Chapter 8 Environmental Health and Safety

8.1 Introduction

This chapter evaluates the impacts of the proposed project's Technology Alternatives, Marine Terminal Alternatives, No-Action Alternative, and related actions on environmental health and safety. The evaluation includes potential construction impacts and potential operational impacts, including impacts resulting from chemical release or spills, fire and explosion incidents at the proposed project methanol manufacturing facility and marine terminal, or during loading methanol on to ships used for transport.

8.2 Regulatory Context

Environmental health and safety issues are regulated at federal, state, and local levels. **Table 8-1** summarizes the laws and regulations applicable to the proposed project.

Table 8-1. Laws and Regulations Related to Environmental Health and Safety

Laws and Regulations	Description
Federal	
Anchorages under Ports and Waterways Safety Act (33 CFR 109)	Authorizes USCG to specify times of movement, restrict operations, and direct anchoring of vessels under hazardous conditions.
Navigable Water Regulations (33 CFR 126)	Regulates the handling of explosives or other dangerous cargoes within or contiguous to waterfront facilities.
Financial Responsibility for Water Pollution (Vessels) and Oil Pollution Act, Limits of Liability (Vessels and Deepwater Ports) (33 CFR 130, 138)	Establishes requirements for responsible parties to demonstrate financial ability to meet potential liability for costs and damages.
Facilities Transferring Oil or Hazardous Materials in Bulk (33 CFR 153-154)	Requires facilities transferring oil or other hazardous materials in bulk to submit an operations manual to USCG for approval.
Vessel Contingency and Response Plans (33 CFR 155)	Requires development, implementation, and annual review of a vessel response plan approved by USCG.
Shipping Regulations – Water Transportation (46 CFR 2, 10-12, 15, 30-40)	Regulates licensing and certification of personnel, manning requirements, vessel inspections, and tank vessels.
Shipping Regulations –Barges (46 CFR 151 Subchapter D- Tank Vessels)	Regulates tank vessels carrying bulk liquid hazardous materials cargoes.
Oil and Hazardous Material Transfer Operations (33 CFR 156)	Specifies procedures and requirements for transferring oil and other hazardous materials to/from vessels.
Navigable Water Regulations (33 CFR 160 – 167)	Ports and waterways safety regulations.
Pipeline and Hazardous Materials Safety Administration (PHMSA) (49 CFR 105–110, and 171–180, 190-195)	Regulates the movement of hazardous materials.
Clean Water Act (33 U.S.C. 1251 et seq., 40 CFR 109-112, 116-131, 133)	Establishes the basic structure for regulating discharges of pollutants into navigable waters of the United States by regulating point pollution sources, such as stormwater discharges, and contains specific provisions related to the incidental release of oil and other hazardous substances into U.S. waters.

