.

SUSPICIOUS ACTIVITIES

If any of the following are observed at company facilities, immediately notify the regional management/on-call person:

- Unknown personnel;
- Unidentified vehicles or vehicles operated out of the ordinary;
- Abandoned parcels or packages; and/or
- Suspicious activities (e.g., loitering).

PROTESTORS

Protestors

Do not approach protestors if they seem angry or violent in any way. When dealing with protestors:

- Show concern for their cause.
- Be cordial.
- Be empathetic.
- Advise them they will receive a quick response.

Maintain crowd control using either onsite security officers, or if necessary, police intervention. If safe, speak to the group leader to gather information about the protestors. Share information with police as appropriate. Before issuing an initial response statement, wait for direction from Public Affairs.

THREAT ASSESSMENT

Upon notification of a bomb threat or other security threat, the Regional Management/on-call person is responsible for:

- Assessing the seriousness of the threat;
- Determining the appropriate level of response;
- Ensuring the police have been alerted;
- To assess the seriousness of a threat, consider:
  - Is the information credible (e.g., identity of the caller, likelihood of facility access to place the explosive device)?
  - Is the information corroborated (e.g., were suspicious activities or personnel observed)?
  - Is the threat specific (e.g., detonation time, location, type of explosive device, intended target)?
  - What are the potential consequences?

INITIAL RESPONSE

Based on the threat assessment, consider the following initial response options:

- General facility evacuation (i.e., if the threat is confirmed or is considered credible and serious).
- Do not evacuate (i.e., if the threat is considered a hoax and not credible).

ENBRIDGE

BOMB EXPLOSION, CONFIRMED OR CREDIBLE THREAT

If (a) there is a bomb explosion, or (b) a security threat is confirmed or considered credible and serious, the regional management/on-call person is responsible to:

- Be pro-active and activate ICS.
- Evacuate workers and visitors from the area according to the regional Emergency Procedures and Evacuation Plan.
- Secure the area to ensure the safety of workers, visitors, and the public.
- If firefighting or other medical response becomes necessary, activate the ICS and mobilize response personnel and equipment.

The Company has developed procedures to be used in responding to bomb threats, identifying strangers in the work place, or other suspicious communications, some of which may be related to acts of terrorism or abductions.

Bomb Threat Call Procedures

Bomb threats or warnings will usually be given by telephone; anyone on site could receive such a call. The individual receiving the bomb threat should obtain as much information as possible. The use of the Bomb Threat Information Form is highly recommended. (See Section 4 – Forms)

- The person receiving the call should, if possible, attempt to have someone else notify a supervisor while the bomb threat call is in progress.
- Remain calm; Keep the caller on the line for as long as possible. Try to keep the caller talking to learn more information. DO NOT HANG UP, even if the caller does.
- Listen carefully, be polite, and show interest.
- If your phone has a display, copy the number and/or letters from the display.
- Once the caller has terminated the call; DO NOT HANG UP, but from a different phone contact the supervisor immediately with information and await instructions.
- The supervisor will notify local authorities and company management. Police will want to speak with the person who received the call directly, thus should remain available to provide details to police.
- Secure access and evacuate the facility until the local authorities have cleared the facility for re-entry.
- A complete written record of each incident shall be retained by the supervisor and any photographs or physical evidence shall be preserved until further disposition of the incident by the company.
- The supervisor should ensure that a follow up investigation into the incident has been conducted and appropriate additional security measures, if any, have been established and any identified issues have been resolved.

Bomb Threat Received by Hand Written Note (In addition to above procedures)

- Contact Supervisor immediately
- Handle note as minimally as possible.

Bomb Threat Received by E-Mail (In addition to above procedures)

- Contact Supervisor immediately
- Do not delete the message.

UNCONFIRMED THREAT

If unable to confirm a security threat, the Regional Management/on-call person is responsible to advise employees, the police and the Control Center, and return to normal operations.

PROCEDURES

- Person in Charge – Call 911 and activate fire alarm.
- Eliminate all ignition sources.
- Begin Emergency Shut-Down if necessary.
- If person(s) down, refer to Medical Emergency Checklist.
- When fire is noticed at any facility, secure the source if safe to do so.
- Account for all personnel in the unit or area where the fire occurred.
- Evacuate all non-essential personnel, if necessary.
- Establish communications. Contact PIC.
- Search for and rescue missing or injured personnel as directed by appropriate authority.
- Use the buddy system.
- Ensure the Facility Operators control the process.
- Conduct air monitoring to ensure safety of personnel and appropriate PPE is required to respond. (For additional information, see the Site Safety and Health Plan and/or the Safety Coordinator.)
- Conduct initial firefighting by personnel (trained in the use of firefighting equipment and PPE), which may include use of monitors, deluge systems, and portable fire extinguishers.
- Coordinate evacuation of nearby residents with local responders.

8.8.13 Radioactive Source Emergencies

In the event of an accident (e.g. fire, explosion), damage or any other incident that may affect the integrity of a radiation source (e.g. nuclear densitometers, either portable or fixed):

- Stop all activity in the immediate area
- Evacuate the immediate vicinity of the source head and clear personnel within a 6 meter radius perimeter around the source head
- Notify local Operations personnel and/or call the 24-hour emergency number shown on the warning sign
- Do not allow workers to re-enter the area until a radiation survey is completed by a radiation specialist
- If the device has sustained physical damage, contact a radiation specialist to leak test the device
- Follow company procedures for required initial notifications
- Notify the CNSC 24 hour Duty Officer and inform them of the incident at 613-996-0479.

8.9 Control Points

Tactical Control Point Planning (TCPPs) is the development and maintenance of plans containing detailed tactics that are identified for strategic locations (Tactical Control Points) along the Company's system. These plans provide fast and effective site-specific response tactics to ensure that sensitive resources are protected. The tactics should be flexible to varying conditions where possible. Tactical Control Point Plans complement this Integrated Contingency Plan. During a response, the interpretation of Tactical Control Point Plans should be flexible; resources and tactics may need to be adjusted (or discontinued) depending on the nature and complexity of the incident or surrounding environmental conditions. Tactical Control Point Plans are not intended as a replacement to communicating with Environmental representatives to ensure resources at risk are adequately identified and protected, nor should they negate any tactical or control point location change recommendations from the field responders.

During an Incident:

- ✓ Refer to Tactical Control Point Plans for guidance on protection, containment and recovery locations and strategies
- ✓ Contact an Environmental representative for detailed screening of the site during a response
- ✓ If required, assess site for hazards
- ✓ Prepare site prior to beginning tactics (grading/clearing)
- ✓ Seek permission if not already secured for any of the following:
    - Highways and secondary roads
    - Bridges
    - Campgrounds
    - Public boat launches
    - Private access points
    - Cut lines or remote access trails

9.0 RESPONSE EQUIPMENT

9.1 Spill Response Organizations – Internal & External Locations

Oil Spill Response Organizations (OSRO)	
CERTIFIED	
Marine Pollution Control Corp. (MPC) - (Superior)	24 Hr. 313-849-2333
T & T Marine Salvage, Inc. (Chicago & Superior)	24 Hr. 713-534-0700
ADDITIONAL	
1. Clean Harbors (Chicago)	24 Hr. 800-645-8265
2. Clean Harbors (North Dakota)	24 Hr. 800-645-8265
3. Future Environmental (Cushing)	24 Hr. 866-579-6900
4. HazMat Response, Inc. (Cushing)	24 Hr. 800-229-5252
5. ACEME Environmental (Cushing)	24 Hr. 855-563-2666
6. Environmental Restoration, LLC (Cushing)	24 Hr. 888-814-7477

To request Emergency Assistance, the Requesting Party or its Affiliate shall contact the Designated Representative of the Responding Party. A formal written request from the Requesting Party's Designated Representative shall follow in the form set out in the Schedule "B" within twenty-four (24 hours). Designated Representative means the person(s) authorized to request or release company resources to receive or provide Emergency Assistance as requested, as set out in the Designated Representative Contact List.

9.2 Local Response Equipment

It is the responsibility of each Area Supervisor/ Maintenance Team Leader to ensure that the spill response equipment is inventoried annually and restocked as resources are expended.

The following table lists the Enbridge owned primary spill recovery equipment and its capabilities. Emergency response trailers contain hard boom, sorbent boom, skimmers, and porta-tanks as well as various tools for initial emergency response to both land and water releases.

Enbridge has an OSRO Master Service Agreement with Marine Pollution Control Corp. (MPC). The agreement and list of OSRO Equipment can be found in Annex 2.

Resource Type	Item Description	Total
Bemidji Cold Storage		
BOAT & RESPONSE VEHICLE	BOAT , WORK, ALUMACRAFT, 14FT, 25 HP, EVINRUDE, C/W TRAILER/40020777	1 Each
BOAT & RESPONSE VEHICLE	BOAT, WORK, ALUMACRAFT, 20FT, 90 HP, EVINRUDE, c/w trailer/40020778	1 Each
BOAT & RESPONSE VEHICLE	BOAT, WORK, LUND, 18FT, 150HP, YAMAHA MOTOR, C/W TRAILER/40020775	1 Each
BOAT & RESPONSE VEHICLE	BOAT,VESSEL, LUND, 20FT, Aluminum, ENGINE Outboard, 90 EVINRUDE, C/W TRAILER/40020776	1 Each
SPECIALIZED EQUIPMENT	ARGO, Diesel, AMPHIBIOUS, PERSONNEL, ALLWHL DRIVE, 950DT/40013663	1 Each
SPECIALIZED EQUIPMENT	VEHICE, OFF HIGHWAY, HYDRATEK, AMPHIBIOUS/40020785	1 Each
SPECIALIZED EQUIPMENT	Vehicle,Off Highway Vehicles, SNOWMOBILE/40020781	1 Each
SPECIALIZED EQUIPMENT	VEHICLE, OFF HIGHWAY, Gasoline, SIDE BY SIDE, 4WHL DRIVE/40015239	2 Each
Bemidji Winter Warehouse		
SHALLOW WATER EQUIPMENT	PUMP, HYDRAULIC, STANLEY, SMP 22/40020790	1 Each
SKIMMER	SKIMMER, GROOVED DRUM, OSYSTSK340, 70 G.P.M., TDS118G, ELASTEC/AMERICAN MARINE, HYDRAULIC Drive, SHALLOW WATER/40013608	2 Each
SKIMMER	SKIMMER, GROOVED DRUM, 8 FT,	2 Each

Resource Type	Item Description	Total
	ELASTEC, UN35/40020828	
SKIMMER	SKIMMER, SMOOTH DRUM, 8 FT, ELASTEC, TDS136/40020811	1 Each
SPECIALIZED EQUIPMENT	GENERATOR, HONDA, EM65000SX (gas powered)/40020367	1 Each
Bemidji ER Boom Trailer, Unit 292		
SHALLOW WATER EQUIPMENT	DAM, SELF INFLATING, 28IN X 25FT (7.5M), ELASTEC/AMERICAN MARINE, WA-2825, WATERGATE/40013619	2 Each
SKIMMER	SKIMMER, GROOVED DRUM, 8 FT, ELASTEC, UN35/40020828	1 Each
SKIMMER	SKIMMER, GROOVED DRUM, OSYSTSK340, 70 G.P.M., TDS118G, ELASTEC/AMERICAN MARINE, HYDRAULIC Drive, SHALLOW WATER/40013608	1 Each
SKIMMER	SKIMMER, MANTA RAY/40020801	1 Each
SKIMMER	SKIMMER, MECHANICAL, DRUM, ELASTEC, 4FT, UNO481/40020830	1 Each
SKIMMER	SKIMMER, DRUM, MINI MAX, ELASTEC/AMERICAN MARINE/40020800	1 Each
SKIMMER	SKIMMER, SKIM PACK, MODEL 1800/40020799	1 Each
SKIMMER	SKIMMER, SMOOTH DRUM, 8 FT, ELASTEC, TDS136/40020811	2 Each
SPECIALIZED EQUIPMENT	TANK. PORTABLE, SEI INDUSTRIES/40020366	1 Each
Bemidji ER Leak Trailer, Unit 109		
SHALLOW WATER EQUIPMENT	PUMP, DIAPHRAM, 3IN. HYDRAULIC/40020793	2 Each
SHALLOW WATER EQUIPMENT	PUMP, TRASH, 2IN/40013876	1 Each
SORBENTS	PAD, ABSORBENT, OIL ONLY, 100PADS/BAG/40013873	10 Each
SORBENTS	PADS, ABSORBENT, PIG, 8IN, 10FT SECTIONS/40020794	5 Each
SPECIALIZED EQUIPMENT	GENERATOR, HONDA, 1000 WATT/40020792	1 Each
SPECIALIZED EQUIPMENT	GENERATOR, HONDA, 3500 WATT/40020791	1 Each
Bemidji ER Leak Trailer, Unit 220		

Resource Type	Item Description	Total
BOOM	BOOM, RIVER, CANADYNE, LONG SKIRT, 18"/40020795	350 Each
BOOM	BOOM, CONTAINMENT, MINI CORRAL/40020798	100 Each
BOOM	BOOM, CORRAL CONTAINMENT,/40020797	1000 Each
BOOM	BOOM, RIVER, CANADYNE, LONG SKIRT, 12"/40020796	350 Each
BOOM	BOOM, SORBENT, 3M, 4 X 10FT/40020829	9 Each
Clearbrook Cold Storage		
BOAT & RESPONSE VEHICLE	BOAT , WORK, ALUMACRAFT, 14FT, 25 HP, EVINRUDE, C/W TRAILER/40020777	1 Each
BOAT & RESPONSE VEHICLE	BOAT, WORK, ALUMACRAFT, 20FT, 90 HP, EVINRUDE, c/w trailer/40020778	1 Each
Clearbrook ER Trailer, Unit 528		
BOOM	Boom, Foam, RIVER, Optimax 1, 50FT, ELASTEC/AMERICAN MARINE P/N 00420501031/40013616	10 Each
BOOM	Bridle, Tow, W/Bullet Float, P/N 0540420F Elastec, For Airmax River Boom/40013602	5 Each
BOOM	VANE, BOOM, 20FT, C/W RUDDER, ELASTEC/AMERICAN MARINE,/40020400	1 Each
SKIMMER	SKIMMER, GROOVED DRUM, 8 FT, ELASTEC, UN35/40020828	1 Each
SORBENTS	PAD, ABSORBENT, OIL ONLY, 100PADS/BAG/40013873	5 Each
Clearbrook ER Trailer, Unit 529		
BOOM	BOOM,ABSORBENT, ELASTEC/AMERICAN MARINE, 5IN X 10FT/40020803	20 Each
BOOM	Boom, Foam, RIVER, Optimax 1, 50FT, ELASTEC/AMERICAN MARINE P/N 00420501031/40013616	10 Each
SKIMMER	SKIMMER, GROOVED DRUM, ELASTEC, UNO48G/40020831	1 Each
SORBENTS	PAD, ABSORBENT, OIL ONLY, 100PADS/BAG/40013873	5 Each
SPECIALIZED EQUIPMENT	TANK. PORTABLE, ELASTEC, 1400 GALLONS/40020804	1 Each
Iron River Station ER Boom Trailer		
BOOM	BOOM, RIVER, CANADYNE, LONG SKIRT,	100

Resource Type	Item Description	Total
	18"/40020795	Each
BOOM	BOOM, RIVER, CANADYNE, LONG SKIRT, 12"/40020796	400 Each
SORBENTS	PAD, ABSORBENT, OIL ONLY, 100PADS/BAG/40013873	10 Each
Ironwood PLM shop		
BOAT, JET, OUTLAW MARINE, 18' WORKBOAT, 200HP MERCURY JET INTAKE MOTOR, C/W JET BOAT TRAILER,/40015621	BOAT, JET, OUTLAW MARINE, 18' WORKBOAT, 200HP MERCURY JET INTAKE MOTOR, C/W JET BOAT TRAILER,/40015621	1 Each
BOAT, WORK, LUND, 18FT, 60 HP, JOHNSON OUTBOARD, ALASKAN C/W TRAILER/40020834	BOAT, WORK, LUND, 18FT, 60 HP, JOHNSON OUTBOARD, ALASKAN C/W TRAILER/40020834	1 Each
BOOM, RIVER, 16FT, CANADYNE, LONG SKIRT/40020808	BOOM, RIVER, 16FT, CANADYNE, LONG SKIRT/40020808	1500 Each
SKIMMER, MECHANICAL, RIDGE DRUM, ELASTEC, 4FT, UN340/40020835	SKIMMER, MECHANICAL, RIDGE DRUM, ELASTEC, 4FT, UN340/40020835	1 Each
VEHICLE, OFF HIGHWAY, TRACK DRIVE, GYRO TRAC,DIESEL, ALL TERRAIN, MESSEK 2000, 5 TON,/40020807	VEHICLE, OFF HIGHWAY, TRACK DRIVE, GYRO TRAC,DIESEL, ALL TERRAIN, MESSEK 2000, 5 TON,/40020807	1 Each
VEHICLE, OFF HIGHWAY, Gasoline, SIDE BY SIDE, 4WHL DRIVE/40015239	VEHICLE, OFF HIGHWAY, Gasoline, SIDE BY SIDE, 4WHL DRIVE/40015239	1 Each
Vehicle,Off Highway Vehicles, HONDA, Gasoline, QUAD, PERSONNEL, ALLWHL DRIVE/40020805	Vehicle,Off Highway Vehicles, HONDA, Gasoline, QUAD, PERSONNEL, ALLWHL DRIVE/40020805	1 Each
Vehicle,Off Highway Vehicles, SNOWMOBILE/40020781	Vehicle,Off Highway Vehicles, SNOWMOBILE/40020781	1 Each

Resource Type	Item Description	Total
Ironwood ER Boom Trailer		
BOOM	BOOM, RIVER, CANADYNE, LONG SKIRT, 18"/40020795	200 Each
BOOM	BOOM, RIVER, CANADYNE, LONG SKIRT, 12"/40020796	500 Each
SHALLOW WATER EQUIPMENT	PUMP, DIAPHRAM, 3IN. HYDRAULIC/40020793	1 Each
SKIMMER	SKIMMER, MECHANICAL, DRUM, ELASTEC, 4FT, UNO481/40020830	1 Each
SKIMMER	SKIMMER, SMOOTH DRUM, ELASTEC, 6FT, HYDRAULIC/40020806	1 Each
SPECIALIZED EQUIPMENT	GENERATOR, HONDA, 3500 WATT/40020791	1 Each
SPECIALIZED EQUIPMENT	TANK. PORTABLE, CINTI SPEEDRAIL, 1800 GALLON/40020810	1 Each
Ironwood Wildlife Trailer		
SPECIALIZED EQUIPMENT	TANK. PORTABLE, FAST TANK, C/W SECONDARY CONTAINMENT/40020760	2 Each
Superior Cold Storage Building		
BOOM	BOOM, GATOR BOOM, 120FT, C/W 4FT SKIRT/40020970	1 Each
BOOM	BOOM, WESTERN SUPPLY, 56FT, C/W 4FT SKIRT/40020969	3 Each
Superior ER CCAN		
BOOM	BOOM, ACME, 200FT, C/W 6IN SKIRT/40020971	4 Each
BOOM	BOOM, ACME, OK CORRAL, 50FT, C/W 8IN SKIRT/40020972	30 Each
BOOM	BOOM, GATOR BOOM, 120FT, C/W 4FT SKIRT/40020970	3 Each
BOOM	BOOM, RIVER, 10 FT SECTIONS/40020848	4 Each
BOOM	TRAILER, BOOM REEL, ELASTEC/AMERICAN MARINE, OREEPBO072, For Shoremax/Optimax, Hand and Electric Diesel Engine/40013638	1 Each
SKIMMER	Skimmer,Weir, ES400 helical screw pump, OSYSTSK440S, 520.0 GPM, Sea Skater Weir, ELASTEC/AMERICAN MARINE, Self Adjusting/40013609	1 Each

Resource Type	Item Description	Total
Superior ER Boom Trailer, Unit 293		
BOOM	BOOM , ABSORBENT, OIL ONLY, 5IN X 10FT, SPILFYTER M-54S, 4 PER BAG/40013874	15 Each
BOOM	BOOM, RIVER, 16FT, CANADYNE, LONG SKIRT/40020808	18 Each
BOOM	Bridle, Tow, W/Bullet Float, P/N 0540420F Elastec, For Airmax River Boom/40013602	3 Each
SKIMMER	SKIMMER, SKIM PACK, MODEL 1800/40020799	1 Each
SORBENTS	PAD, ABSORBENT, OIL ONLY, 100PADS/BAG/40013873	14 Each
Superior ER leak Trailer, Unit 2		
BOOM	BOOM , ABSORBENT, OIL ONLY, 5IN X 10FT, SPILFYTER M-54S, 4 PER BAG/40013874	5 Each
BOOM	BOOM, RIVER, CANADYNE, ORANGE, 50FT/40020949	3 Each
BOOM	BOOM, YELLOW SHORE, POLEMAR, 50FT/40020968	3 Each
BOOM	BOOM, YELLOW SHORE, POLEMAR, 50FT/40020353	7 Each
SHALLOW WATER EQUIPMENT	PUMP, DIAPHRAM, 3IN. HYDRAULIC/40020793	1 Each
SHALLOW WATER EQUIPMENT	PUMP, TRASH, 2IN/40013876	1 Each
SKIMMER	SKIMMER, GROOVED DRUM, OSYSTSK340, 70 G.P.M., TDS118G, ELASTEC/AMERICAN MARINE, HYDRAULIC Drive, SHALLOW WATER/40013608	1 Each
SKIMMER	SKIMMER, SMOOTH DRUM, 8 FT, ELASTEC, TDS136/40020811	1 Each
SORBENTS	ABSORBENT, OIL, EARTHCARE, 2.2 CU FT BAG OF LOOSE OIL ABSORBENT - PEAT MOSS/40015611	5 Each
SORBENTS	ABSORBENT, ROLL, DOUBLE WEIGHT, 32IN X 150FT, SPILFYTER Z-97RBW, SMS MFG/40013872	1 Each
SORBENTS	PAD, ABSORBENT, OIL ONLY, 100PADS/BAG/40013873	5 Each
SPECIALIZED EQUIPMENT	GENERATOR, HONDA, 3500 WATT/40020791	1 Each

Resource Type	Item Description	Total
Superior ER Wildlife Trailer, Unit 0888		
SHALLOW WATER EQUIPMENT	DAM, SELF INFLATING, 28IN X 25FT (7.5M), ELASTEC/AMERICAN MARINE, WA-2825, WATERGATE/40013619	2 Each
SHALLOW WATER EQUIPMENT	PUMP, HYDRAULIC, ELASTEC/AMERICANMARINE, 3IN/40020395	2 Each
SKIMMER	SKIMMER, GROOVED DRUM, 8 FT, ELASTEC, UN35/40020828	1 Each
SKIMMER	SKIMMER, MECHANICAL, RIDGE DRUM, ELASTEC, 4FT, UN340/40020835	1 Each
Superior ER Submerged Oil Recovery Trailer, Unit 504		
BOOM	Boom, Foam, RIVER, Optimax 1, 50FT, ELASTEC/AMERICAN MARINE P/N 00420501031/40013616	10 Each
SORBENTS	POM POMS, OIL POMS POMS/40015603	24 Each
Thief River Falls Cold Storage		
BOAT & RESPONSE VEHICLE	BOAT, VESSEL, 14FT, OUTBOARD, 15HP MERCURY, LOW LINE,/40020814	1 Each
BOAT & RESPONSE VEHICLE	BOAT, WORK, 18FT, 175HP, Outboard, AQUA DECK,/40020816	1 Each
BOAT & RESPONSE VEHICLE	BOAT,VESSEL, LUND, 20FT, Aluminum, ENGINE Outboard, 90 EVINRUDE, C/W TRAILER/40020776	1 Each
BOOM	BOOM, CONTAINMENT, ELASTEC, AIRMAX, 12IN/40020817	1000 Each
BOOM	BOOM, RIVER, CANADYNE, LONG SKIRT, 12"/40020796	500 Each
SPECIALIZED EQUIPMENT	VEHICLE, OFF HIGHWAY, Gasoline, SIDE BY SIDE, 4WHL DRIVE/40015239	1 Each
SPECIALIZED EQUIPMENT	Vehicle,Off Highway Vehicles, SNOWMOBILE/40020781	1 Each
Thief River Falls Boom Trailer, Unit ER0837		
BOOM	BOOM, RIVER, CANADYNE, LONG SKIRT, 12"/40020796	1000 Each
SKIMMER	SKIMMER, DRUM, 4 DRUM,4 FT,, MAG200, ELASTEC/AMERICAN MARINE/40020787	1 Each
SKIMMER	SKIMMER, SMOOTH DRUM, 8 FT, ELASTEC, TDS136/40020811	1 Each
Thief River Falls Boom/Skimmer Trailer Unit 590		
BOOM	BOOM, RIVER, CANADYNE, LONG SKIRT,	1100

Resource Type	Item Description	Total
	12"/40020796	Each
SKIMMER	SKIMMER, DRUM, 4 DRUM,4 FT,, MAG200, ELASTEC/AMERICAN MARINE/40020787	1 Each
SKIMMER	SKIMMER, SMOOTH DRUM, 8 FT, ELASTEC, TDS136/40020811	1 Each
SORBENTS	PAD, ABSORBENT, OIL ONLY, 100PADS/BAG/40013873	2 Each
Thief River Falls PLM Shop		
SHALLOW WATER EQUIPMENT	PUMP, TRASH, 3IN/40020394	1 Each
SPECIALIZED EQUIPMENT	GENERATOR, HONDA, EB6500, GASOLINE/40020882	1 Each
SPECIALIZED EQUIPMENT	GENERATOR, HONDA, EU2000IA/40020883	1 Each
Thief River Falls Spill Response/Wildlife Trailer Unit 0836		
BOOM	BOOM,ABSORBENT, ELASTEC/AMERICAN MARINE, 5IN X 10FT/40020803	660 Each
SORBENTS	PAD, ABSORBENT, OIL ONLY, 100PADS/BAG/40013873	3 Each
SPECIALIZED EQUIPMENT	TANK. PORTABLE, FAST TANK, C/W SECONDARY CONTAINMENT/40020760	1 Each

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9.3 Emergency Response Time Maps

Regional Emergency Response Time Maps were created utilizing ESRI® (Environmental Systems Research Institute) ArcMap. Times were calculated from actual street speed limits based on a network dataset built from ESRI's World Routing Service dataset which contains street information from 2013. Peak travel time conditions were used in this analysis. Actual time is subject to change based on local road, traffic and weather conditions.

These response time maps are considered a conservative timeframe for travel to site and include time to deployment. In the event of an incident, reference to individual maps will be necessary.

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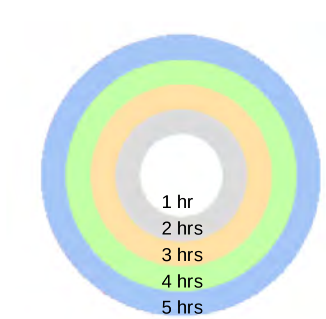
Steinbach
Nipigon
Thunder Bay
Wawa
Sault Ste Marie
Joliette
MP 800
Donaldson
Lines 1-4, 13, 65, 67
Viking
MP 850
Thief River Falls
Grand Forks
Larimore
Line 81-102
Crookston
Brooks
MP280
MP 900
Lines 81-101
Line 81-101
Wilton
North Dakota-Superior Region Border
Bemidji
MP 950
Cass Lake
Deer River
MP 1000
Blackberry
Red Lake Reservation
Chippewa National Forest
White Earth Reservation
Minnesota
Fargo
Lines 1-4, 13, 67
Floodwood
MP 1050
Gowan
Twin Ports Fire Dept.
Duluth
MP 1100
Superior
Line 5
Ino
MP 1150
Line 5
Saxon
MP 1200
Ironwood
Gogebic
MP 1250
Iron River
MP 1300
Line 5
Marquette
Hiawatha National Forest
MP 1350
Rapid River
Escanaba
Manistique
MP 1400
Gould City
Naubinway
MP 1450
North Straits
Mackinaw
MP 1500
Indian River
Superior-Chicago Region Border
MP 1550
Superior-Chicago Region Border
Hawthorne
Lines 6A, 13, 14, 61
Minong
MP 50
Stone Lake
Edgewater
MP 100
Superior-Chicago Region Border
Lublin
MP 150
Lines 6A, 13, 14, 61
Marshfield South
Marshfield
MP 200
Cottonville
MP 250
Quetico Provincial Park
Superior National Forest
Lake Superior
Lake Michigan
Ottawa National Forest
Menominee Reservation
Lake Traverse Reservation
St Cloud
Willmar
Minneapolis
St Paul
Wisconsin
Eau Claire
Watertown
Aberdeen
Rochester
La Crosse
Green Bay
Fond du Lac
Sheboygan
Manistee National Forest
Rainy River
Red River of the North River
Mississippi River
Wisconsin River
N



ENBRIDGE

Manned Facility
EnbridgeTrailer
Enbridge Boat
Enbridge ER Storage
Enbridge Station
Mile Post
Region Boundary
Pipeline

Superior Region Emergency Response Facilities Overview

0 55 110 220 Miles

Date Issued: 08/13/2014
Date Revised: 8/23/2016
Drawn By: KPS
Scale: 1:4,200,000

Natural Resources Engineering Co.
715-395-5680

Lines 6B & Vector

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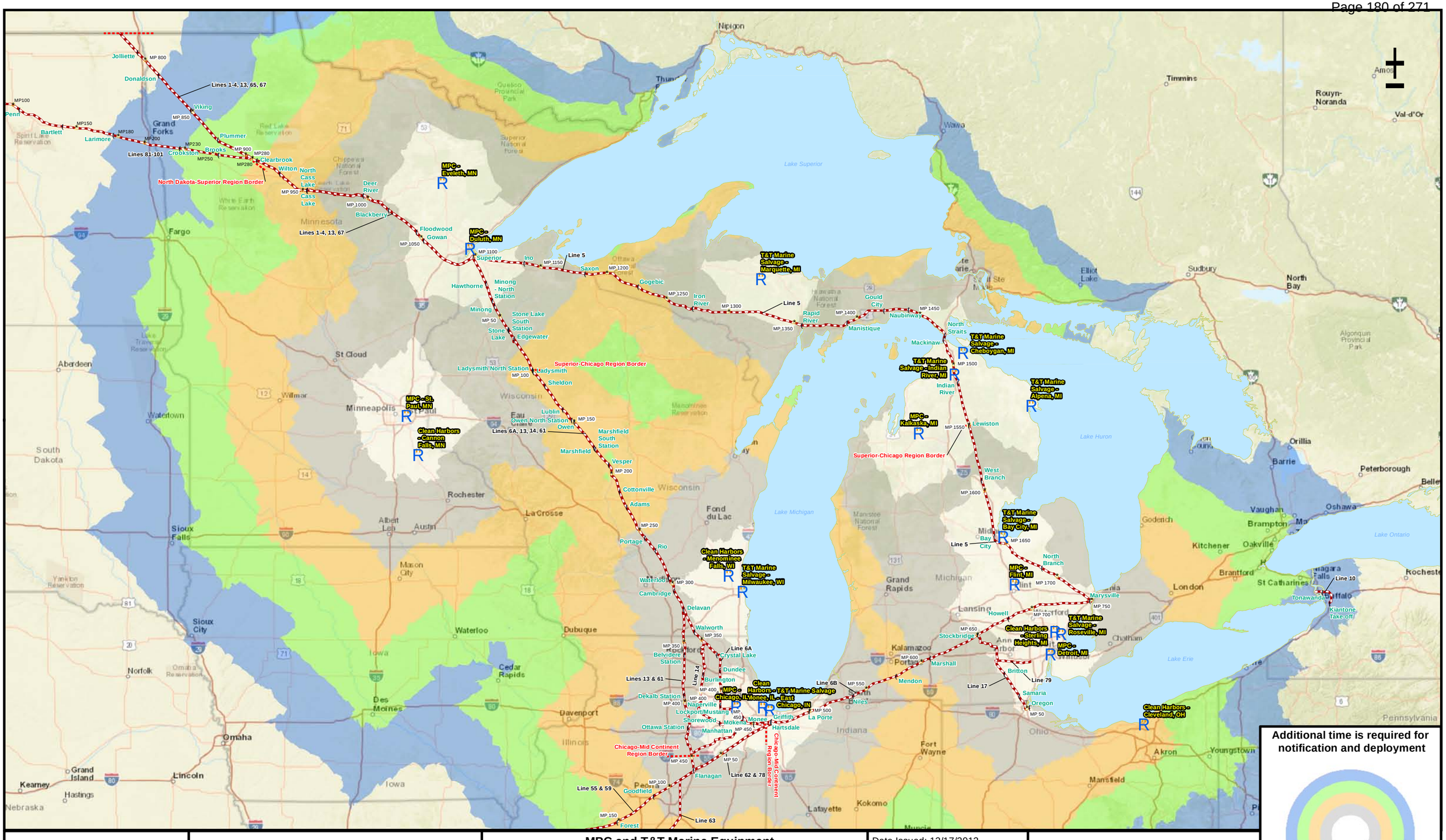

ENBRIDGE

(Enbridge Facility * Milepost

Contractor Trailer Pipeline

MPC and T&T Marine Equipment

OSRO - Overview

Regional Travel Time Per Hour Based on Ideal Road and Traffic Conditions

Superior Region

0 125 250 Miles

Date Issued: 12/17/2013
Date Revised: 8/25/2016
Drawn By: NMS
Scale: 1:6,000,000

Natural Resources Engineering Co.
715-395-5680

Additional time is required for notification and deployment

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10.0 GENERAL GUIDANCE

The purpose of this Emergency Response Action Plan is to provide quick access to key types of information that are often required in the initial stage of an emergency incident. The information provided in this Emergency Response Action Plan is presented in greater detail in other sections of the Integrated Contingency Plan.

The Emergency Response Action Plan will be updated and redistributed annually. Coordinating updates and reviews of the Emergency Response Action Plan shall be the responsibility of the Emergency & Security Management Department.

10.1 Contingency Plans

- National Oil and Hazardous Substances Pollution Contingency Plan (NCP)
- Canada-United States Joint Inland Pollution Contingency Plan (CANUSPLAIN)
- EPA Region 5 and 8 Area Contingency Plans
- EPA Inland Area Contingency Plan
- Inland Response Tactics Manual (USCG)
- Wisconsin Contingency Plan for Hazardous Substance Discharges
- Michigan Emergency Management Plan (MEMP)
- Minnesota's Preparedness for an Oil Transportation Incident
- Wisconsin Emergency Response Plan
- Sub-Area Geographical Response Plans (GRP):
    - Emergency Support Function 10- Wisconsin (GRP)
    - Greater Chicago Sub-Area Contingency Plan (GRP)
    - Great Rivers Sub-Area Contingency Plan
    - Lake Michigan (GRP)
    - Minnesota Spill Bill (GRP)
    - Northern Michigan Sub-area Contingency Plan (GRP)
    - Red River Sub-Area Contingency Plan (GRP)
    - Western Lake Superior Area Contingency Plan (GRP)
    - Western Lake Erie Area Contingency Plan (GRP)

Tactical Response Plans

- Straits of Mackinac
- Cass Lake
- Superior Terminal- Superior Bay
- Indian River
- Red River of the North

11.0 PROTECTION, CONTAINMENT AND RECOVERY

11.1 Isolation Protection Technique Selection

Containment and recovery refers to the techniques or methods that can be employed to contain and recover petroleum spills on water or the containment of petroleum spills flowing overland. Recovery of terrestrial spills is often very similar, or uses the same techniques as shoreline clean-up.

The following considerations should be taken into account when planning or	
✓	Containment is most effective when conducted near the source of the spill where the oil has not spread over a large area and the contained oil is of sufficient thickness to allow effective recovery and/or clean-up thickness to allow effective recovery and/or clean-up.
✓	Feasibility of containment is generally dependent on the size of the spill, available logistical resources, implementation time, environmental conditions and the nature of the terrain in the spill area
✓	Aquatic (water) containment is primarily conducted through the use of oil spill containment booms
✓	Skimmers are usually the most efficient means of recovery of aquatic spills, although pumps, vacuum systems, and sorbents can also be effective, particularly in smaller waterways
✓	Terrestrial (land) containment typically involves berms or other physical barriers
✓	Recovery of free petroleum from the ground surface is best achieved by using pumps, vacuum sources, and/or sorbents.

The *Inland Spill Response Tactics Guide* is a Company document that can be used as a quick reference by Enbridge first-on-scene responders to select and implement containment and recovery tactics with Enbridge-owned oil spill response equipment during the first 72 hours of the response. It illustrates a collection of inland spill tactics that can be applied using obtainable resources to a liquid products release until additional resources and personnel arrive on site.

Isolation Protection Technique Selection *(Conversion table located in Section 1: Plan Introduction Elements)*

Technique	Description	Logistical Requirement Examples	Use Limitations[1]	Potential Environmental Effects
Techniques on Land				
A. Containment / Diversion Berms (3.1.1 in Tactics Guide)	Construct berm (clay, bales, rocks, logs, etc.) ahead of advancing surface spill to contain spill or divert it to a containment area.	Typical Equipment Backhoe, bulldozer, front- end loader, or set of hand tools, plastic sheeting	• Steep Slopes • Porous substra te	• Disturbance to environmental sensitivities, surface soils and vegetation • Increased oil penetration
B. Interceptor Trench (3.1.2 in Tactics Guide)	Excavate ahead of advancing surface/ near-surface spill to contain product. Cover bottom and down gradient side with plastic.	Typical Equipment* Backhoe or set of hand, tools, misc. plastic sheeting	• Slope • Depth to near-surface flow	• Increased oil penetration • Disturbance to environmental sensitivities, surface soils and vegetation • Potential to impact groundwater

C. Trench and Berm (3.1.3 in Tactics Guide)	Construct berm with soil from the trench to stop the advancing surface spill and allow for recovery.	Typical Equipment* Backhoe, bulldozer, front- end loader, or set of hand tools, plastic sheeting	• Steep Slopes • Porous substrate	• Increased oil penetration • Disturbance to environmental sensitivities, surface soils and vegetation • Potential to impact groundwater
Techniques on Small Watercourses				
D. Stream Dam, Board Weir, Siphon Dam (3.2.1, 3.2.2 and 3.2.5 in Tactics Guide)	Construct dam in drainage course/stream bed to block and contain flowing oil. Cover with plastic sheeting. If water is flowing, install inclined pipes during dam construction to pass water underneath.	Typical Equipment* Backhoe, bulldozer, front- end loader, or set of hand tools, plastic sheeting roll, Aqua Dam, PVC Pipe, Water Gate, Tiger Dam, Water Bag	• Upstream storage capacity	• Increased oil penetration • May increase suspended sediment • Downstream water flow may be restricted

Isolation Protection Technique Selection *(See Conversion table located in Section 1: Plan Introduction Elements)*

Technique	Description	Logistical Requirement Examples	Use Limitations[1]	Potential Environmental Effects
E. Culvert Block (3.2.3 in Tactics Guide)	Block culvert opening with plywood, sediments, sandbags, etc. to prevent oil from entering culvert	Typical Equipment* Misc. hand tools, misc. plywood, sandbags, etc.	• Upstream storage capacity	• Increased oil penetration • Downstream water flow may be restricted
F. Filter Fence - Debris Exclusion (3.2.4 in Tactics Guide)	Install fence barrier upstream of containment site to exclude debris/ice	Typical Equipment* Misc. hand tool, fence posts, fence, fasteners, chicken wire, support lines, bales, sorbent materials etc.	• Soft substrate	• Minor substrate disturbance at post an anchor points
G. Sorbent Barriers / Filter Fence (3.2.4 in Tactics Guide)	A barrier is constructed by installing two parallel lines of stakes across a channel, fastening wire mesh to the stakes, and filling the space between stakes with sorbents.	Typical Equipment* Misc. hand tools, boats, fence posts, wire mesh, sorbents, misc. fasteners, support lines, stakes, etc.	• Soft substrate	• Minor substrate disturbance at post and shoreline anchor points • High substrate disturbance if boat is not used

Isolation Protection Technique Selection *(See Conversion table located in Section 1: Plan Introduction Elements)*

Technique	Description	Logistical Requirement Examples	Use Limitations[1]	Potential Environmental Effects
Techniques on Larger Watercourses				
H. Diversion Booming (3.3.3.3 in Tactics Guide)	Boom is deployed from the shoreline at an angle towards the approaching slick and anchored or held in place with a work boat. Oil is diverted towards the shoreline for recovery.	Typical Equipment* Hard boom, ground tackle, rope, shoreline anchors, boats, winches.	• Sensitive shorelines	• Minor substrate disturbance at anchor points • Heavy oiling at shoreline anchor point
I. Narrow Channel Containment Booming (3.3.3.3 in Tactics Guide)	Boom is deployed across entire river channel at an angle to contain floating oil passing through channel.	Typical Equipment* Hard boom, ground tackle, rope, shoreline anchors, boats, winches.	• Sensitive shorelines	• Minor substrate disturbance at anchor points • Heavy shoreline oiling at downstream anchor point
J. Exclusion Booming (3.3.3.1 and 3.3.3.2 in Tactics Guide)	Boom is deployed across or around sensitive areas and anchored in place. Approaching oil is excluded from area.	Typical Equipment* Hard boom, ground tackle, rope, shoreline anchors, boats, winches.		• Minor substrate disturbance at anchor points

Isolation Protection Technique Selection *(See Conversion table located in Section 1: Plan Introduction Elements)*

Technique	Description	Logistical Requirement Examples	Use Limitations[1]	Potential Environmental Effects
Spills on Water (Cont'd)				
K. Deflection Booming (3.3.3.1 and 3.3.3.2 in Tactics Guide)	Boom is deployed from the shoreline away from the approaching slick and anchored or held in place with a work boat. Oil is deflected away from shoreline.	Typical Equipment* Hard boom, ground tackle, rope, shoreline anchors, boats, winches.	• Onshore winds	• Minor substrate disturbance at anchor points • Oil is not contained and may contact other shorelines
L. Boomvane Deploying Containment / Recovery / Deflection modes (3.3.3.4 in Tactics Guide	BoomVanes can be used in place of ground tackle when deploying deflection and diversion booms.	Typical Equipment* Hard boom, BoomVane(s), control line, mooring line,boom/shore anchor line, tow bridles, shore anchor pins.	• Requires access to multiple shoreline locations (if mooring line is to be used) • Requires a current (not for still water use)	• Minor disturbance of trees if using as an anchor point.