Laws and Regulations	Description
Clean Air Act (40 CFR 61, 68)	Establishes emissions limits and reporting requirements for air emissions of certain criteria pollutants and hazardous substances air pollutants.
Limits on Liability (33 U.S.C. 2704)	Establishes limits on liability of a responsible party to incur costs from certain types of incidents.
Hazardous Materials Transportation Act (49 U.S.C. 51)	Authorizing Act for all aspects of hazardous materials packaging, handling, and transportation for vessel, truck, and rail. Requirements enforced by PHMSA (listed above).
Comprehensive Environmental Response, Compensation and Liability Act (40 CFR 300-302)	Establishes authority for governmental response to hazardous substance releases to the environment and liability for responsible parties for response actions and damage to natural resources.
Emergency Planning and Community Right to Know Act/SARA Title III Reporting (40 CFR 302, 355, 370, 372, 373)	Establishes requirements for public notification and emergency planning at a facility that uses or manufactures hazardous substances.
Occupational Safety and Health (29 CFR 1904, 1910)	Regulates emergency planning and response, including air contaminant exposure limits for workers.
State: Washington	
Transportation Regulations (RCW 81)	Regulates transportation in Washington State and administers gas and hazardous liquid pipelines allowed under state law (RCW 81.88)
Pilotage Act (RCW 88.16)	Establishes requirements for compulsory pilotage provisions in certain waters of the state. Washington waters of Columbia River are subject to the pilotage laws and rules set by the state of Oregon (ORS 776).
Transport of Petroleum Products and Hazardous Substances– Financial Responsibility (RCW 88.40)	Defines and prescribes financial responsibility requirements for vessels that transport petroleum products across state waters and facilities that store, handle, or transfer oil or hazardous substances near navigable waters of the state.
Vessel Oil and Hazardous Substance Spill Prevention and Response (RCW 88.46)	Establishes rules and regulations for tank vessels that carry hazardous substances and enter navigable waters of the state.
Oil and Hazardous Substance Spill Prevention and Response (Oil Spill Act) (RCW 90.56)	Establishes programs to reduce the risk and develop an approach to respond to oil and hazardous substance spills; provides a simplified process to calculate damages from an oil spill; and holds responsible parties liable for damages resulting from injuries to public resources.
Hazardous Chemical Emergency Response Planning and Community Right-to-Know Act of 1986 (WAC 118-40)	Establishes requirements for federal, state, and local governments, and industry to improve hazardous chemical preparedness and response through coordination and planning; provisions include public notification about chemicals used at facilities.
Pollution Prevention Plan Requirements (WAC 173-307)	Requirements for Pollution Prevention Plans associated with hazardous substance users and waste generators.
Oil Spill Natural Resources Damage Assessment (WAC 173-183)	Establishes procedures for convening a resource damage assessment committee, pre-assessment screening of damages, and selecting the damage assessment method. Applies to the facility in the event of oil/fuel spills into the water related to equipment use and/or facility operations.
Washington Industrial Health and Safety Act (RCW-49.17)	Regulates emergency planning and response, including air contaminant exposure limits for workers.

Laws and Regulations	Description
State: Oregon	
Maritime Pilots and Pilotage (ORS 776.028)	Establishes requirements for compulsory pilotage; provisions in the Oregon and Washington waters of Columbia River.
Local	
Environmental Policy Kalama Municipal Code 15.04	City environmental policy adheres to State SEPA policy and Ecology rules and regulations.
Cowlitz County Code, Chapter 19.11	Cowlitz County is required under RCW 43.21C.120 to adopt rules pertaining to the integration of the policies and procedures of the State SEPA into programs within Cowlitz County's jurisdiction. Cowlitz County rules are consistent those of the Ecology, Chapter 197-11 WAC.

Notes:
CFR – Code of Federal Regulations; USCG – U.S. Coast Guard; USC – United States Code; RCW – Revised Code of Washington; WAC – Washington State Administrative Code; Ecology – Washington State Department of Ecology; ORS – Oregon Revised Statutes; City – City of Kalama; SEPA – State Environmental Policy Act; SARA – Superfund Amendments and Reauthorization Act of 1986

Table 8-2 summarizes the federal and state agencies that provide oversight for prevention, preparedness, and response.

Table 8-2. Agency Oversight of Prevention, Preparedness, and Response

	Federal		State	
Source of Spill/Release	**Prevention/ Preparedness**	**Response Action**	**Prevention/ Preparedness**	**Response Action**
Terminal (on site)				
Vessel Loading Facilities	USCG		Ecology	
Storage Tanks	EPA			
Off-site Transport				
Pipeline	PHMSA	EPA	Utilities and Transport Commission and Ecology	
Vessels	USCG		Ecology	

Notes: Adapted from Westway Draft Environmental Impact Statement (City of Hoquiam & Ecology, August 2015)
USCG- U.S. Coast Guard, Ecology – Washington State Department of Ecology; EPA – U.S. Environmental Protection Agency; PHMSA – Pipeline and Hazardous Materials Safety Administration

See **Appendix G2**, Safety and Health Aspects Report (AcuTech 2016a) for additional codes, standards and regulations associated with the proposed project.

8.3 Methodology

The study area for this analysis is the project site, the areas of the Columbia River used for associated vessel transport, and the surrounding area including human populations and natural resources that could be affected by an incident during construction or operation at the project site.