[1] In addition to implementation and accessibility.
* Need to establish a safe perimeter and follow safety precautions as appropriate before work begins.

11.2 Imperial/Metric Conversion Table

English to Metric		Metric to English	
Length			
1 inch (in)	2.54 centimetres (cm)	1 cm	0.393 in
1 foot (ft)	0.3048 meters (m)	1 m	3.28 ft
1 mile (mi)	1.609 kilometres (km)	1 km	0.621 mi
1 nautical mile (nm)	1. 852 kilometres (km)	1 km	0.540 nm
Area			
1 square foot (ft^2)	929 square centimetres (cm^2)	1 cm^2	0.0129 ft^2
1 square foot (ft^2)	0.0929 square metres (m^2)	1 m^2	10.76 ft^2
1 acre (ac)	4.047 square metres (m^2)	1 000 m^2	0.247 ac
1 square mile (mi^2)	2.59 square kilometres (km^2)	1 km^2	0.386 mi^2
Volume			
1 US Gallon (US gal)	3.785 litres (l)	1 l	0.264 U.S. gal
1 Imperial Gallon (Imp gal)	4.546 litres (l)	1 l	0.220 imp gal
1 Barrel	0.16 cubic metres (m^3)	1m^3	6.29 bbl
1 Barrel (bbl)	159 litres (l)	1 l	0.00629 bbl
Velocity			
1 mile per hour (mph)	1.609 kilometres/hr (kph)	1 km/h	0.621 mph
1 nautical mile per hour (knot)	1.852 kilometres/hr (kph)	1 km/h	0.54 knot
1 foot per second (fps)	0.3048 metre/second (m/sec)	1 m/sec	3.28 fps
1 foot per second (fps)	1.097 kilometres/hr (kph)	1 km/h	0.911 fps
Weight			
1 pound (lb)	0.454 kilogramme (kg)	1 kg	2.205 lb
1 short ton (st)	0.907 tonne (mt)	1 t	1.102 st
1 long ton (lt)	1.016 tonne (mt)	1 t	0.984 lt
Temperature			
$^oF = (^oC\ (9) \div 5) + 32$			

English to Metric		Metric to English	
Pressure			
1 pound per square inch (psi)	0.0689 bar	1 bar	14.504 psi
1 pound per square inch (psi)	6.89 kilopascals (kPa)	1 kPa	0.145 psi
1 pound per square inch (psi)	0.704 metre (water column) (mwc)	1 m CE	1.42 psi
1 inch mercury (in Hg)	25.4 mm mercury (mm Hg)	1 mm Hg	0.0394 in Hg
1 atmosphere (atm)	1.033 kg/cm^2	1 kg/cm^2	0.968 atm
1 atmosphere (atm)	760 mm mercury (mm Hg)	1 mm Hg	0.00132 atm
Flow			
1 gallon per minute (gpm)	0.227 $metre^3$ per hour (m^3/hr)	1 m^3/h	4.403 gpm
1 cubic foot per minute (cfm)	1.699 cubic meters per hour (m^3/hr)	1 m^3/h	0.5886 cfm
1 barrel per day (bph)	0.1104 litres per minute (lpm)	1 lpm	9.057 bpd
Power			
1 horsepower (hp)	0.746 kilowatt (kw)	1 kw	1.341 hp

BIOLOGICAL DISINFECTION

Biological disinfection is the systematic reduction in the probability of spreading invasive biological organisms between freshwater environments.

Applying the practices in the procedure will reduce the probability of spreading invasive biological organisms between freshwater environments by way of Enbridge Pipelines Inc., Enbridge Energy Partners, L.P. (Enbridge) or contractor equipment, material or operations used during a response or exercise. The procedure incorporates the requirements of the jurisdictions (state, province, territory and country) in which Enbridge operates.

The disinfection procedures included in this document may not be suitable in all situations or for all potential biological organisms. If more information is required regarding which disinfection procedure should be used, an appropriate environmental professional or environmental regulator should be contacted.

If required, the ENVL is responsible for development of the detailed Biological Disinfection Plan.

- Once items are disinfected, they should not come into contact with infected waters or other materials.
- Avoid touching absorbent materials with other absorbent materials during disinfection.

INSPECTION

To help determine if equipment need to undergo disinfection, either prior or post deployment, a full inspection of the equipment is needed. The inspection should be focused on any attached mud, plants, and other organisms. If debris is found, the equipment must undergo disinfection procedures. All inspections should be documented on the *Enbridge Invasive Species Inspection and Certification Form.* Further information on how inspection should be conducted can be found in the *Emergency Response Aquatic Invasive Species Inspection Procedures.*

GENERAL GUIDELINES

General guidelines that will assist in implementation of this SOP follow:

- Use a tagging system to identify infected from disinfected equipment.
- Look in cracks/crevices that may otherwise go unnoticed and hide unwanted organisms.
- Use rubber waders, gloves and boots where possible, as neoprene waders and gloves as well as felt soled boots retain moisture and organism such as Rock Snot and whirling disease. Neoprene and felt soles are also harder to disinfect.
- Allow equipment to dry completely and for the recommended times between uses.
- To help prevent transfer of aquatic invasive species, in addition to the above mentioned disinfection methods, where possible efforts should be made to designate equipment and personal gear to a single waterbody

The following should be considered when setting up disinfection stations:

- Weather conditions
- Proximity to water bodies or means by which water and cleaning solutions could enter water bodies.
- Disinfection stations will be constructed with secondary containment to collect wash water. Wash water will be collected and disposed of as per the site-specific waste management plan.
- Wherever possible, draining water from equipment (e.g. bilge water) should be done in the waterbody in which work was conducted.
- Type and quantity of PPE, clothing, heavy equipment and vehicles to be disinfected.

EQUIPMENT

WORKERS AND PERSONAL PROTECTIVE EQUIPMENT

When using chemicals, the appropriate PPE is to be used (e.g., appropriate gloves, safety glasses and clothing) and the SDS are to be reviewed and available.

Recommended cleaning supplies and equipment for disinfecting workers and their PPE will depend on the method of disinfection that is determined to be appropriate and may include:

- Heavy gauge plastic drop cloths for larger pieces of equipment, personal clothing/technical equipment (i.e., waders, wader boots, rubber boots, motors, etc.).
- Assorted long and short handles soft bristled brushes to scrub equipment, parts and boots.
- Buckets for wash and rinse solutions.
- Tubs, stock tanks, or containers large enough and sturdy enough to contain water above 60ºC (140ºF).
- Plastic tubs for workers to submerge equipment and clothing.
- Methods for containing waste water.
- Methods for disposing of waste water (e.g. bilge water etc.).

EQUIPMENT, cont.

- Bleach solutions:
  - 2% bleach solution (200 mL and water added to make 10 liters) for general disinfection
  - if targeting whirling disease specifically, a 10% solution should be used
  - if Viral Hemorrhagic Septicemia (VHS) is targeted a 20% chlorine bleach solution should be used.

Bleach can be corrosive to aluminum and hot water can delaminate Gore-Tex® fabric and other sensitive clothing or fabrics.

- 5% salt solution.
- 5% antiseptic hand solution.
- Full strength cleaning agents with quaternary ammonium compound alkyl dimethyl benzyl ammonium chloride (ex Parvasol ® and Kennelsol ® or Formula 409® and Fantastic ®).
- A 5% Household detergent (dishwashing detergent) solution.

Disinfection of workers and PPE must be completed in one of the on-site disinfection stations. These stations are to be separate from the on-site decontamination stations.

The following is recommended for disinfecting heavy equipment and vehicles. These should be used in addition to the previously listed materials and solutions.

- Pressure washer with at least 250 psi strength.
- Pumps for collecting wash solutions and emptying boats and other vessels
- Brooms and brushes for cleaning operator areas inside vehicles and equipment.
- Disposal receptacles for disposable cleaning materials and for any biological materials removed from equipment (e.g., plants, bait fish, paper towels or other disposable cleaning materials used).
- Methods for containing waste water.
- Methods for disposing of waste water (e.g. bilge water etc.).

Disinfection of heavy equipment and vehicles must be completed in one of the on-site disinfection stations. These stations are to be separate from the on-site decontamination stations. Decontamination is to occur prior to disinfection. If heavy equipment and vehicles require disinfection following decontamination, the equipment is to be brought directly from the decontamination station and is not to be re-used until disinfection has been completed.

Where possible, potentially infected equipment should be disinfected in one of the on-site disinfection station, rather than transported off-site for disinfection.

If on-site disinfection is not feasible, PPE and clothing should be removed as per the site-specific decontamination plan, bagged and not used on other sites before being disinfected off-site.

ENBRIDGE

DISINFECTION PROCEDURES

Disinfection methods should be matched to best suit the type of equipment being used. Refer to Spill Response Freshwater Biological Disinfection Procedures for detailed disinfection procedures.

It is illegal to transport live fish, bait or other organisms from one body of water to another. If none of the disinfection procedures are plausible for certain equipment, restrict use of equipment to a single water body.

DISINFECTION

Disinfection procedures may vary depending on whether particular organisms are being targeted, as well as what may be most suitable, based on what the equipment is made of, how readily some supplies are, and the feasibility of obtaining large enough quantities of cleaning solutions in the field.

DRYING

Drying can be used as a disinfection process if the following procedure can be followed:

- Some aquatic invasive species can survive out of water for more than two weeks. It is important to know potential species to which equipment may have been exposed. Equipment should be dried before transporting to another body of water, according to the site-specific species of concern.
- If targeting adult zebra mussels, 10 days may be required to kill organisms in cool or humid weather.
- If targeting *Didymosphenia geminate* (commonly referred to as Didymo or Rock Snot), equipment must be dried completely inside and out, and then for an additional 48 hours. Freezing items solid will also kill Didymo cells. Freezing overnight should work in most instances.
- Porous materials should be soaked in cleaning solutions for longer than non-porous materials and dried for longer periods of time than non-porous materials. Materials should be dry to the touch both inside and out, and allowed to dry for at least an additional 48 hours prior to entering a different waterway.

ACTIVE CLEANING

If drying cannot be implemented, an active cleaning method of disinfection will be required to limit the potential of transporting biological organisms from one fresh water environment to another.

Non Absorbent Items

Soak and scrub non-absorbent items for at least one minute (unless otherwise specified below) in one of the following solutions:

- 5% solution of dishwashing liquid (500 mL or 2 cups and water added to make 10 liters).
- 2% solution of bleach (200 mL and water added to make 10 liters).
- 5% solution of salt (500 ml or 2 cups and water added to make 10 liters).
- 5% antiseptic hand cleaner (500 mL or 2 cups and water added to make 10 liters).
- A dilute solution of 7% hydrogen peroxide mixed in a 64 ml (hydrogen peroxide):1litre (water) ratio. Can be applied using spray equipment. Infected equipment should be completely covered with the solution and allowed to sit for approximately 60 minutes before rinsing with clean water.
- Iodophor solution of 100 mg/L for moving equipment out of Viral Hemorrhagic Septicemia (VHS) management zones.
- Vinegar Dip (100% vinegar for 20 minutes).
- 1% salt solution in place of the vinegar dip for 24 hours.
- Full strength cleaning agents with quaternary ammonium compound alkyl dimethyl benzyl ammonium chloride (ex Parvasol ®and Kennelsol ®or Formula 409® and Fantastic ®)
- These can also be used in a 2:1 water to disinfectant ratio
- Soak all equipment for a minimum of 10 minutes

When deciding on the appropriate active cleaning methodology for non-absorbent items, the following should be considered:

- Disinfection with chemicals is not effective against killing spiny water fleas resting eggs.
- Disinfection with chlorine or iodophor must be used if fieldwork is conducted within and outside of the VHS management zones.
- Water-based solutions should be at least 60ºC (140ºF) and soaked for at least 20 minutes in hot water kept above 45ºC (113ºF).
- For equipment that cannot be submerged, solutions may be applied by either washing with a pressure washer, or with a pressurized garden hose. Pressure washers should reach at least 250 pounds per square inch (psi). Pressure washers may not be appropriate for all equipment and may damage some equipment.

ABSORBENT ITEMS

Absorbent items (e.g. felt-soled waders and diving suits) will require longer soaking times than non-absorbent items, to allow thorough saturation.

Soak absorbent items in the following solutions:

- At least 40 minutes in hot water kept above 45ºC
- At least 30 minutes in hot water kept above 45ºC containing a 5% dishwashing detergent solution
- For SCUBA gear, the following solution and soak times may also be used:
- Submerge and wash the suit and equipment (including inside of buoyancy compensator with hot water that is at least 40ºC (or 104ºF);
- Submerge/wash suit and equipment in a tub/tote with a salt solution (1/2 cup salt dissolved in 3.4 liters of water), then rinse with clean water

DISPOSAL

- Materials and solutions used in the disinfection process will be contained, and managed as outlined in the site-specific Waste Management Plan.

12.0 SAFETY DATA SHEETS ("SDS")

Table of Contents

- Light Synthetic
- Condensate
- Sweet
- Sour
- Heavy
- Dilbit
- Synbit
- Other (High Sweet Clearbrook)

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Esso Imperial Oil

MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: (see Section 16 for Synonyms) **CRUDE OIL, SOUR**
Product Description: Petroleum Crude Oil (>0.005% H2S)
MSDS Number: 3277

Intended Use: Feedstock

COMPANY IDENTIFICATION

Supplier: **Imperial Oil - Crude Oil Supply & Marketing**
Products & Chemicals Division
P.O. Box 2480, Station M
Calgary, ALBERTA. T2P 3M9 Canada

24 Hour Environmental / Health Emergency Telephone 1-866-232-9563
Transportation Emergency Phone Number 1-866-232-9563
Supplier General Contact 1-800-567-3776

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

Reportable Hazardous Substance(s) or Complex Substance(s)

Name	CAS#	Concentration*	Acute Toxicity
HYDROGEN SULPHIDE	7783-06-4	0.1 - 1%	Inhalation Lethality: LC50 444 ppm (Rat)
PETROLEUM CRUDE OIL	8002-05-9	100%	Dermal Lethality: LD50 > 2.0 g/kg (Rat); Oral Lethality: LD50 > 4.3 g/kg (Rat)

Hazardous Constituent(s) Contained in Complex Substance(s)

Name	CAS#	Concentration*	Acute Toxicity
BENZENE	71-43-2	1 - 5%	None
CYCLOHEXANE	110-82-7	1 - 5%	Dermal Lethality: LD50 > 2000 mg/kg (Rabbit); Inhalation Lethality: LC50 > 19.1 mg/l (Rat)
ETHYL BENZENE	100-41-4	0.1 - 1%	Inhalation Lethality: LC50 17.8 mg/l (Rat); Oral Lethality: LD50 3.5 g/kg (Rat)
n-Hexane	110-54-3	1 - 5%	None
NAPHTHALENE	91-20-3	0.1 - 1%	Dermal Lethality: LD50 > 2500 mg/kg (Rat); Inhalation Lethality: LC50 > 0.4 mg/l (Rat); Oral Lethality: LD50 622 mg/kg (Mouse)
POLYNUCLEAR AROMATIC HYDROCARBONS		0.1 - 1%	None
TOLUENE	108-88-3	1 - 5%	None
XYLENES	1330-20-7	0.1 - 1%	Oral Lethality: LD50 > 5000 mg/kg (Rat)

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

SECTION 3 HAZARDS IDENTIFICATION

This material is considered to be hazardous according to regulatory guidelines (see (M)SDS Section 15).

PHYSICAL/CHEMICAL EFFECTS

FLAMMABLE. Material can release vapours that readily form flammable mixtures. Vapour accumulation could flash and/or explode if ignited. Material can accumulate static charges which may cause an ignition.

HEALTH EFFECTS

Very toxic by inhalation. Irritating to skin. Danger of serious irreversible effects by a single exposure. If swallowed, may be aspirated and cause lung damage. Under conditions of poor personal hygiene and prolonged repeated contact, some polycyclic aromatic compounds (PACs) have been suspected as a cause of skin cancer in humans. Hydrogen sulphide, a highly toxic gas, is expected to be present. Signs and symptoms of overexposure to hydrogen sulphide include respiratory and eye irritation, dizziness, nausea, coughing, a sensation of dryness and pain in the nose, and loss of consciousness. Odour does not provide a reliable indicator of the presence of hazardous levels in the atmosphere. May be irritating to the eyes, nose, throat, and lungs. May cause cancer. Aliphatic hydrocarbon gases may build up in confined spaces and may cause dizziness, light-headedness, headache, nausea and loss of co-ordination. Continued inhalation may result in narcosis, unconsciousness, and possibly lead to death. May cause central nervous system depression. High-pressure injection under skin may cause serious damage. Exposure to benzene is associated with cancer (acute myeloid leukaemia and myelodysplastic syndrome), damage to the blood-producing system, and serious blood disorders (see Section 11).

NFPA Hazard ID:	Health:	2	Flammability:	3	Reactivity:	0
HMIS Hazard ID:	Health:	2*	Flammability:	3	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION

Immediately remove from further exposure. Get immediate medical assistance. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. Give supplemental oxygen, if available. If breathing has stopped, assist ventilation with a mechanical device.

SKIN CONTACT

Remove contaminated clothing. Dry wipe exposed skin and cleanse with waterless hand cleaner and follow by washing thoroughly with soap and water. For those providing assistance, avoid further skin contact to yourself or others. Wear impervious gloves. Launder contaminated clothing separately before reuse. Discard contaminated articles that cannot be laundered. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury. For hot product: Immediately immerse in or flush affected area with large amounts of cold water to dissipate heat. Cover with clean cotton sheeting or gauze and get prompt medical attention.

EYE CONTACT

Flush thoroughly with water for at least 15 minutes. Get medical assistance.

INGESTION

Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately. This light hydrocarbon material, or a component, may be associated with cardiac sensitisation following very high exposures (well above occupational exposure limits) or with concurrent exposure to high stress levels or heart-stimulating substances like epinephrine. Administration of such substances should be avoided.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. If a leak or spill has not ignited, use water spray to disperse the vapours and to protect personnel attempting to stop a leak. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Highly flammable. Vapour is flammable and heavier than air. Vapour may travel across the ground and reach remote ignition sources, causing a flashback fire danger. Exposure to fire can generate toxic fumes. Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

Hazardous Combustion Products: Hydrogen sulphide, Smoke, Fume, Sulphur oxides, Incomplete combustion products, Oxides of carbon

FLAMMABILITY PROPERTIES

Flash Point [Method]: -20°C (-4°F) - 35°C (95°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.6 UEL: 15
Autoignition Temperature: >400°C (752°F)

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required, due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be

necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: half-face or full-face respirator with filter(s) for organic vapor and, when applicable, H2S, or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Chemical goggles are recommended if splashes or contact with eyes is possible. Work gloves that are resistant to aromatic hydrocarbons are recommended. If contact with hot product is possible or anticipated, gloves should be heat-resistant and thermally insulated. Note: gloves made of PVA are not water-resistant, and are not suitable for emergency use. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic and, if necessary, heat resistant and thermal insulated material is recommended.

SPILL MANAGEMENT

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do so without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapour-suppressing foam may be used to reduce vapour. Large Spills: Water spray may reduce vapour, but may not prevent ignition in enclosed spaces.

Water Spill: Stop leak if you can do so without risk. Eliminate sources of ignition. Warn other shipping. If the Flash Point exceeds the Ambient Temperature by 10 deg C or more, use containment booms and remove from the surface by skimming or with suitable absorbents when conditions permit. If the Flash Point does not exceed the Ambient Air Temperature by at least 10C, use booms as a barrier to protect shorelines and allow material to evaporate. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Use booms as a barrier to protect shorelines. Use containment booms when the ambient temperature is below the flash point of the material. Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

H2S is present. Avoid all personal contact. Avoid contact with skin. Crude oils can contain trace levels of natural impurities including heavy metals, such as mercury, nickel or lead, as well as naturally occurring radioactive material. As the impurity content may concentrate during refining/processing, process operations, including equipment, materials and products should be evaluated to identify and manage any potential risks to health, safety or the environment or regulatory concerns.
Prevent exposure to ignition sources, for example use non-sparking tools and explosion-proof equipment. Potentially toxic/irritating fumes/vapour may be evolved from heated or agitated material. Use only with adequate ventilation. Do not enter storage areas or confined spaces unless adequately ventilated. The toxic and olfactory (sense of smell) fatigue properties of hydrogen sulfide require that air monitoring alarms and respiratory protection be used where the concentration might be expected to reach a harmful level, such as in an enclosed space, heated transport vessel, or in a spill or leak situation.
Material may contain trace amounts of naturally occurring radioactive material (NORM), which will accumulate in process equipment and storage vessels. Prevent small spills and leakage to avoid slip hazard. Material can

accumulate static charges which may cause an electrical spark (ignition source). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.

STORAGE

Ample fire water supply should be available. A fixed sprinkler/deluge system is recommended. The container choice, for example storage vessel, may effect static accumulation and dissipation. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Outside or detached storage preferred. Storage containers should be earthed and bonded. Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Substance Name	Form	Limit/Standard			Note	Source
BENZENE		STEL	1 ppm			Supplier
BENZENE		TWA	0.5 ppm			Supplier
BENZENE		STEL	2.5 ppm		Skin	ACGIH
BENZENE		TWA	0.5 ppm		Skin	ACGIH
CYCLOHEXANE		TWA	100 ppm			ACGIH
ETHYL BENZENE		TWA	20 ppm			ACGIH
HYDROGEN SULPHIDE		STEL	14 mg/m3	10 ppm		Supplier
HYDROGEN SULPHIDE		TWA	7 mg/m3	5 ppm		Supplier
HYDROGEN SULPHIDE		STEL	5 ppm			ACGIH
HYDROGEN SULPHIDE		TWA	1 ppm			ACGIH
n-Hexane		TWA	50 ppm		Skin	ACGIH
NAPHTHALENE		STEL	15 ppm		Skin	ACGIH
NAPHTHALENE		TWA	10 ppm		Skin	ACGIH
TOLUENE		TWA	20 ppm			ACGIH
XYLENES		STEL	150 ppm			ACGIH
XYLENES		TWA	100 ppm			ACGIH

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Use explosion-proof ventilation equipment to stay below exposure limits.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Positive-pressure, air-supplied respirator in areas where H2S vapours may accumulate.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended. If contact with forearms is likely wear gauntlet style gloves.

Eye Protection: Chemical goggles are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

Chemical/oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practise good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Colour: Dark Brown
Odour: Rotten Egg
Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.7 - 0.95

Flash Point [Method]: -20°C (-4°F) - 35°C (95°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.6 UEL: 15
Autoignition Temperature: >400°C (752°F)
Boiling Point / Range: > 20°C (68°F)
Vapour Density (Air = 1): N/D
Vapour Pressure: > 0.36 kPa (2.7 mm Hg) at 20ºC
Evaporation Rate (n-butyl acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): N/D
Solubility in Water: Negligible
Viscosity: [N/D at 40 °C] | <15 cSt (15 mm2/sec) at 20°C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -60°C (-76°F) - 20°C (68°F)
Decomposition Temperature: N/D

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Avoid heat, sparks, open flames and other ignition sources.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Route of Exposure	Conclusion / Remarks
Inhalation	
Toxicity: No end point data for material.	Highly toxic.
Irritation: No end point data for material.	Elevated temperatures or mechanical action may form vapours, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.
Ingestion	
Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: Data available.	May dry the skin leading to discomfort and dermatitis. Based on test data for structurally similar materials.
Eye	
Irritation: Data available.	Irritating and will injure eye tissue. Based on test data for

	structurally similar materials.

CHRONIC/OTHER EFFECTS

For the product itself:

Vapour/aerosol concentrations above recommended exposure levels are irritating to the eyes and respiratory tract, may cause headaches, dizziness, anaesthesia, drowsiness, unconsciousness and other central nervous system effects including death. May cause central nervous system disorder (e.g., narcosis involving a loss of coordination, weakness, fatigue, mental confusion and blurred vision) and/or damage. Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema. Very high exposure (confined spaces / abuse) to light hydrocarbons may result in abnormal heart rhythm (arrhythmias). Concurrent high stress levels and/or co-exposure to high levels of hydrocarbons (above occupational exposure limits), and to heart-stimulating substances like epinephrine, nasal decongestants, asthma drugs, or cardiovascular drugs may initiate arrhythmias.
Crude oil: Contains polycyclic aromatic compounds (PACs). Prolonged and / or repeated exposure by skin or inhalation of certain PACs may cause cancer of the skin, lung, and of other sites of the body. In animal studies, some crudes produced skin tumors in mice, while other crudes produced no tumors. Developmental studies of crude oil in lab animals showed reduced fetal weight and increased fetal resorptions at maternally toxic levels. Repeated dermal exposure to crude oils in rats resulted in toxicity to the blood, liver, thymus, and bone morrow.

Contains:

BENZENE: Caused cancer (acute myeloid leukemia and myelodysplastic syndrome), damage to the blood-producing system, and serious blood disorders in human studies. Caused genetic effects and effects on the immune system in laboratory animal and some human studies. Caused toxicity to the fetus and cancer in laboratory animal studies. HYDROGEN SULPHIDE: Chronic health effects due to repeated exposures to low levels of H2S have not been established. High level (700 ppm) acute exposure can result in sudden death. High concentrations will lead to cardiopulmonary arrest due to nervous system toxicity and pulmonary edema. Lower levels (150 ppm) may overwhelm sense of smell, eliminating warning of exposure. Symptoms of overexposure to H2S include headache, fatigue, insomnia, irritability, and gastrointestinal problems. Repeated exposures to approximately 25 ppm will irritate mucous membranes and the respiratory system and have been implicated in some eye damage. NAPHTHALENE: Exposure to high concentrations of naphthalene may cause destruction of red blood cells, anemia, and cataracts. Naphthalene caused cancer in laboratory animal studies, but the relevance of these findings to humans is uncertain.
N-HEXANE: Prolonged and/or repeated exposures to n-Hexane can cause progressive and potentially irreversible damage to the peripheral nervous system (e.g. fingers, feet, arms, legs, etc.). Simultaneous exposure to Methyl Ethyl Ketone (MEK) or Methyl Isobutyl Ketone (MIBK) and n-Hexane can potentiate the risk of adverse effects from n-Hexane on the peripheral nervous system. n-Hexane has been shown to cause testicular damage at high doses in male rats. The relevance of this effect for humans is unknown. TOLUENE : Concentrated, prolonged or deliberate inhalation may cause brain and nervous system damage. Prolonged and repeated exposure of pregnant animals (> 1500 ppm) have been reported to cause adverse fetal developmental effects. ETHYLBENZENE: Caused cancer in laboratory animal studies. The relevance of these findings to humans is uncertain.
XYLENES: High exposures to xylenes in some animal studies have been reported to cause health effects on the developing embryo/fetus. These effects were often at levels toxic to the mother. The significance of these findings to humans has not been determined.

CMR Status:

Chemical Name	CAS Number	List Citations
BENZENE	71-43-2	1, 4, 5
CYCLOHEXANE	110-82-7	4

ETHYL BENZENE	100-41-4	3, 4
HYDROGEN SULPHIDE	7783-06-4	4
n-Hexane	110-54-3	4
NAPHTHALENE	91-20-3	3, 4
TOLUENE	108-88-3	4
XYLENES	1330-20-7	4

--REGULATORY LISTS SEARCHED--

1 = IARC 1
2 = IARC 2A
3 = IARC 2B
4 = ACGIH ALL
5 = ACGIH A1
6 = ACGIH A2

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY

More volatile component -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.

Less volatile component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Low molecular wt. component -- Expected to be inherently biodegradable

High molecular wt. component -- Expected to biodegrade slowly.

Photolysis:

More water soluble component -- Expected to degrade at a moderate rate in water when exposed to sunlight.

Atmospheric Oxidation:

More volatile component -- Expected to degrade rapidly in air

BIOACCUMULATION POTENTIAL

Components -- Has the potential to bioaccumulate.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (TDG)

Proper Shipping Name: PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC
Hazard Class & Division: 3 (6.1)
UN Number: 3494
Packing Group: I

Footnote: If shipped over water, product TDG classification as shown below for SEA (IMDG).

LAND (DOT)

Proper Shipping Name: PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC
Hazard Class & Division: 3
ID Number: 3494
Packing Group: I
ERG Number: 131
Label(s): 3 (6.1)
Transport Document Name: UN3494, PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC, 3 (6.1), PG I

SEA (IMDG)

Proper Shipping Name: PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC
Hazard Class & Division: 3
EMS Number: F-E, S-E
UN Number: 3494
Packing Group: I
Label(s): 3 (6.1)
Transport Document Name: UN3494, PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC, 3 (6.1), PG I, (-20°C c.c.)

AIR (IATA)

Proper Shipping Name: FORBIDDEN

SECTION 15 REGULATORY INFORMATION

WHMIS Classification: Class B, Division 2: Flammable Liquids Class D, Division 1, Subdivision A: Very Toxic Material Class D, Division 2, Subdivision B: Toxic Material

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the (M)SDS contains all the information required by the Controlled Products Regulations.

CEPA: All components of this material are either on the Canadian Domestic Substances List (DSL), exempt, or have been notified under CEPA.

Complies with the following national/regional chemical inventory requirements AICS, DSL, ENCS, IECSC, KECI, PICCS, TSCA

The Following Ingredients are Cited on the Lists Below:

Chemical Name	CAS Number	List Citations
BENZENE	71-43-2	6
CYCLOHEXANE	110-82-7	6
n-Hexane	110-54-3	6
TOLUENE	108-88-3	6

--REGULATORY LISTS SEARCHED--

1 = TSCA 4	3 = TSCA 5e	5 = TSCA 12b
2 = TSCA 5a2	4 = TSCA 6	6 = NPRI

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Revision Changes:
Section 09: Boiling Point C(F) information was modified.
Section 11: Inhalation Lethality Test Data information was modified.
Section 11: Dermal Irritation Test Data information was modified.
Section 11: Eye Irritation Test Data information was modified.
Section 11: Inhalation Lethality Test Comment information was modified.
Section 09: Flash Point C(F) information was modified.
Section 09 Viscosity information was modified.
Section 14: Packing Group information was modified.
Section 14: Transport Document Name information was modified.
Section 14: Proper Shipping Name information was modified.
Section 14: Packing Group information was modified.
Section 14: Packing Group information was modified.
Section 14: Transport Document Name information was modified.
Section 16: First Aid Skin information was modified.
Section 14: Hazard Class & Division - Header information was deleted.
Section 14: Hazard Class information was deleted.
Section 14: UN Number - Header information was deleted.
Section 14: UN Number information was deleted.
Section 14: Packing Group - Header information was deleted.
Section 14: Packing Group information was deleted.

Section 14: Label(s) - Header information was deleted.
Section 14: Label(s) information was deleted.
Section 14: Transport Document Name - Header information was deleted.
Section 14: Transport Document Name information was deleted.
SYNONYMS: DRAYTON VALLEY SOUR CRUDE (PREVIOUSLY CALLED PEMBINA SOUR), EDMONTON HIGH SOUR CRUDE (SHE), EDMONTON LOW SOUR CRUDE (ELE), LIGHT SOUR BLEND CRUDE, MIXED BLEND SOUR CRUDE, SOUR CRUDE OIL, CRUDE OIL, HIGH H2S, CRUDE OIL (>0.005% H2S)

PRECAUTIONARY LABEL TEXT:
WHMIS Classification: Class B, Division 2: Flammable Liquids Class D, Division 1, Subdivision A: Very Toxic Material Class D, Division 2, Subdivision B: Toxic Material

HEALTH HAZARDS
Very toxic by inhalation. Irritating to skin. Danger of serious irreversible effects by a single exposure. If swallowed, may be aspirated and cause lung damage.

PHYSICAL HAZARDS
FLAMMABLE. In use, may form flammable/explosive vapour-air mixture. Material can accumulate static charges which may cause an ignition.

PRECAUTIONS
H2S is present. Avoid contact with skin. Avoid contact with eyes. Prevent exposure to ignition sources, for example use non-sparking tools and explosion-proof equipment. Potentially toxic/irritating fumes/vapour may be evolved from heated or agitated material. Use only with adequate ventilation. Do not enter storage areas or confined spaces unless adequately ventilated. Use proper bonding and/or earthing procedures.However, bonding and earthing may not eliminate the hazard from static accumulation. The toxic and olfactory (sense of smell) fatigue properties of hydrogen sulfide require that air monitoring alarms and respiratory protection be used where the concentration might be expected to reach a harmful level, such as in an enclosed space, heated transport vessel, or in a spill or leak situation.

FIRST AID
Inhalation: Immediately remove from further exposure. Get immediate medical assistance. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. Give supplemental oxygen, if available. If breathing has stopped, assist ventilation with a mechanical device.

Eye: Flush thoroughly with water for at least 15 minutes. Get medical assistance.

Oral: Seek immediate medical attention. Do not induce vomiting.

Skin: Remove contaminated clothing. Dry wipe exposed skin and cleanse with waterless hand cleaner and follow by washing thoroughly with soap and water. For those providing assistance, avoid further skin contact to yourself or others. Wear impervious gloves. Launder contaminated clothing separately before reuse. Discard contaminated articles that cannot be laundered. For hot product: Immediately immerse in or flush affected area with large amounts of cold water to dissipate heat. Cover with clean cotton sheeting or gauze and get prompt medical attention.

FIRE FIGHTING MEDIA
Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

SPILL/LEAK
Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do so without risk. Prevent entry into waterways, sewer, basements or confined areas. A vapour-suppressing foam may be used to reduce vapour. Fully encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire.

Water Spill: Stop leak if you can do so without risk. Eliminate sources of ignition. Warn other shipping. Report spills as required to appropriate authorities. If the Flash Point exceeds the Ambient Temperature by 10 deg C or more, use containment booms and remove from the surface by skimming or with suitable absorbents when conditions permit. If the Flash Point does not exceed the Ambient Air Temperature by at least 10C, use booms as a barrier to protect shorelines and allow material to evaporate. Seek the advice of a specialist before using dispersants.

Use

Not intended or suitable for use in or around a household or dwelling.

DGN: 5003405 (1014936)

Prepared by: Imperial Oil Limited, IH and Product Safety

ENBRIDGE

Safety Data Sheet

Section 1: Identification

PRODUCT IDENTIFIER	Petroleum Crude Oil—Sour	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1267
	Synonyms	Medium Sour Blend (MSB), Central Alberta Pipeline (CAL 1), Pembina Light Sour (PLS 1), Gibsons Light Sour (GLS 1), Pembina Low Sour (PLO 1), Gibson Sour (MGS 2), Kinder Morgan High Sour (KHE 2), Pembina High Sour (PHO 2), Peace Pipe Sour (SPR 2), Rangeland Sour (RSO 2), Gibsons High Sour (GHE 2), Hardisty Light (MBL 3), Manitoba Medium (MM 4), Wespur Midale (MSM 4), Tundra Light Sour (MLS), Moose Jaw Tops (MJT)
	Chemical Category	Crude oils—extremely flammable
RECOMMENDED USE	No information available	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420-5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION	Skin Irritation	Category 2
	Eye Irritation	Category 2
	Germ Cell Mutagenicity	Category 1B
	Carcinogenicity	Category 1A
	Reproductive Toxicity	Category 2
	Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
	Specific Target Organ Toxicity (Repeated Exposure)	Category 1
	Aspiration Toxicity	Category 1
	Flammable liquids	Category 1

LABEL ELEMENTS

Signal Word

Danger

Hazard Pictograms

Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.
- May cause drowsiness or dizziness.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- Keep container tightly closed.
- No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF EXPOSED or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- Do NOT induce vomiting.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If SKIN irritation occurs: Get medical advice/attention.
- If EYE irritation persists: Get medical advice/attention.

Storage/Disposal

- Store locked up and keep cool.
- Store in a well-ventilated place. Keep container tightly closed.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
2-Methylbutane (In Liquid form)	78-78-4	0-4	
Benzene	71-43-2	0-5	
Butane	106-97-8	0-5	
Cyclohexane	110-82-7	0-5	
Ethylbenzene	100-41-4	0-2	
Heptane	142-82-5	0-10	
Hexane	110-54-3	0-8	
Hydrogen Sulfide	7783-06-4	0-5	
Isobutane	75-28-5	0-5	
Methylcyclohexane	108-87-2	0-3	
Methylcyclopentane	96-37-7	0-3	
Naphthalene	91-20-3	0-1	
Natural gas condensates (petroleum)	64741-47-5	0-25	
Octane	111-65-9	0-10	
Pentane	109-66-0	0-3	
Petroleum	8002-05-9	0-100	
Toluene	108-88-3	0-5	
Xylene	1330-20-7	0-3	

**Values do not reflect absolute minimums and maximums; those values may vary from time to time.*

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES

Inhalation	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed—can enter lungs and cause damage.

MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

Refer to Section 11 - Toxicological Information

INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY

Note to the Physician

- Aspiration hazard. Symptoms may be delayed.
- Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for development of cardiac arrhythmias.
- Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA

Suitable Extinguishing Media	• SMALL FIRES: Dry chemical, CO_2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.

FIREFIGHTING PROCEDURES

- FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out.
- Stay upwind.
- Ventilate closed spaces before entering.
- Fire fighters should wear complete protective clothing including self-contained breathing apparatus.
- FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.
- FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions.
- Move containers from fire area if you can do it without risk.

- LARGE FIRES: Use water spray or fog; do not use straight streams.
- LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.
- LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products	• Carbon monoxide. Carbon dioxide (CO_2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
Sensitivity to Mechanical Impact	• None.
Sensitivity to Static Discharge	• Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced firefighters.
- Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions	• Evacuate personnel to safe areas. • Remove all sources of ignition. • Deny entry to unauthorized and unprotected personnel. • Use personal protective equipment. • Avoid contact with skin, eyes and clothing. • Stop leak if you can do it without risk. • Keep people away from and upwind of spill/leak. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Ventilate enclosed areas. • Do not walk through spilled material.
Protective Equipment	• Wear appropriate breathing apparatus (if applicable) and protective clothing.

	Emergency Procedures	• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk. • Report spills to local or federal authorities as appropriate or required.
ENVIRONMENTAL PRECAUTIONS		• Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.
METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP	**Methods for Containment**	• Stop leak if you can do it without risk. • Contain and recover liquid when possible. • A vapor suppressing foam may be used to reduce vapors. • Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming. • Use water spray to reduce vapors or divert vapor cloud drift. • A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.
	Methods for Cleaning Up	• Clean up spill immediately. • LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST. • SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal. • Use appropriate Personal Protective Equipment (PPE). • Use clean non-sparking tools to collect absorbed material. • Vacuum spilled material. • Try to work upwind of spill. • All equipment used when handling the product must be grounded. • Recover and return free product to proper containers • Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids. • Do not place spilled materials back in the original container. • Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING	**Handling**	• All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces. • The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). • The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits. • Take precautionary measures against static discharges.