The following documents and databases were reviewed for environmental health and safety risks associated with the construction and operation of a methanol plant, marine terminal, and pipeline.

- AcuTech Consulting Group (AcuTech), Northwest Innovation Works, LLC – Kalama (NWIW) - Quantitative Risk Assessment (QRA), February 2016
- AcuTech, NWIW - Safety and Health Aspects, February 2016
- AcuTech, Technical Memorandum: NW Citizen Science Initiative DEIS Comments, August 2016
- Geosyntec Consultants, Technical Memorandum, Methanol Spill Simulation in Support of Draft EIS Response to Comments. August 2016
- Northwest Pipeline LLC, Kalama Lateral Project Reliability and Safety Resource Report, October 2014
- Northwest Pipeline LLC, Federal Energy Regulatory Commission (FERC), Kalama Lateral Project Environmental Assessment, July 2015

Table 8-3 provides a summary of additional information in other chapters of the environmental impact statement regarding discipline-specific construction and operation impacts to health and safety.

Table 8-3. Additional Information Regarding Potential Environmental Health and Safety Impacts

Chapter	Section	Activity or Hazard that May Create an Impact	Potential Impacts
Chapter 2 Proposed Project and Alternatives	2.6.1.5 2.6.2.5	Construction • Pile installation • Dredging • Stormwater • Upland construction	• Timing, noise, construction debris in-water, hazardous materials releases; turbidity increases • Releases, fires
	2.6.1.4	Operation • Emergency response • On-site features for fire suppression and response and control of fires	• Releases, fires, emergencies
Chapter 3 Earth	3.4.1.1	Construction • Hazardous materials releases • Soil disturbance • Dredging • Slope stability	• Contaminated soil, groundwater, or surface water • Soil erosion • Water quality/turbidity
	3.4.1.2	Operation • Geologic hazards (ground shaking, liquefaction, etc.), created by landslides, earthquakes, and tsunami	• Lateral movement, damage and/or destruction of structures
Chapter 4 Air	4.4.1.1 4.4.2.1	Construction • Site development	• Dust and particulate matter
	4.4.1.2 4.4.2.2	Operation • Methanol production air discharges	• Pollutant emissions
Chapter 5 Water Resources	5.5.1.1	Construction • Erosion • Hazardous materials releases • Ground Improvements • In-water work water quality impacts	• Stormwater, surface water, and ground water impacts
	5.5.1.2	Operation	• Surface and groundwater quality impacts

		• Stormwater, process water and wastewater generation	
Chapter 6 Plants and Animals	6.6.1.1	Construction • Site disturbance • In-water work	• Erosion, habitat impacts, endangered species, noise
	6.6.1.2	Operation • Vessel traffic	• Wake stranding, erosion, collisions, invasive species

8.3.1 Operational Risk Evaluation

A range of possible incidents, such as spills, releases, fires, and explosions, was considered to evaluate risks posed by operation of the proposed project. A Quantitative Risk ~~Analysis~~ Assessment (QRA) (see **Appendix G1**) was used to develop various incident scenarios and evaluate the potential consequences of those incidences to on- and off-site individuals and community/societal risks. The QRA used conservative hazard and process conditions (e.g., composition, temperature, pressure, wind speed) to develop and identify conservative hazard distances and zones of impacts as described below.

The QRA was conducted using the commercially available Process Hazards Analysis Software Tool (Phast) and software for the Assessment of Fire, Explosion, and Toxic Impacts (Safeti). The software package is available from Det Norske Veritas, with Phast used to complete the hazard/consequence modeling and Safeti used to develop the risk results.

8.3.2 Quantitative Risk Analysis

AcuTech conducted a QRA to evaluate the spill, fire and explosion impacts of the proposed project. The QRA focuses on the safety and potential accidental releases that could occur at the proposed methanol plant and at the marine terminals while loading methanol onto the ships. The QRA includes modeling of the worst-case scenarios for spills, fires and explosions that could take place and looks at the risks to workers at the proposed facility as well as to the surrounding community.