	Handling	• Do not cut drill, grind or weld on empty containers since they may contain explosive residues. • Stay upwind and vent open hatches before uploading. • Avoid contact with skin, eyes and clothing. • Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. • Wear personal protective equipment. • Remove and wash contaminated clothing before re-use. • Do not eat, drink or smoke when using this product. • Do not take internally. • Wash thoroughly after handling. • Empty containers pose a potential fire and explosion hazard.
CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES	**Storage**	• Ventilate enclosed areas. • Store in a well-ventilated place. • Keep container tightly closed. • Store locked up. • Avoid shock, impact, friction, and rough handling. Do not use sparking tools. • Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources. • Keep away from sources of ignition. • No Smoking. • Do not enter confined spaces such as tanks or pits without following proper entry procedures. • Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. • Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. • Keep away from open flames, hot surfaces and sources of ignition. • Keep product and empty container away from heat and sources of ignition. • Storage containers should be grounded and bonded. • Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. • Store away from incompatible materials.
	Incompatible Products	• Strong oxidizers such as nitrates, chlorates, peroxides, chlorine.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
2-Methylbutane (In Liquid form)	TWA 600 ppm	–	–
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Butane	STEL 1000 ppm	–	TWA 800 ppm TWA 1900 mg/m^3

Cyclohexane	TLV 100 ppm TLV 334 mg/m^3	PEL 300 ppm PEL 1050 mg/m^3	TWA 300 ppm TWA 1050 mg/m^3 IDLH 1300 ppm
Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm
Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
Hydrogen sulfide	TLV 1 ppm TLV 1.4 mg/m^3 STEL 5 ppm STEL 7 mg/m^3	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m^3 IDLH 100 ppm
Isobutane	TWA 1000 ppm	–	–
Methylcyclohexane	TLV 400 ppm TLV 1610 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 400 ppm TWA 1600 mg/m^3 IDLH 1200 ppm
Naphthalene	TLV 10 ppm STEL 15 ppm	PEL 10 ppm PEL 50 mg/m^3	TWA 10 ppm TWA 50 mg/m^3 STEL 15 ppm STEL 75 mg/m^3
Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm
Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm

Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES

Eye and Face	• Wear face shield and eye protection.
Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION

Physical State	Liquid	**Odor**	Petroleum like odor
Substance Type	Mixture	**Odor Threshold**	No data available
Appearance	Yellow/green to Brown/black liquid		

PROPERTIES

pH	No data available	**Vapor Pressure**	No data available
Melting Point/ Freezing Point	No data available	**Vapor Density**	>1 Air=1
Boiling Point/ Boiling Range	-20 to 550°C -4 to 1022°F	**Relative Density**	No data available
Flash Point	-40 to 100 °C -40 to 212 °F	**Water Solubility**	Negligible
Evaporation Rate	No data available	**Partition Coefficient: n-octanol/water**	No data available
Flammability (solid, gas)	No data available	**Autoignition Temperature**	No data available
Upper Flammability Limit	No data available	**Decomposition Temperature**	No data available

Lower Flammability Limit	No data available	**Specific Gravity**	No data available
Viscosity	No data available		

Section 10: Stability and Reactivity

REACTIVITY	Chlorine Dioxide
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides, chlorine
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, sulfur dioxide, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE

Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
Eye Contact	• Causes serious eye irritation.
Skin Contact	• Causes skin irritation.
Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
2-Methylbutane (In Liquid form)	–	–	= 150,000 mg/m^3 (Rat) 2 h
Benzene	1800 mg/kg (Rat)	–	13050 - 14380 ppm (Rat) 4 h
Butane	–	–	658 mg/L (Rat) 4 h
Cyclohexane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 13.9 mg/L (Rat) 4 h
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
Heptane	–	= 3000 mg/kg (Rabbit)	= 103 g/m^3 (Rat) 4 h
Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h

Hydrogen sulfide	–	–	= 444 ppm (Rat)
Isobutane	–	–	= 658,000 mg/m^3 (Rat) 4 h
Methylcyclohexane	> 3200 mg/kg (Rat)	–	–
Naphthalene	490 mg/kg (Rat)	0.05 ml (Rabbit) 24 h	–
Natural gas condensates (petroleum)	–	–	= 600 mg/m^3 (Rat)
Octane	–	–	= 118 g/m^3 (Rat) 4 h = 25260 ppm (Rat) 4 h
Pentane	>2000 mg/kg (Rat)	–	364 g/cu (Rat) 4 h
Propane	–	–	>800000 ppm (Rat) 15 min
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	–
Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene	• Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.
Hydrogen Sulfide Gas (H_2S)	• Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning have been reported. Complete and rapid recovery is the general rule. However, if the exposure was sufficiently intense and sustained causing cerebral hypoxia (lack of oxygen to the brain), neurologic effects such as amnesia, intention tremors or brain damage are possible.
Hexane	• This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.

Xylenes	• Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.
Toluene	**Carcinogenicity:** Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC. **Target Organs:** Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances. **Reproductive Toxicity:** Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.
Ethylbenzene	**Carcinogenicity:** Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC. **Target Organs:** In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.
Naphthalene	Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The US National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has been identified as a carcinogen by IARC and NTP.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA
Benzene	A1	X	Group 1	Known	X
Ethylbenzene	A3	–	Group 2B	Evidence	X
Hexane	–	X	–	–	–
Naphthalene	A4	X	2B	Evidence	
Petroleum	–		Group 3	Evidence	
Toluene	A4	–	Group 3	Evidence	–
Xylenes	A4	–	Group 3	Evidence	–

**ACGIH Skin designation refers to the potential significant contribution of overall exposure by cutaneous route, including mucous membranes and eyes, from airborne exposure to gases, vapor, or liquid OR by direct skin contact.*

REPRODUCTIVE TOXICITY

- Suspected of damaging fertility or the unborn child.

STOT—SINGLE EXPOSURE

- May cause drowsiness and dizziness.

STOT—REPEATED EXPOSURE

- Causes damage to organs through prolonged or repeated exposure.

ASPIRATION HAZARD

May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
2-Methylbutane (In Liquid form)			EC50 48 h: = 2.3 mg/L (Daphnia magna)	
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Cyclohexane	EC50 72 h: > 500 mg/L (Desmodesmus subspicatus)	LC50 96 h: 3.96 - 5.18 mg/L flow-through (Pimephales promelas) LC50 96 h: 23.03 - 42.07 mg/L static (Pimephales promelas) LC50 96 h: 24.99 - 44.69 mg/L static (Lepomis macrochirus) LC50 96 h: 48.87 - 68.76 mg/L static (Poecilia reticulata)	EC50 24 h: > 400 mg/L (Daphnia magna	EC50 = 85.5 mg/L 5 min EC50 = 93 mg/L 10 min (Microorganisms)
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)
Heptane	–	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	–
Hexane	–	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	–
Hydrogen sulfide	–	LC50 96h: 49 µg/l Oncorhynchus mykiss (Rainbow Trout) eggs LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow)	EC50 48h: 62 µg/l Gammarus pseudolimnaeus (Scud)	–
Methylcyclohexane	–	LC50 96hr: 72.0 mg/l (Golden Shiner)	–	–
Naphthalene	EC50 24 h: = 33000 ug/L (Chlorella vulgaris)	LC50 96 h: = 1.4 mg/L (Oncorhynchus gorbuscha)	EC50 48 h: 1600 ug/L (Daphnia magna)	–
Natural gas condensates (petroleum)	–	LC50 96 h: = 119 mg/L static (Alburnus alburnus) LC50 96 h: = 82 mg/L static (Cyprinodon variegatus)	EC50 24 h: = 170 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Octane	–	–	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
Pentane	–	–	EC50 48h: 135 mmol/cu	LC50 24h: 165 mmol/cu Artemia salina (Brine Shrimp)
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 11.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	-

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
2-Methylbutane (In Liquid form)	2.72
Benzene	1.83
Butane	2.89

Cyclohexane	3.44
Ethylbenzene	3.118
Heptane	3.90
Hexane	3.90
Hydrogen Sulfide	0.45
Isobutane	2.76
Methylcyclohexane	3.61
Methylcyclopentane	3.37
Naphthalene	3.30
Octane	5.18
Pentane	3.39
Toluene	2.65
Xylene	2.77-3.15

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
2-Methylbutane (In Liquid form)	Low
Benzene	High
Butane	Low
Cyclohexane	Moderate
Ethylbenzene	Low
Heptane	Moderate
Hexane	High
Isobutane	Very High
Methylcyclopentane	Low
Naphthalene	High to None
Octane	Immobile
Pentane	High
Toluene	High to Moderate
Xylene	Very High to Moderate

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste	• This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility. • This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP). • This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s). • It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.
Packaging Waste	• Container contents should be completely used and containers should be emptied prior to discard. • Container could be considered a RCRA hazardous waste and must be disposed of with care and in full compliance with federal, state and local regulations. • Larger empty containers, such as drums, should be returned to the distributor or to a drum re-conditioner. • To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1267	Petroleum Crude Oil	3	I	Emergency response guide number: 128
TDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IMO/IMDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IATA/ICAO	UN1267	Petroleum Crude Oil	3	I	ERG Code 3L

SPECIAL RECAUTIONS FOR USER

• None

Section 15: Regulatory Information

U.S.—CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb final RQ; 454 kg final RQ
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
Heptane	142-82-5	Not Listed
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
Hydrogen Sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	100 lb final RQ; 45.4 kg final RQ
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ

U.S.—CWA (CLEAN WATER ACT)—REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	10 lb RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb RQ
Ethylbenzene	100-41-4	1000 lb RQ
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	100 lb RQ
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	100 lb RQ
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Toluene	108-88-3	1000 lb RQ
Xylene	1330-20-7	100 lb RQ

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR FRESHWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR SALTWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)— HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	X
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	X
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

U.S.—CWA (CLEAN WATER ACT)— PRIORITY POLLUTANTS

COMPONENT	CAS #	LISTED
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	Not Listed
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed

Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	X
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	Not Listed

X= The component is listed

CANADA-WHMIS—CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
2-Methylbutane (In Liquid form)	78-78-4	B2
Benzene	71-43-2	B2, D2A, D2B
Butane	106-97-8	A, B1
Cyclohexane	110-82-7	B2, D2B
Ethylbenzene	100-41-4	B2, D2A, D2B
Heptane	142-82-5	B2, D2B
Hexane	110-54-3	B2, D2A, D2B
Hydrogen Sulfide	7783-06-4	A, B1, D1A, D2B
Isobutane	75-28-5	A, B1 (listed under Methyl-2 propane)
Methylcyclohexane	108-87-2	B2
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	B4, D2A
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	B2, D2B
Pentane	109-66-0	B2
Petroleum	8002-05-9	B2
Toluene	108-88-3	B2, D2A, D2B
Xylene	1330-20-7	B2, D2A, D2B

X= The component is listed

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L
Naphthalene	91-20-3	1.1 µg/L (listed under Polycyclic aromatic hydrocarbons (PAHs))

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L
Naphthalene	91-20-3	1.4 µg/L (listed under Polycyclic aromatic hydrocarbons (PAHs))

CANADA—ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
2-Methylbutane (In Liquid form)	78-78-4	X
Benzene	71-43-2	X
Butane	106-97-8	X
Cyclohexane	110-82-7	X
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Isobutane	75-28-5	X
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	X
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	X
Petroleum	8002-05-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

Section 16: Other Information

NFPA				
	Health Hazard: 3	**Flammability:** 4	**Instability:** 0	**Physical and Chemical Hazards:** X
HMIS	**Health Hazard:** 3	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X
ISSUING DATE	5/7/15			
REVISION DATE	5/7/15			

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

Natural Gas Liquid (Canada)

Safety Data Sheet

Section 1: Identification of the substance or mixture and of the supplier

Product Name: Natural Gas Liquid (Canada)
SDS Number: 791815

Synonyms/Other Means of Identification:
Natural Gas Liquids, Raw
Natural Gas Liquids, Ethane Free
Plant Condensate
Raw NGL
EPBC Mix
PBC Mix
Y-Grade
Gas Liquids

MARPOL Annex I Category: Naphthas and Condensates
Intended Use: Refinery Feed

Manufacturer:
ConocoPhillips Canada Limited or its Affiliates
PO Box 130, 401 9th Ave. SW
Calgary, Alberta T2P 2H7 Canada

Emergency Health and Safety Number:
Chemtrec: 800-424-9300 (24 Hours)
CANUTEC (613) 996-6666

Customer Service: 403-233-4000

Technical Information: 403-233-4000

SDS Information:
Phone: 855-244-0762
Email: SDS@conocophillips.com
URL: www.conocophillips.com

Section 2: Hazard(s) Identification

Classification
H224 -- Flammable liquids -- Category 1
H304 -- Aspiration Hazard -- Category 1
H315 -- Skin corrosion/irritation -- Category 2
H336 -- Specific target organ toxicity (single exposure) -- Category 3
H350 -- Carcinogenicity -- Category 1B
H411 -- Hazardous to the aquatic environment, chronic toxicity -- Category 2

Hazards not Otherwise Classified
May contain or release poisonous hydrogen sulfide gas

Label Elements

DANGER

Extremely flammable liquid and vapor. (H224)*
Causes skin irritation. (H315)*
May contain or release poisonous hydrogen sulfide gas
May be fatal if swallowed and enters airways. (H304)*
May cause drowsiness or dizziness. (H336)*
May cause cancer. (H350)*
Toxic to aquatic life with long lasting effects. (H411)*

Precautionary Statement(s):

Obtain special instructions before use. (P201)*
Do not handle until all safety precautions have been read and understood. (P202)*
Keep away from heat/sparks/open flames/hot surfaces. - No smoking. (P210)*
Keep container tightly closed. (P233)*
Ground/bond container and receiving equipment. (P240)*
Use with explosion-proof equipment. (P241)*
Use only non-sparking tools. (P242)*
Take precautionary measures against static discharge. (P243)*
Avoid breathing dust/fume/gas/mist/vapours/spray. (P261)*
Wash thoroughly after handling. (P264)*
Use only outdoors or in a well-ventilated area. (P271)*
Wear protective gloves / protective clothing / eye protection / face protection. (P280)*
IF ON SKIN: Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. (P303+P361+P353)*
If skin irritation occurs: Get medical advice/attention. (P313)*
Take off contaminated clothing and wash before reuse. (P362)*
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. (P301+P310)*
Do NOT induce vomiting. (P331)*
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. (P304+P340)*
Call a POISON CENTER or doctor/physician if you feel unwell. (P312)*
In case of fire: Use dry chemical, carbon dioxide, or foam for extinction.(P370+P378)*
Store in a well-ventilated place. Keep cool.(P403+P235)*
Store locked up. (P405)*
Dispose of contents/container to approved disposal facility. (P501)*

- *(Applicable GHS hazard code.)*

Section 3: Composition / Information on Ingredients

Component	CASRN	Concentration[1]
Natural gas (petroleum), raw liq. mix	64741-48-6	100
n-Hexane	110-54-3	5-25
Benzene	71-43-2	0.1-5
Hydrogen Sulfide	7783-06-4	<1

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

Section 4: First Aid Measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: Remove contaminated shoes and clothing, and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops, seek medical attention. Wash contaminated clothing before reuse.

Inhalation (Breathing): If respiratory symptoms or other symptoms of exposure develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. If symptoms persist, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

Most important symptoms and effects

Acute: Headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue.

Delayed: Dry skin and possible irritation with repeated or prolonged exposure.

Notes to Physician: At high concentrations hydrogen sulfide may produce pulmonary edema, respiratory depression, and/or respiratory paralysis. The first priority in treatment should be the establishment of adequate ventilation and the administration of 100% oxygen. Animal studies suggest that nitrites are a useful antidote, however, documentation of the efficacy of nitrites in humans is lacking. If the diagnosis of hydrogen sulfide poisoning is confirmed and if the patient does not respond rapidly to supportive care, the use of nitrites may be an effective antidote if delivered within the first few minutes of exposure. For adults the dose is 10 mL of a 3% NaNO2 solution (0.5 gm NaNO2 in 15 mL water) I.V. over 2-4 minutes. The dosage should be adjusted in children or in the presence of anemia, and methemoglobin levels, arterial blood gases, and electrolytes should be monitored closely.

Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of hydrocarbon solvents (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for the development of cardiac arrhythmias.

Federal regulations (29 CFR 1910.1028) specify medical surveillance programs for certain exposures to benzene above the action level or PEL (specified in Section (i)(1)(i) of the Standard). In addition, employees exposed in an emergency situation shall, as described in Section (i)(4)(i), provide a urine sample at the end of the shift for measurement of urine phenol.

Other Comments: Before attempting rescue, first responders should be alert to the possible presence of hydrogen sulfide, a poisonous gas with the smell of rotten eggs, and should consider the need for respiratory protection (see Section 8). Remove casualty to fresh air as quickly as possible. Immediately begin artificial respiration if breathing has ceased. Consider whether oxygen administration is needed. Obtain medical advice for further treatment.

Section 5: Fire-Fighting Measures

NFPA 704 Hazard Class

Health: 1 **Flammability:** 4 **Instability:** 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

Unusual Fire & Explosion Hazards: Extremely flammable. This material can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. This product will float and can be reignited on surface water. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire. Hazardous combustion/decomposition products, including hydrogen sulfide, may be released by this material when exposed to heat or fire. Use caution and wear protective clothing, including respiratory protection.

Extinguishing Media: Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Fire Fighting Instructions: For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

Hazardous Combustion Products: Combustion may yield smoke, carbon monoxide, and other products of incomplete combustion. Oxides of nitrogen and sulfur may also be formed.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

Section 6: Accidental Release Measures

Personal Precautions: May contain or release poisonous hydrogen sulfide gas. If the presence of dangerous amounts of H2S around the spilled product is suspected, additional or special actions may be warranted, including access restrictions and use of protective equipment. Extremely flammable. Spillages of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of ignition and hot metal surfaces away from spill/release if safe to do so. The use of explosion-proof electrical equipment is recommended. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use foam on spills to minimize vapors. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard. Spills into or upon navigable waters, the contiguous zone, or adjoining shorelines that cause a sheen or discoloration on the surface of the water, may require notification of the National Response Center (phone number 800-424-8802).

Methods for Containment and Clean-Up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken.

Section 7: Handling and Storage

Precautions for safe handling: Keep away from ignition sources such as heat/sparks/open flame – No smoking. Take precautionary measures against static discharge. Nonsparking tools should be used. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. May contain or release dangerous levels of hydrogen sulfide. Wear protective gloves/clothing and eye/face protection. Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Extremely Flammable. May vaporize easily at ambient temperatures. The vapor is heavier than air and may create an explosive mixture of vapor and air. Beware of accumulation in confined spaces and low lying areas. Open container slowly to relieve any pressure. Electrostatic charge may accumulate and create a hazardous condition when handling or processing this material. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-70 and/or API RP 2003 for specific bonding/grounding requirements. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames.

Static Accumulation Hazard: Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding of tanks, transfer piping, and storage tank level floats are necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. Special care should be given to ensure that special slow load procedures for "switch loading" are followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such as gasoline or naphtha). For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.

Conditions for safe storage: This material may contain or release poisonous hydrogen sulfide gas. In a tank, barge, or other closed container, the vapor space above this material may accumulate hazardous concentrations of hydrogen sulfide. Check atmosphere for oxygen content, H2S, and flammability prior to entry. Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Store only in approved containers. Post area "No Smoking or Open Flame." Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Section 8: Exposure Controls / Personal Protection

Component	ACGIH	OSHA	Other
Natural gas (petroleum), raw liq. mix	TWA: 300 ppm (as Gasoline)	TWA: 400 mg/m^3 TWA: 100 ppm	0.5 ppm TWA8hr (as benzene) 0.25 ppm TWA12hr (as benzene) 2.5 ppm STEL (as benzene) (ConocoPhillips Guidelines)
n-Hexane	TWA: 50 ppm Skin	TWA: 500 ppm TWA: 1800 mg/m^3	---
Benzene	STEL: 2.5 ppm TWA: 0.5 ppm Skin	Ceiling: 25 ppm STEL: 5 ppm TWA: 10 ppm TWA: 1 ppm	---
Hydrogen Sulfide	STEL: 5 ppm TWA: 1 ppm	Ceiling: 20 ppm	TWA: 5 ppm 8hr TWA: 2.5 ppm 12hr STEL: 15 ppm (ConocoPhillips Guidelines)

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye protection that meets or exceeds ANSI Z.87.1 is recommended to protect against potential eye contact, irritation, or injury. Depending on conditions of use, a face shield may be necessary.

Skin/Hand Protection: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Depending on exposure and use conditions, additional protection may be necessary to prevent skin contact including use of items such as chemical resistant boots, aprons, arm covers, hoods, coveralls, or encapsulated suits. Suggested protective materials: Nitrile

Respiratory Protection: A NIOSH approved, self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode should be used in situations of oxygen deficiency (oxygen content less than 19.5 percent), unknown exposure concentrations, or situations that are immediately dangerous to life or health (IDLH).

A respiratory protection program that meets or is equivalent to OSHA 29 CFR 1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use.

If benzene concentrations equal or exceed applicable exposure limits, OSHA requirements for personal protective equipment, exposure monitoring, and training may apply (29CFR1910.1028 - Benzene).

Other Protective Equipment: Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse.

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

Section 9: Physical and Chemical Properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance:	Colorless
Physical Form:	Liquid
Odor:	Gasoline
Odor Threshold:	No data
pH:	Not applicable
Vapor Pressure:	128 psia (Reid VP) @ 100°F / 37.8°C
Vapor Density (air=1):	>1
Initial Boiling Point/Range:	-44 to 90 °F / -42 to 32 °C
Melting/Freezing Point:	No data
Solubility in Water:	Slight
Partition Coefficient (n-octanol/water) (Kow):	No data
Specific Gravity (water=1):	0.5-0.7 (estimated) @ 60ºF (15.6ºC)
Evaporation Rate (nBuAc=1):	No data
Flash Point:	< 10 °F / < -12 °C
Test Method:	Pensky-Martens Closed Cup (PMCC), ASTM D93, EPA 1010
Lower Explosive Limits (vol % in air):	1.1
Upper Explosive Limits (vol % in air):	13.0
Auto-ignition Temperature:	No data

Section 10: Stability and Reactivity

Stability: Stable under normal ambient and anticipated conditions of use.

Conditions to Avoid: Avoid high temperatures and all sources of ignition. Prevent vapor accumulation.

Materials to Avoid (Incompatible Materials): Avoid contact with strong oxidizing agents and strong reducing agents.

Hazardous Decomposition Products: Not anticipated under normal conditions of use.

Hazardous Polymerization: Not known to occur.

Section 11: Toxicological Information

Information on Toxicological Effects of Substance/Mixture

Acute Toxicity	Hazard	Additional Information	LC50/LD50 Data
Inhalation	Expected to have a low degree of toxicity by inhalation	May contain or release poisonous hydrogen sulfide gas - see Other Comments.	>5.2 mg/L (vapor)
Skin Absorption	Unlikely to be harmful		> 2 g/kg
Ingestion (Swallowing)	Unlikely to be harmful		> 5 g/kg

Aspiration Hazard: May be fatal if swallowed and enters airways.

Skin Corrosion/Irritation: Causes skin irritation. Repeated exposure may cause skin dryness or cracking.

Serious Eye Damage/Irritation: Causes mild eye irritation. .

Signs and Symptoms: Effects of overexposure can include slight irritation of the respiratory tract, nausea, vomiting, and signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue). Continued exposure to high concentrations can result in vomiting, cardiac irregularities and sudden loss of consciousness.

Skin Sensitization: Not expected to be a skin sensitizer.

Respiratory Sensitization: No information available.

Specific Target Organ Toxicity (Single Exposure): May cause drowsiness and dizziness.

Specific Target Organ Toxicity (Repeated Exposure): Not expected to cause organ effects from repeated exposure.

Carcinogenicity: May cause cancer.

Germ Cell Mutagenicity: Not expected to cause heritable genetic effects.

Reproductive Toxicity: Not expected to cause reproductive toxicity.

Other Comments: This material may contain or liberate hydrogen sulfide, a poisonous gas with the smell of rotten eggs. The smell disappears rapidly because of olfactory fatigue so odor may not be a reliable indicator of exposure. Effects of overexposure include irritation of the eyes, nose, throat and respiratory tract, blurred vision, photophobia (sensitivity to light), and pulmonary edema (fluid accumulation in the lungs). Severe exposures can result in nausea, vomiting, muscle weakness or cramps, headache, disorientation and other signs of nervous system depression, irregular heartbeats, convulsions, respiratory failure, and death.

Information on Toxicological Effects of Components

Natural gas (petroleum), raw liq. mix

Carcinogenicity: Two year inhalation studies of vaporized unleaded gasoline produced an increased incidence of kidney tumors in male rats and liver tumors in female mice. Repeated skin application of various petroleum naphthas in mice for two years resulted in an increased incidence of skin tumors but only in the presence of severe skin irritation. Follow-up mechanistic studies suggest that the occurrence of these tumors may be the consequence of promotional processes and not relevant to human risk assessment. Epidemiology data collected from a study of more than 18,000 petroleum marketing and distribution workers showed no increased risk of leukemia, multiple myeloma, or kidney cancer from gasoline exposure. Unleaded gasoline has been identified as a possible carcinogen by the International Agency for Research on Cancer.

Target Organs: Two year inhalation studies of wholly vaporized unleaded gasoline, and 90 days studies of various petroleum naphthas, did not produce significant target organ toxicity in laboratory animals. Nephropathy in male rats, characterized by the accumulation of alpha-2-u- globulin in epithelial cells of the proximal tubules was observed, however follow-up studies suggest that these changes are unique to the male rat.
Reproductive Toxicity: No evidence of developmental toxicity was found in pregnant laboratory animals (rats and mice) exposed to high vapor concentrations of unleaded gasoline and petroleum naphthas via inhalation. A two-generation reproductive toxicity study of vapor recovery gasoline did not adversely affect reproductive function or offspring survival and development.

n-Hexane

Target Organs: Excessive exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesias of distal portions of the extremities. Motor weakness is typically observed in muscles of the toes and fingers but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. The neurotoxic properties of n-hexane are potentiated by exposure to methyl ethyl ketone and methyl isobutyl ketone.
Reproductive Toxicity: Prolonged exposure to high concentrations of n-hexane (>1,000 ppm) resulted in decreased sperm count and degenerative changes in the testes of rats but not those of mice.

Benzene

Carcinogenicity: Benzene is an animal carcinogen and is known to produce acute myelogenous leukemia (a form of cancer) in humans. Benzene has been identified as a human carcinogen by IARC, the US National Toxicology Program and the US-Occupational Safety and Health Administration.
Target Organs: Prolonged or repeated exposures to benzene vapors can cause damage to the blood and blood forming organs, including disorders like leukopenia, thrombocytopenia, and aplastic anemia.
Reproductive Toxicity: Some studies in occupationally exposed women have suggested benzene exposure increased risk of miscarriage and stillbirth and decreased birth weight and gestational age. The size of the effects detected in these studies was small, and ascertainment of exposure and outcome in some cases relied on self-reports, which may limit the reliability of these results.
Germ Cell Mutagenicity: Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells. Exposure has also been associated with chromosomal aberrations in sperm cells in human and animal studies.

Toluene

Carcinogenicity: Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC.
Target Organs: Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances.
Reproductive Toxicity: Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.

Cyclohexane

Reproductive Toxicity: Two-generation reproduction and developmental toxicity studies using rats and rabbits exposed (whole-body) to atmospheric concentrations up to 7000 ppm cyclohexane did not detect evidence of developmental toxicity in either species.

Section 12: Ecological Information

Toxicity: Acute aquatic toxicity studies on samples of gasoline and naphtha streams show acute toxicity values greater than 1 mg/L and mostly in the range 1-100 mg/L. These tests were carried out on water accommodated fractions, in closed systems to prevent evaporative loss. Results are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon composition. These substances should be regarded as toxic to aquatic organisms, with the potential to cause long term adverse effects in the aquatic environment. Classification: H411; Chronic Cat 2.

Persistence and Degradability: The hydrocarbons in this material are not readily biodegradable but are regarded as inherently biodegradable since their hydrocarbon components can be degraded by microorganisms.

Bioaccumulative Potential: Log Kow values measured for the hydrocarbon components of this material range from 3 to greater than 6 and therefore are regarded as having the potential to bioaccumulate. In practice, metabolic processes or physical properties may prevent this effect or limit bioavailability.

Mobility in Soil: On release to water, hydrocarbons will float on the surface and since they are sparingly soluble, the only significant loss is volatilization to air. In air, these hydrocarbons are photodegraded by reaction with hydroxyl radicals with half lives varying from 6.5 days for benzene to 0.5 days for n-dodecane.

Other Adverse Effects: None anticipated.

Section 13: Disposal Considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations.

This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste. However, it would likely be identified as a federally regulated RCRA hazardous waste for the following characteristic(s) shown below. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the MSDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.

Container contents should be completely used and containers should be emptied prior to discard. Container residues and rinseates could be considered to be hazardous wastes.

EPA Waste Number(s)
- D001 - Ignitability characteristic
- D018 - Toxicity characteristic (Benzene)

Section 14: Transport Information

Canadian (TDG)

Shipping Description:	***Shipping description assumes vapor pressure is >300 kPa.*** UN1965, Hydrocarbon gas mixture, liquefied, n.o.s., (Propane; ,; Butane), 2.1
Small Means of Containment	
Package Marking:	Hydrocarbon gas mixture, liquefied, n.o.s., (Propane, Butane), UN1965
Package Labeling:	Flammable gas
Large Means of Containment	
Package Placard/Marking:	Flammable gas / 1965
ERAP Index:	3000
Emergency Response Guide:	115

U.S. Department of Transportation (DOT)

Shipping Description:	UN1965, Hydrocarbon gas mixture, liquefied, n.o.s., 2.1
Non-Bulk Package Marking:	Hydrocarbon gas mixture, liquefied, n.o.s., UN1965
Non-Bulk Package Labeling:	Flammable gas
Bulk Package/Placard Marking:	Flammable gas / 1965
Packaging - References:	49 CFR: 173.306; 173.304; 173.314 & .315 ***(Exceptions; Non-bulk; Bulk)***
Hazardous Substance:	See Section 15 for RQ`s
Emergency Response Guide:	115
Note:	***The following alternate shipping description order may be used until January 1, 2013:*** **Proper Shipping name, Hazard Class or Division, (Subsidiary Hazard if any), UN or NA number, Packing Group *Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code:*** *Not applicable* ***Other shipping description elements may be required for DOT compliance.***

International Maritime Dangerous Goods (IMDG)

Shipping Description:	UN1965, Hydrocarbon gas mixture, liquefied, n.o.s., (Propane , Butane), 2.1
Non-Bulk Package Marking:	Hydrocarbon gas mixture, liquefied, n.o.s., (Propane, Butane), UN1965
Labels:	Flammable gas
Placards/Marking (Bulk):	Flammable gas / 1965
Packaging - Non-Bulk:	P200
EMS:	F-D, S-U
Note:	***If transported in bulk by marine vessel in international waters, product is being carried under the scope of MARPOL Annex I.***

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)

UN/ID #:	UN1965
Proper Shipping Name:	Hydrocarbon gas mixture, liquefied, n.o.s. (Propane, Butane)
Hazard Class/Division:	2.1
Subsidiary risk:	None
Packing Group:	None
Non-Bulk Package Marking:	Hydrocarbon gas mixture, liquefied, n.o.s. (Propane, Butane), UN1965
Labels:	Flammable gas
ERG Code:	10L

	LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	*Forbidden*	*Forbidden*	200
Max. Net Qty. Per Package:	*Forbidden*	*Forbidden*	150 kg

Section 15: Regulatory Information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material contains the following chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372:

Component	TPQ	EPCRA RQ
Hydrogen Sulfide	500 lb	100 lb

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health:	Yes
Chronic Health:	Yes
Fire Hazard:	Yes
Pressure Hazard:	No
Reactive Hazard:	No

CERCLA/SARA - Section 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Component	Concentration[1]	de minimis
n-Hexane	5-25	1.0%
Toluene	1-5	1.0%
Benzene	0.1-5	0.1%
Cyclohexane	0-3	1.0%

EPA (CERCLA) Reportable Quantity (in pounds):
EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

California Proposition 65:
Warning: This material may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the warning requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Component	Type of Toxicity
Toluene	Developmental Toxicant Female Reproductive Toxicant
Benzene	Cancer Developmental Toxicant Male Reproductive Toxicant

International Hazard Classification

Canada:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the Regulations.

WHMIS Hazard Class:
B2 - Flammable Liquids
D2A
D2B

National Chemical Inventories
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA
All components are either on the DSL, or are exempt from DSL listing requirements

U.S. Export Control Classification Number: EAR99

Section 16: Other Information

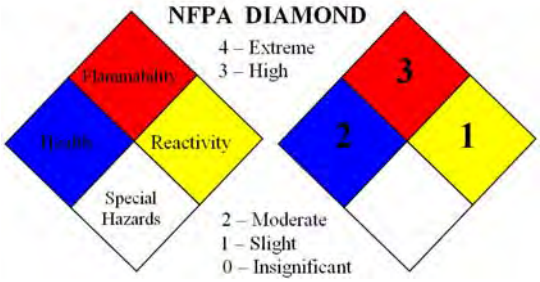
Date of Issue:	03-Apr-2012
Status:	FINAL
Previous Issue Date:	21-Jun-2011
Revised Sections or Basis for Revision:	Identified Hazards (Section 2) Precautionary Statement(s) (Section 2) First Aid (Section 4) Shipping information (Section 14) Regulatory information (Section 15)
SDS Number:	791815

Guide to Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:
The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

Material Safety Data Sheet

1 – CHEMICAL PRODUCT AND COMPANY IDENTIFICATION



Manufacturer/Supplier: Enbridge Pipelines Inc.
10201- Jasper Avenue
Edmonton, Alberta T5J 3N7
CANADA
Product Name: North Dakota Sweet (NSW), Crude Oil
Synonyms: Bakken Crude Oil, US. High Sweet Clearbrook (UHC), Hydrocarbons of Petroleum
General Information: 780-420-5306
Emergency Telephone Number (24 hrs):
CHEMTREC 800-424-9300 USA CANUTEC 613-996-6666 Canada
Date Prepared: 10/7/2013

2 – PRODUCT COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS Number	Normal % * by Wt./Vol.	Occupational Exposure Limits (ppm)		
			OSHA	ACGIH	NIOSH
Petroleum Hydrocarbons	68919-39-1	100	N/A	N/A	N/A
1t,2-dimethylcyclopentane	28729-52-4	1.8	None	None	None
2-methylhexane	591-76-4	1.0	None	None	None
2-methylpentane	107-83-5	1.8	None	500	100
3-methylhexane	589-34-4	1.6	None	None	None
3-methylpentane	96-14-0	1.3	None	500	100
2-methylheptane	592-27-8	1.4	None	300	None
Benzene	71-43-2	0.4	1	0.5	0.1
cyclohexane	110-82-7	1.0	300	100	300
i-pentane	109-66-0	1.8	1000	600	120
methylcyclohexane	108-87-2	2.3	500	400	400
methylcyclopentane	96-37-7	2.2	None	None	None
n-butane	106-97-8	1.9	800	1000	800
n-heptane	142-82-5	3.4	500	400	85
n-Hexane	110-54-3	3.4	50	50	50
n-Pentane	109-66-0	3.4	600	600	120
n-octane	111-65-9	3.0	500	300	75

n-nonane	111-84-2	2.2	None	200	200
n-decane	124-18-5	2.0	None	None	None
n-undecane	1120-21-4	1.7	None	None	None
n-dodecane	112-40-3	1.5	None	None	None
n-tridecane	629-50-5	1.3	None	None	None
Toluene	108-88-3	0.9	100	20	100
Hydrogen sulfide	7783-06-4	<0.00001	$20^{Ceiling}$	1	$10^{Ceiling}$
Ethylbenzene	100-41-4	0.6	100	20	100
Xylenes	1330-20-7	0-5	100	100	100

* Values do not reflect absolute minimums and maximums; those values may vary from time to time.
N/A - Not Available

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3 – HAZARDS IDENTIFICATION

Flammability: Flammable liquid and vapor. Keep away from heat, sparks, flames or other sources of ignition (such as static electricity, pilot lights, mechanical/electrical equipment).
HMIS Classification for Flammability: 3

Stability: Stable under normal conditions. Avoid all sources of ignition.
HMIS Classification for Reactivity: 1

Potential Health Effects from Overexposure

Acute Effects:

Ingestion: Ingestion may result in nausea, vomiting, diarrhea and central nervous system depression. Aspiration of liquid into the lungs must be avoided as even small quantities in the lungs can produce chemical pneumonitis, pulmonary edema/hemorrhage and even death.

Skin Contact: Prolonged and repeated contact may cause defattting and drying of the skin and can lead to irritation and/or dermatitis.

Eye Contact: Liquid or vapor contact may cause mild eye irritation, including stinging, watering, redness and swelling. Hydrogen sulfide (H_2S) may cause burning or tearing and visual disturbances at repeated exposures above the TLV.

Inhalation: Prolonged or excessive exposure may cause irritation to the nose, throat, lungs and respiratory tract and may lead to headache, nausea, drowsiness, fatigue, pneumonitis, pulmonary edema, CNS depression, coma and respiratory arrest.

Chronic Health Effects from Overexposures:

Skin and eye irritation. May affect the respiratory and central nervous systems.

Special Toxic Effects:

n-Hexane (CAS 110-54-3)

Target Organs – Excess exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesia of distal portions of the extremities. Motor weakness is typically observed in muscles of the toes and fingers but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. The neurotoxic properties of n-hexane are potentiated by exposure to methyl ethyl ketone and methyl isobutyl ketone. Prolonged exposure to high concentrations of n-hexane (>1,000 ppm) has resulted in decreased sperm count and degenerative changes in the testes of rats but not those of mice.

Benzene (CAS 71-43-2)

Carcinogenicity: Benzene is a known animal carcinogen and is known to produce leukemia in humans. Benzene has been identified as a human carcinogen by NTP, IARC and OSHA.

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4 – FIRST AID MEASURES

Ingestion: Aspiration hazard. Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe damage. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration.

Skin Contact: Wipe material from skin and remove contaminated clothing. Cleanse affected areas thoroughly by washing with mild soap and water and, if necessary, a waterless skin cleanser. If irritation or redness develops, seek medical attention.

Eye Contact: If irritation or redness develops, move victim away from exposure and into fresh air. Flush eyes with clean water for 15 minutes, with eyelids held open. If symptoms persist, seek medical attention.

Inhalation: If respiratory symptoms or other symptoms of exposure develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, qualified personnel should administer oxygen. Seek immediate medical attention.

Notes to Physician: Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for development of cardiac arrhythmias.

---

5 – Exposure Controls/ Personal Protection

Eye Protection: Safety glasses or goggles are recommended when there is a possibility of splashing or spraying.

Skin Protection: The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. Depending on conditions, the use of an apron or chemical protective clothing may be necessary.

Respiratory Protection: A NIOSH certified air purifying respirator with an organic vapor cartridge may be used under conditions where airborne concentrations of hydrocarbons are expected to exceed exposure limits. Protection provided by air purifying respirators is limited. Use a positive pressure air supplied respirator if there is a potential for an uncontrolled release, exposure levels are not known or any other circumstances where air purifying respirators

may not provide adequate protection. A respiratory protection program that meets US OSHA's 29 CFR 1910.134, Canadian Labour Code Part II and ANSI Z88.2 requirements must be followed when workplace conditions warrant a respirator's use.

Engineering Controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional ventilation or exhaust systems may be required. Where explosive mixtures may be present, electrical systems safe for such locations must be used (see appropriate electrical codes).

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6 – FIRE FIGHTING MEASURES

Flash Point:	< 40 °C	Lower Explosive Limit:	Not Established
Auto Ignition Temperature:	Not data available	Upper Explosive Limit:	Not Established

Basic Fire Fighting Procedures: Long-duration fires involving diluent stored in tanks may result in a boilover. The contents of the tank may be expelled beyond the containment dikes or ditches. All personnel should be kept back a safe distance when a boilover is anticipated (reference NFPA 11). For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces or when explicitly required by DOT, a self-contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant. Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Move undamaged containers from immediate hazard area if it can be done with minimal risk. Water spray may be useful in minimizing or dispersing vapors. Cool equipment exposed to fire with water, if it can be done with minimal risk. Avoid spreading burning liquid with water used for cooling purposes.

Extinguishing Media: Any extinguisher capable of handling Class B fires is recommended, including extinguishing media such as CO_2, dry chemical or foam. Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Firefighting should be attempted only by those who are adequately trained and equipped with proper personal protective equipment.

Unusual Fire and Explosion Hazards: This material is flammable and may be ignited by heat, sparks, flames or other sources of ignition (such as static electricity, pilot lights, or mechanical/electrical equipment). Vapors may travel considerable distances to a source of ignition where they can ignite, flashback or explode. May create vapor/air explosion hazard indoors, outdoors or in sewers. Vapors are heavier than air and can accumulate in low areas. If container is not properly cooled, it can rupture in the heat of a fire.

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7 – ACCIDENTAL RELEASE MEASURES

Personal precautions: Keep public away. Isolate and evacuate area. Shut off source if safe to do so. Eliminate all ignition sources.

Spill management: Wear appropriate breathing apparatus (if applicable) and protective clothing. A vapor suppressing foam may be used to reduce vapors. Try to work upwind of spill. Dike and contain land spills; contain water spills by booming. For large spills remove by mechanical means such as vacuuming or pumping and place in containers. All equipment used when

handling the product must be grounded. Recover and return free product to proper containers. Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids. Do not wash spills into sewers or other public water systems.

Reporting: Report spills to local or federal authorities as appropriate or required.

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8 – HANDLING AND STORAGE

The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). Do not enter confined spaces such as tanks or pits without following proper entry procedures. The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits.

Use appropriate grounding and bonding practices. Stores in properly closed containers that are appropriately labeled and in a cool well-ventilated area. Do not expose to hear, open flames, strong oxidizers or other sources of ignition. Do not cut drill, grind or weld on empty containers since they may contain explosive residues.

Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. Stay upwind and vent open hatches before uploading.

Avoid skin contact. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.

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9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear to brown liquid
Physical Form:	Liquid
Substance type (Pure/Mixture):	Mixture
Boiling Temperature:	94 to 1330 ºF
Melting Temperature:	Not determined
Vapor Pressure:	about 7.47 psi
Vapor Density:	1.0 - 3.9
Evaporation Rate:	(Ethyl ether =1) >1
Specific Gravity:	0.82
Water Solubility:	Negligible
pH:	Not determined
Viscosity:	5.43 mm^2/s
Color:	Clear to brown
Odor:	Rotten egg, petroleum like odor

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10 – STABILITY AND REACTIVITY

CONDITIONS TO AVOID:	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity.
CHEMICAL STABILITY:	Stable at 70 °F, 760 mmHg pressure.
HAZARDOUS DECOMPOSITION PRODUCTS:	Combustion produces carbon monoxide, aldehydes, aromatic and other hydrocarbons.
HAZARDOUS POLYMERIZATION:	Will not occur
INCOMPATIBILITY:	Strong oxidizers such as nitrates, chlorates, peroxides.

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11 – TOXICOLOGICAL INFORMATION– CHRONIC AND ACUTE HEALTH HAZARDS

This product contains aliphatic naphatha at a level of >0.1%. Lifetime skin painting studies in mice with similar naphthas have shown wither negative or very weak dermal carcinogenic activity following prolonged and repeated skin contact. Some other petroleum fractions that show carcinogenic activity when tested at nonirritating dose levels did not show any significant carcinogenic activity indicating that this tumorigenic response is likely related to chromic irritation and not dose. Some components of aliphatic naphthas, i.e., paraffins and olefins, have been shown to produce a species specific, sex hormonal dependent kidney damage develops via the formation of alpha-2u-globulin, a mechanism unique to the male rat. Humans do not for alpha-2u-globulin; therefore, the kidney effects resulting from this mechanism are not relevant in humans.

This product contains benzene at a level of 0.1%. Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in man. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.

Hydrogen sulfide gas (H_2S) is toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning have been reported. Complete and rapid recovery is the general rule. However, if the exposure was sufficiently intense and sustained causing cerebral hypoxia (lack of oxygen to the brain), neurologic effects such as amnesia, intention tremors or brain damage are possible.

This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.

This product may contain xylenes at a level of >1.0%. Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.

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12 – DISPOSAL INFORMATION

Container contents should be completely used and containers should be emptied prior to discard. Container could be considered a RCRA hazardous waste and must be disposed of with care and in full compliance with federal, state and local regulations. Larger empty containers, such as drums, should be returned to the distributor or to a drum re-conditioner. To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities. This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law

requires disposal at a licensed hazardous waste disposal facility. This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP). This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s). It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.

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13 – ENVIRONMENTAL INFORMATION

Spill or Release to the Environment: Keep all sources of ignition and hot metal surfaces away from spill/release. The use of explosion-proof equipment is recommended. Stay upwind and away from spill/release. Notify persons downwind of spill/release, isolate immediate hazard area and keep unauthorized personnel out. Product may release large amounts of flammable vapors (e.g., methane, ethane and propane) at or below ambient temperature depending on source and process conditions. Stop spill/release if it can be done with minimal risk. Wear appropriate protective equipment including respiratory equipment as conditions warrant. Prevent spilled material from entering sewers, storm drains, other unauthorized treatment drainage systems and natural waterways. Dike far ahead of spill for later recovery or disposal. Use foam on spills to minimize vapors. Spilled material may be absorbed into an appropriate absorbent material.

Notify fire authorities and appropriate federal, state (provincial) and local agencies. Immediate cleanup of any spill is recommended. If spill of any amount into navigable waters, notify appropriate federal, state (provincial) and local agencies.

Sara Title III Information: This material contains the following chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372:

Toluene	CAS – 108-88-3	Weight % - 0 – 2%
n-Hexane	CAS – 110-54-3	Weight % - up to 11%
Benzene	CAS – 71-43-2	Weight % - 0 – 2%

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14 – REGULATORY INFORMATION

USA: All of the components of this product are on the Toxic Substances Control Act (TSCA) Chemical Inventory.

Canada: All the components of this product are on the Canadian Domestic Substances List (DSL), or have been notified under the New Substances Notification Regulations, but have not yet been published in the Canada Gazette.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Classification:	Class B2 Flammable Liquids Class D2B Other Toxic Effects - Skin Irritant Class D2A Other Toxic Effects – Embryotoxic/Fetotoxic
US EPA Reportable Quantity:	The estimated reportable quantity (RQ) for this material is based on the weight % shown below:
RQ based on benzene –	The RQ for benzene is 10 pounds, which equals 3,333 pounds of natural gas condensate (556 gallons). The RQ is based on 0.3 wt. % benzene.
RQ based on n-Hexane –	The RQ for n-Hexane is 5000 pounds, which equals 50,000 pounds of natural gas condensate (8,333 gallons). The RQ is based on 10 wt. % n-Hexane.
RQ based on toluene –	The RQ for toluene is 1000 pounds, which equals 50,000 pounds of natural gas condensate (8,333 gallons). The RQ is based on 2 wt. % toluene.

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15 – SPECIAL PRECAUTIONS / SUPPLEMENTAL INFORMATION

Keep containers tightly closed. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces and all sources of ignition. Post area “No Smoking or Open Flame”. Store only in approved containers. Keep away from any incompatible material. Protect container(s) against physical damage. Outdoor or detached storage is preferred. Indoor storage should meet US OSHA standards, Canadian Labour Codes and other appropriate fire codes.

Depending on the source of natural gas condensate, there could be some amount of NORM (naturally occurring radioactive materials) in the scale, deposit and sludge associated with this material. Proper measurements should be taken prior to handling this material or any equipment contaminated with this material. If NORM is indicated, refer to API Bulletin E2, “Bulletin on Management of Naturally Occurring Radioactive Materials in Oil and Gas Production,” for additional information.

Empty Containers: “Empty” containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, flame, sparks or other sources of ignition. They may explode and cause injury or death. “Empty” drums should be completely drained, properly bunged and promptly shipped to the supplier or a drum re-conditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1 and other governmental and industrial references pertaining to cleaning, repairing, welding or other contemplated operations.

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16 – TRANSPORTATION REQUIREMENTS

General Transportation Information:

DOT Proper Shipping Name (49 CFR 172.101):	Petroleum Crude Oil
DOT Hazard Classes (49 CFR 172.101):	3
UN/NA Code (49 CFR 172.101):	UN1267
Packing Group (49 CFR 172.101):	II
Bill of Lading Description (49 CFR 172.202):	Petroleum Crude Oil
DOT Labels Required (49 CFR 172.101):	Flammable Liquid

Please note that the actual shipping name and associated data can vary due to the properties of the product. Other acceptable shipping names may include Petroleum Distillate n.o.s. 1268, Gasoline UN1203, Flammable liquids, n.o.s. (pentane) UN1993 or Hydrocarbons, Liquid n.o.s. (condensate) UN3295.

PREPARED BY: Enbridge Pipelines Inc.

Disclaimer

The information presented herein is based on data considered to be accurate as of the date of preparation of this Material Safety Data Sheet (MSDS). However, MSDS’s may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
ASTM	American Society for Testing and Materials
CAS	Chemical Abstract Service
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
HMIS	Hazardous Materials Identification System
IARC	International Agency for Research on Cancer
m^3	Cubic meter
NIOSH	National Institute for Occupational Safety and Health
NTP	National Toxicology Program
n.o.s.	Not Otherwise Specified
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
REL	Recommended Exposure Limit
SARA	Superfund Amendments and Reauthorization Act
TLV	Threshold Limit Value
TSCA	Toxic Substance Control Act
TWA	Time Weighted Average

13.0 FORMS

The following forms should be used, when applicable, in the initial phases of an emergency response

Table of Contents

ICP 001	Receiving Emergency Information
ICP 002	Initial Response Checklist
ICP 005	Threat Checklist
ICP 006	Site Monitoring Template
ICP 012	Elevated Security Measures Checklist
ICS 201-1	Incident Briefing Map/Sketch
ICS 201-2	Summary of Current Actions
ICS 201-3/ ICS 207	Current Organization
ICS 201-4	Resource Summary
ICS 201-5	Site Safety and Control Analysis
ICS 204	Assignment List
ICS 214a	Individual Logs

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ENBRIDGE	Receiving Emergency Information	ICP 001

Purpose: To be used by any employee receiving emergency information on a potential incident or in preparation to attend the emergency location as an early responder.

Notification		
Date and Time of Notification:		
Name of the Employee Receiving Call:		
Caller		
Name of Person Reporting :		
Caller's Location:		
Caller's Telephone # *(next 2 hours)*		(Home):
Caller's Address:		
Emergency Description		
Condition Observed *(spill, cloud, odor, etc):*		
Facility Involved, Location or Land Description:		
Date and Time Incident Observed:		
Nearest Community:		
Local Directions to Site:		
Nearest River, Stream, Lake *(direction & distance):*		
Other Helpful Information *(weather, wind, roads, public interest, injuries):*		
Emergency Reporting		
Did Caller Notify Community Emergency Responders or Other Agencies:		(Time of Call):
Are other Emergency Response Agencies On-Site or En-route *(provide details):*		

Internal Reporting	
If this is a potential emergency and you are the first Enbridge point-of-contact, call the Control Centre at:	
US Regions 1-800-858-5253	**EPSI Region** 1-888-440-4357
CND Region 1-877-420-8800	**Cushing Control Centre** 1-918-223-2461
Athabasca and Western Region 1-888-813-6844	**Enbridge Media Hotline Canada** 1-888-992-0997
In Quebec 1-780-420-8899	**Enbridge Media Hotline U.S.** 1-800-496-8142
North Dakota Region 1-888-838-4534	

Other Information	
Give Warning Information for NGL/Crude oil if appropriate *(see Form B – Warning Information)*	

ENBRIDGE	Initial Response Checklist	ICP 002

Purpose: To be used when exploring a suspected or reported emergency. Safe work practices will be followed per the following guidelines (the order of these actions will depend on the situation).

EXPLORE – To be reviewed by the First Responder prior to taking any immediate action.	
☐	Notify Senior staff on-site immediately if a pressure drop has been observed or a leak is suspected and stop all product transfers. Close all automatic isolation valves, if available.
☐	Conduct a field level hazard assessment to identify and mitigate all hazards including potential for fire, explosion, and hazardous toxic vapors. • Determine the wind direction and approach cautiously from upwind. • Explore the suspected release area only when wearing appropriate PPE using the buddy system if possible. • Ensure safety of personnel in the area. • Eliminate or shut off all potential ignition sources in the immediate area • Use intrinsically safe equipment (e.g., flashlights, two-way radios, gas detectors with audible alarms).
☐	If appropriate, request surveillance fly-over to determine: • If there is any abnormal activity and dead vegetation in the vicinity of a pipeline; • Size and description of oil slick; • Direction of movement; • Coordinates of leading and trailing edge of oil slick; • Sensitivities endangered; and • Areas of population that are threatened. If radio contact cannot be made; the line flyer will land report to Company management by telephone
☐	Maintain regular/scheduled communication with the Control Centre and Regional Management/on-call person.
APPROACH	
☐	If hazards cannot be safely mitigated, move to a safe upwind location, monitor the incident, and keep people out the hot zone.
☐	Are people injured or trapped? Are there outside people involved in rescue or evacuation?
☐	Are there immediate signs of potential hazards such as: • Electrical lines down or overhead? • Unidentified liquid or solid products visible? • Vapors visible? • Smells or breathing hazards evident? • Fires, sparks or ignition sources visible? • Holes, caverns, deep ditches, fast water or cliffs nearby? • Is local traffic a potential problem? • Ground conditions (select one) ☐ Dry ☐ Wet ☐ Icy
CONFIRM & CONTROL	
☐	Begin a 214A Individual log when notified of an incident and continue documenting key actions throughout the response.
☐	Determine level of response needed, hazards of product(s) involved and proper response guidelines to be followed. Confirm identification of spilled material and check the SDS sheets. Consider the following: • Assess the spill threat, site safety, and parameters such as spill volume, extent and direction of movement. • Has pipeline(s) been shut down? • Has wind direction been confirmed and windsock erected? • Has the public been protected or evacuation considered if necessary? • Have all ignition sources been identified and eliminated? • Have personal protection and safety requirements been established and communicated? • Is adequate fire protection equipment available and in place? • Are tank and VAC-truck electrical equipment properly grounded? • Have decontamination sites and procedures been established? • Are activities and events being logged/ documented? • Eliminate sources of vapor cloud ignition, consider the ignition of NGL. Shut down all engines and motors. • Establish Exclusion zone and Safe Work Areas (Hot, Warm, and Cold).
☐	If on water, consult Control Point and HCA maps for appropriate response strategies for incoming resources. • Review pipeline alignment sheets to become familiar with the location of mainline valves and elevation characteristics. • Review ESA maps for the location of any sensitive area that may be impacted (Annex 3).
☐	Once support has arrived conduct transfer of command and start preparing for tactical and planning meetings.

ENBRIDGE	Initial Response Checklist	ICP 002

COMMUNICATION / NOTIFICATIONS	
☐	Initiate actions to notify government agencies including local authorities of area affected or at risk areas via the Control Centre, Regional Management or designate. • Complete notifications for emergency call-out, including regulatory agencies. This will be done by Regional Management or designate. • If excavating, has One-Call agency been notified? • Has a Preliminary Incident Report been issued? • Has a radio channel been established for communication between the site and other personnel in field? • Notify External Emergency Services as appropriate. Work with local law enforcement to make sure all personnel/citizens are a safe distance away from the hazard area. • Notify the appropriate Company management. • Advise neighboring property owners and operators of any threat to their property or personnel. • Notify appropriate federal, state and local government agencies, including local utilities.
INCIDENT COMMAND	
☐	Once it has been determined to activate the ICS, the IC will initiate the following actions: • Confirm that containment equipment and oil spill contractors have been deployed. • Integrate local evacuation plans into the Unified Command decision-making process. Work with response team once they arrive on site to establish a workable Incident Command Post and Communications Center. • Direct initial response actions • Begin development of an initial incident action plan (ICS 201 Forms).
EMERGENCY SHUT DOWN PROCEDURES	
☐	The following emergency shutdown procedures should be initiated if company personnel are threatened by the release of product from a pipeline to the environment or when coordinating activities for prompt and safe repair of the pipeline and the return to normal operating conditions: • Shutting in the line at the nearest block valves. • Notifying the nearest pump station and/or the appropriate Control Center. • Maintenance crewmembers should notify their immediate supervisor who will in turn notify appropriate Company contacts. • If the exact location of the leak is unknown, the immediate supervisor will request a line flyer, or if it is at night, manpower might be used to walk the line. Once a leak site has been located, the following information should be obtained: • Have all ignition sources been eliminated? • Are any water intakes at risk? • Are any schools, homes or commercial properties at risk and should they be evacuated? • Should access to the area be restricted (roads blocked)? If so, assistance should be requested from law enforcement agencies. • Have local response agencies been advised of the product's characteristics and handling precautions which are described in the SDSs? • Are railroads or utility companies in the area and have they been notified? • Will product flow into any waterways or roadways? • In the U.S. work with Company Environmental Department to conduct a Natural Resource Damage Assessment. The Control Center should be notified following an assessment of the release site; an evaluation should be made regarding the effect of downtime on product scheduling. Appropriate report, logs & notifications will be made.

ENBRIDGE	Threat Checklist	ICP 005

Date: _____

Person receiving threat/suspicious package: _____

Time received: _____

If by phone, time call terminated: _____

Phone number displayed by Caller ID: _____

Work location of person receiving threat/suspicious package:_____

EXACT WORDING OF THREAT

SUSPICIOUS PACKAGE/MAIL

Time delivered/discovered: _____

Location of delivery/discovery: _____

Who/how delivered or discovered:_____

Characteristics of package/mail (Select all that apply)

- ☐ Actual threat message
- ☐ Marked with any threatening
- ☐ Inappropriate or unusual labeling
- ☐ Strange or no return address
- ☐ Misspelled common words
- ☐ City of postmark does not match return address city
- ☐ Oil stains, discoloration or odor
- ☐ Lopsided/uneven package or envelope
- ☐ Excessive tape, string, or packing materials
- ☐ Incorrect titles or title without a name
- ☐ Handwritten or poorly typed address
- ☐ Protruding wires or aluminum foil
- ☐ Excessive postage
- ☐ Excessive weight
- ☐ Ticking sound

CALLER/SUSPECT VOICE AND DESCRIPTION (select all that apply)

Gender: ☐ Male ☐ Female

Age: ☐ Child ☐ Teen ☐ 20-29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ Older

Voice characteristics: ☐ Loud ☐ Soft ☐ Deep ☐ Whisper ☐ Stutter ☐ Lisp ☐ Fast ☐ Slow ☐ Normal ☐ Nasal ☐ Slurred ☐ Broken ☐ Disguised ☐ Squeaky

Accent: ☐ **Other:** ☐

Manner: ☐ Angry ☐ Excited ☐ Giggling ☐ Crying ☐ Sincere ☐ Stressed ☐ Calm

Language: ☐ Well-spoken ☐ Incoherent ☐ Irrational

BACKGROUND NOISE

Street noises:

House/residence noises:

Aircraft:

Voices:

Music:

Machinery:

Bar/Tavern:

Other:

BOMB THREAT QUESTIONS

When is the bomb going to explode?

Where did you put the bomb?

Where is it right now?

Did you place the bomb? Why?

Do you know who placed the bomb?

What does it look like?

What kind of bomb is it?

What will make the bomb explode?

What is your name?

Where are you calling from?

What is your address?

Have you noticed anyone else?

Whom do you represent?

Do you know that there are innocent people in the building that may be injured or killed? ☐ Yes ☐ No (select if either is confirmed)

NOTES

ENBRIDGE	Site Monitoring Template	ICP 006

Date:	Time:	Wind Dir.	Wind Speed	Temp.
Event Description:				

Location Description	Time	PID / FID	H_2S	SO_2	CO	LEL	O_2	Benzene	Other	Comments
1.										
2.										
3.										
4.										
5.										
6.										
7.										
8.										
9.										
10.										

ENBRIDGE	Elevated Security Measures Checklist	ICP 012

ELEVATED SECURITY MEASURES & PRE-CHECKLIST

ENBRIDGE

ELEVATED SECURITY MEASURES
☐ Ensure gates are locked or secured in the closed position at all times.
☐ Limit visitors and confirm with an employee that the visitor is expected before allowing access.
☐ All unknown visitors must be escorted by company personnel at all times.
☐ Employees entering facility after regular work hours must contact shift personnel.
☐ Identify resource requirements for security service (i.e., number of security officers), and confirm availability to assist with 24-hour coverage as required. Consideration should be given to posting a security guard at locations open to the public.
☐ Employees must complete yard and perimeter circle checks 2 times per day.
☐ Employees must complete daily inspections of buildings (including those that are not regularly used); storage areas, tank and perimeter fencing (alter times). Ensure gates are locked or secured in the closed position at all times.
PRE-CHECKLIST
☐ Determine available contract security staff on hand for while security measures are elevated.
☐ Consider options for project/work restrictions or postponement.
☐ Take into consideration employee compliment and work start/end times.
☐ Review access/egress points for deliveries, employee access and project work.
☐ Review current camera views with respect to gates.
☐ Confirm current recording capabilities for all site cameras.
☐ Ensure all cameras and recording equipment are set with current time/date stamps.
☐ Engage with Local Policing.
☐ Ensure vicinity ownership contacts/contractors are contacted.
☐ Consider alternative access/egress points.

CONTACTS	NAME	PHONE NUMBER
Director/Sr. Manager/Manager		
Supervisor		
Regional Security		

ENBRIDGE	Incident Briefing Map/Sketch	ICS 201-1

Incident:	Prepared By: at:
Period:	Version Name:

ENBRIDGE	Summary of Current Actions	ICS 201-2

Incident:	Prepared By: at:
Period: to	Version Name:

Incident Information

Initial Incident Objectives

Summary of Current Actions

Date/Time	Action Notes

ENBRIDGE

Current Organization

ICS 201-3 / 207

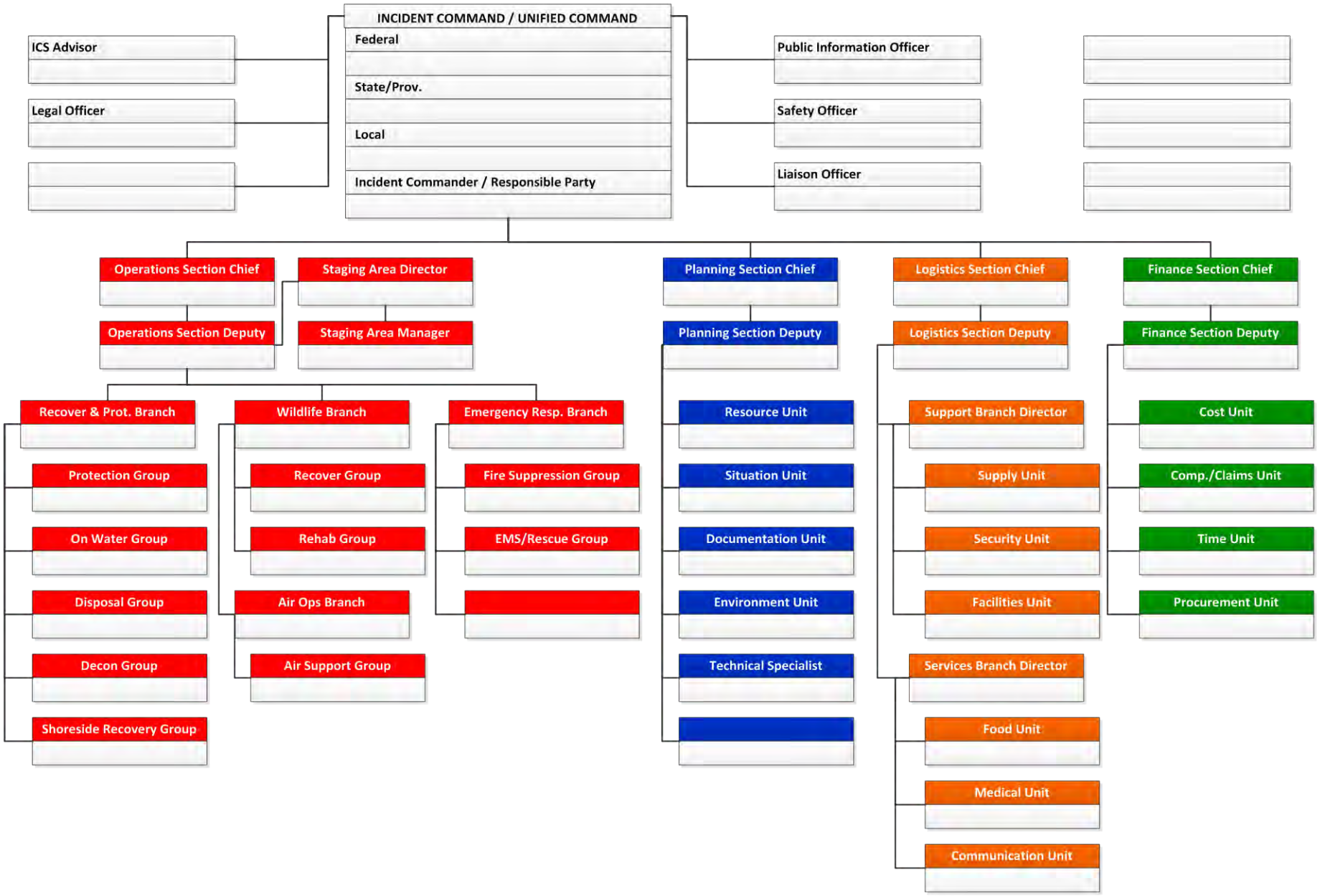
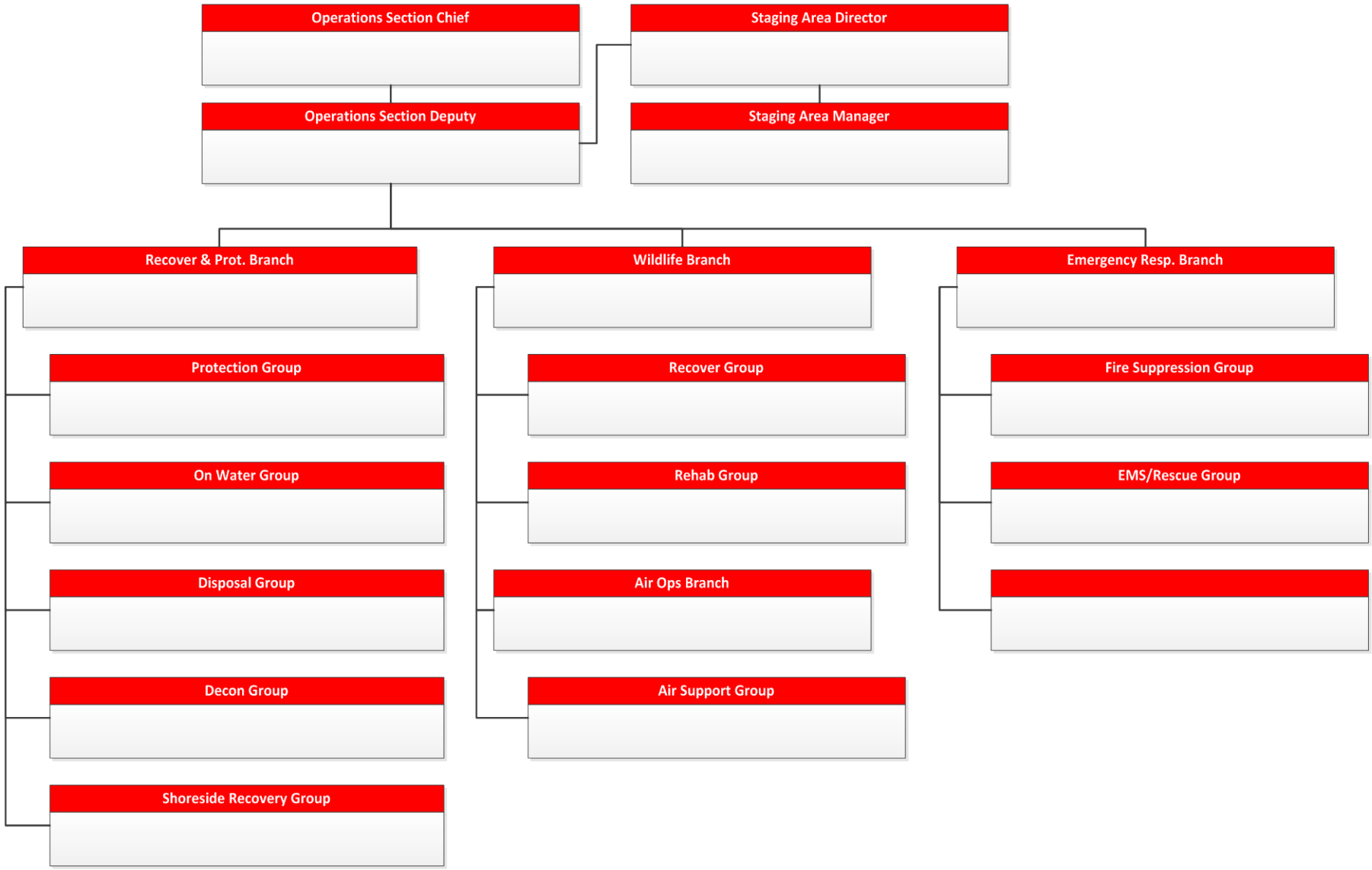


Illustration shows suggested ICS positions. ICS is scalable; the positions are filled according to the needs of the incident.
If positions are not filled, the responsibility is assumed by the Section Chief or Incident Commander.

ENBRIDGE

Operations Section



ENBRIDGE

Resource Summary

ICS 201-4

Incident:					**Period:**			
ID	**Supplier**	**Resource Type**	**Description**	**Quantity**	**Size**	**Area of Operation**	**Status**	**Status Date/Time**

ENBRIDGE	Site Safety and Control Analysis	ICS 201-5

Incident:	**Prepared By:** **at:**
Period:	**Version Name:**
Site Control	
1. Is Site Control set up? ☐ Yes ☐ No	2. Is there an on-scene command post? ☐ Yes ■ No If so, where?
3. Have all personnel been accounted for? ☐ Yes ■ No ☐ Don't Know	Injuries: Fatalities: Unaccounted: Trapped:
4. Are observers involved, or rescue attempts planned? Observers: ■ Yes ☐ No Rescuers: ☐ Yes ☐ No	5. Are decon areas setup? ☐ Yes ■ No If so, where?
Hazard identification, immediate signs of: (if yes, explain in Remarks)	
1. Electrical line(s) down or overhead? ☐ Yes ☐ No	2. Unidentified liquid or solid products visible? ■ Yes ■ No
3. Wind direction across incident: ☐ Towards your position Wind Speed: ☐ Away from your position	4. Is a safe approach possible? ■ Yes ■ No
5. Odors or smells? ☐ Yes ☐ No	6. Vapors visible? ☐ Yes ☐ No
7. Holes, ditches, fast water, cliffs, etc. nearby? ☐ Yes ☐ No	8. Fire, sparks, sources of ignition nearby? ☐ Yes ☐ No
9. Is local traffic a potential problem? ☐ Yes ☐ No	10. Product placards, color codes visible? ☐ Yes ☐ No
11. Other Hazards? ☐ Yes ☐ No	12. As you approach the scene from the upwind side, do you note a change in the status of any of the above? ☐ Yes ☐ No
13. Remarks:	
Hazard Mitigation: have you determined the necessity for any of the following?	
1. Entry Objectives:	
2. Warning sign(s), barriers, color codes in place? ☐ Yes ☐ No	
3. Hazardous material being monitored? ☐ Yes ☐ No 3a. Sampling Equipment: 3b. Sampling location(s): 3c. Sampling frequency: 3d. Peak Reading: 3e. Personal exposure monitoring:	
4. Protective gear / level:	4a. Gloves: 4c. Clothing: 4e. Chemical cartridge change frequency:
4b. Respirators: 4d. Boots:	
5. Decon 5a. Instructions: 5b. Decon equipment and materials:	
6. Emergency escape route established? ☐ Yes ☐ No Route?	
7. Field responders briefed on hazards? ☐ Yes ☐ No	
8. Remarks:	

ENBRIDGE	Site Safety and Control Analysis	ICS 201-5

Protective Zones: record initial control perimeters (see Figure 1)

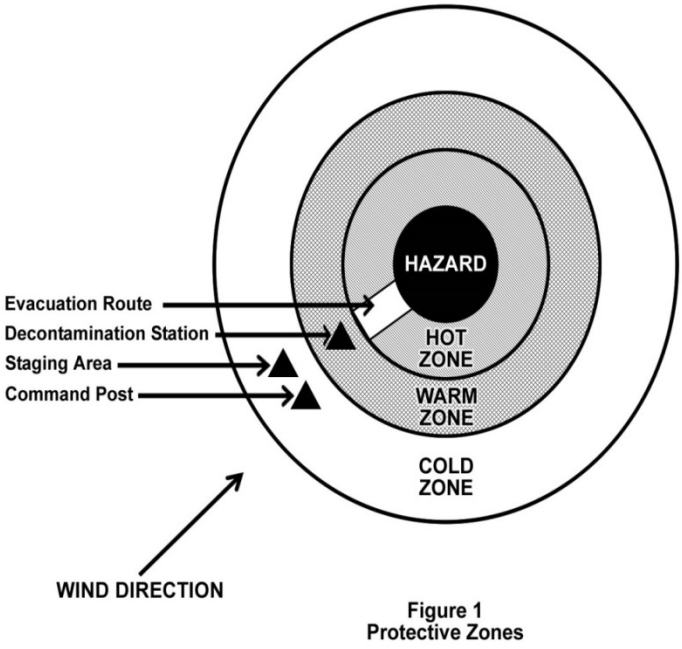


Figure 1
Protective Zones

1. Is there a Hot Zone established? ☐ Yes ☐ No

If so, where?

2. Is there a Warm Zone established? ☐ Yes ☐ No

If so, where?

3. Is there a Cold Zone established? ☐ Yes ☐ No

If so, where?

4. Remarks: (Include any information on evacuation route etc.)

5. Include any site sketches or photos of the protective zones (if available):

ENBRIDGE	Assignment List	ICS 204

Incident:	Branch:
Period:	Division:

Operations Personnel

Title	Name	Affiliation	Contact Number(s)
Operations Section Chief			
Branch Director			
Division/Group/STAM			

Incident Resources – Equipment

Supplier	Resource Type	Description	Quantity	Size	Status

Assignments

Special Instructions for Division/Group

Communications

Name/Function	Radio: Frequency/System/Channel	Phone	Cell/Pager

Emergency Communications

Medical	Evacuation	Other
Prepared by (Resource Unit Leader):	**Approved by (Planning Section Chief):**	**Date/Time Approved:**

ENBRIDGE	Assignment List	ICS 204

Incident:	**Branch:**
Period:	**Division:**
Prepared by Signature:	**Task Force:**
Approved by Signature:	**Group:**

Tactical Objective
Description of Work
Location of Work
Work Assignment Special Instructions
Special Equipment/Supplies Needed for Assignment
Special Environmental Considerations
Special Site-Specific Safety Considerations
Shoreline Cleanup Assessment Team (SCAT) Considerations

Prepared by (Resource Unit Leader):	**Approved by (Planning Section Chief):**	**Date/Time Approved:**

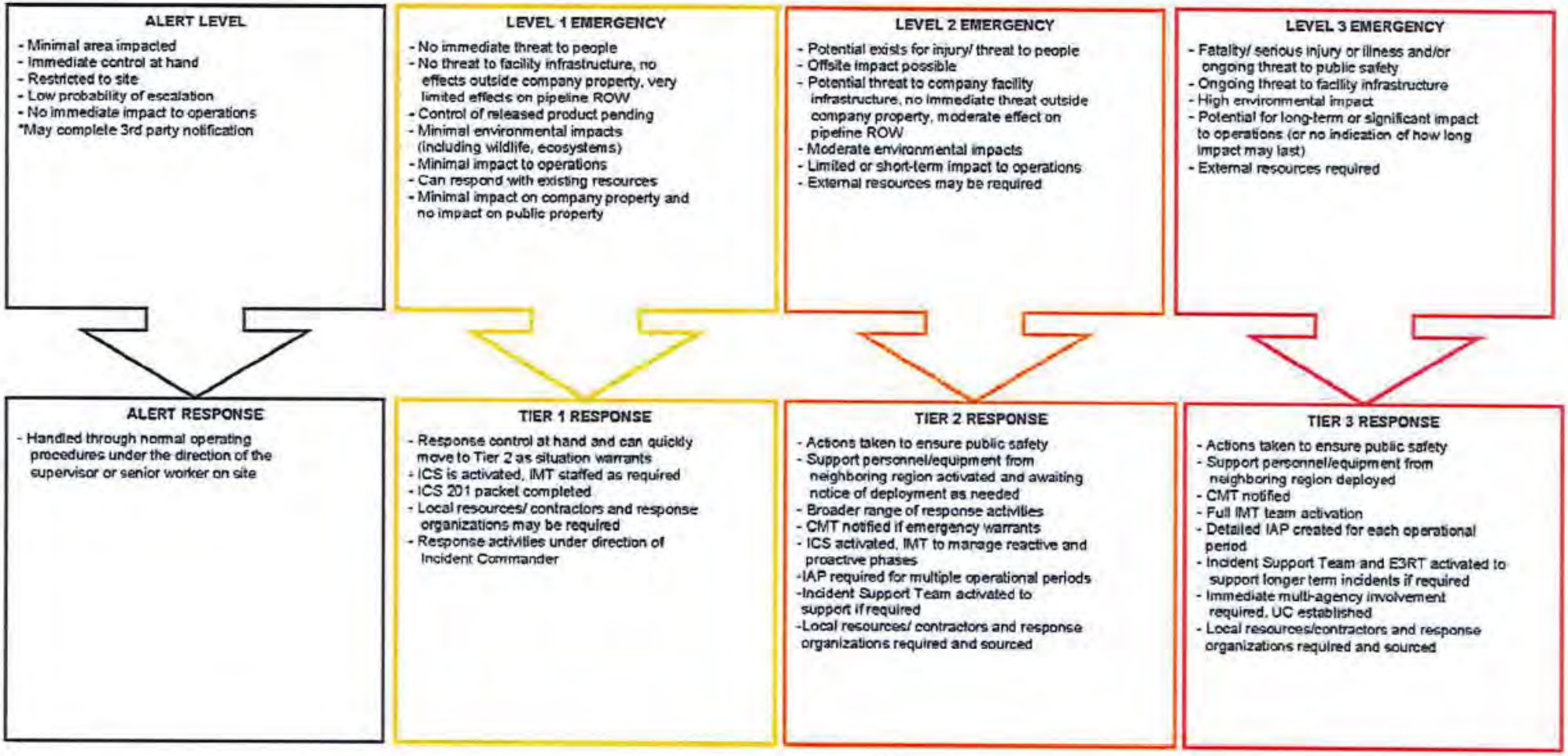
ENBRIDGE	Individual Logs	ICS 214a

Incident:	Prepared By:	at:
Period:	Version Name:	

Activity Log	
Date/Time	Events/Notes

Attachment C

Classification of the Incident



Attachment D

Enterprise Crisis Management Team - Strategic (EXTERNAL TO IMS 07)

As identified in the Enterprise Crisis Management Plan (external to this framework and IMS 07): Responsible for "Actions taken away from the scene to support and assist the IST and [IMT] in planning, business recovery projects and address the implications of the problem and its potential on the Company's viability, operability and credibility"

Guiding Plan: Enterprise Crisis Management Plan

LP Incident Support Team – Strategic

Actions taken at and/or away from the incident scene to support the IMT, facilitate planning, and manage business recovery projects.

Guiding Plan: LP Incident Support Plan

Incident Management Team – Tactical & Strategic (Regional)

Actions taken at and/or away from the incident scene to support tactical response operations, facilitate planning, and address the immediate concerns of the public and government agencies. *Guiding Plan: Integrated Contingency Plan*

LP Membership - Enbridge Enterprise Emergency Response Team

At the request of the Regional Incident Management Team (IMT), the LP membership of E3RT will provide LP mentorship to the IMT, and/or fill substantive roles in the IMT. LP members would deploy first, followed by the remainder of the E3RT membership for future operational periods.

Full Membership - Enbridge Enterprise Emergency Response Team

At the request of the Regional Incident Management Team, the full membership of this cross-business unit team of individuals, who are specially trained to support significant incidents, will fill roles in the IMT.

Field Response Team – Tactical

Actions taken by responders at an incident scene to directly attack the problem and its consequences.

Guiding Plans: Field Emergency Response Plan (Integrated Contingency Plan), Tactical Response Plan/Control Point Maps, Pre-Fire Plan and other tools