One of the first steps in the QRA is to develop accidental release scenarios – how, when, and where accidental releases could happen. AcuTech collected information specific to the site and proposed project operations to provide the basis for the assumptions applied in the QRA. AcuTech held a Hazard Identification (HAZID) workshop to develop the accidental release scenarios with representatives from NWIW, the Port, Northwest Pipeline LLC (Northwest) and the team assisting with the design of the facility. The HAZID considered how the methanol manufacturing process works, the hazards of the process, and safeguards used at the facility and marine terminals to reduce the hazards and risks to workers and the community. Specific accident scenarios for operations and activities at the methanol facility and marine terminals were developed based on information from the workshop.

The study also included analysis of explosion hazards to proposed project buildings and created a map of the facility that shows how far shock waves generated by an explosion would travel. The map identifies areas of vulnerable buildings that could be impacted by three levels of shock waves shown in **Appendix G1**, QRA, Figure 15, as overpressure contours. The QRA concludes that an explosion at the facility would not produce a shock wave that could cause significant damage off site. An on-site explosion would not result in deformation or collapse of any off-site buildings and individuals off site would be protected from significant injury. For additional information on the analysis of explosion hazards and overpressure contours, see **Appendix G1**, QRA, Section 8.3.3, Overpressure.

The potential risk for fires, explosions and exposures to toxic materials were then evaluated and hazard zones identified for spills ranging in sizes from a leak to a rupture. The hazard zones are used to identify potential impacts to onsite and offsite people. The risks were calculated for any single individual on or near the site and also for groups of people on or near the site. Section 8.3.3, Individual and Societal Risk Evaluation, discusses how these risks were evaluated.

The QRA does not include assessment of the security at the methanol facility or of the safety and security of the ships transporting methanol. The security of the marine terminal and ships would be covered by the Maritime Transportation Security Act of 2002 (MSTA).

8.3.3 ALOHA Model

Additional modeling was conducted using the ALOHA model[1] in response to public comments regarding the DEIS that used the ALOHA model to characterize potential hazards from the project (**Appendices G3 and G4**). The ALOHA model is designed to model chemical releases for emergency responders for use during accidental chemical spills to help response professionals assess the risk to human populations associated with toxic air hazards, thermal radiation from fires, and blast effects. It is designed to provide an upper bound to the threat distances associated with chemical spills during an emergency and is used to inform appropriate emergency response actions, such as safe evacuation distances.[2]

ALOHA was used to model the potential risk associated with a massive methanol release from the storage area, including risks associated with possible fire and explosion and the distances for potential toxic impacts from methanol vapors resulting from evaporation following a massive release with a fire. The model generates specific distances to Acute Exposure Guidelines Level (AEGL). AEGLs are used by emergency planners as guidance in dealing with the release of chemicals and are designed to protect susceptible individuals.

8.3.4 Individual and Societal Risk Evaluation

Accidental spill or release scenarios were developed, as explained above, to consider the potential for fire, explosion, and toxic exposure at the methanol manufacturing facility. Hazard zones were calculated to define the potential impacts from these scenarios to on-site and off-site people. The calculated risks were compared to risk criteria from the Health and Safety Executive of the United Kingdom (UK-HSE) to determine what is and is not an acceptable level of potential risk. (This source was used because the United States has not established prescribed risk criteria to support a quantitative risk assessment and it is the most conservative approach as discussed in **Appendix G1**, QRA).

The UK-HSE criteria address on-site individual risk for workers, as well as risks to off-site people. Individual risk is defined as the risk to a single person exposed to a hazard. The hazard can be a single incident or a collection of incidents. The UK-HSE criteria for individual risk are classified as:

[1] The ALOHA® (Areal Locations of Hazardous Atmospheres) model, developed by the Environmental Protection Agency (EPA), Office of Emergency Management (OEM), and the National Oceanic and Atmospheric Administration (NOAA), Emergency Response Division.

[2] The ALOHA model is not an appropriate model to inform decisions for siting an industrial facility. The methodology and modeling used in the QRA is more appropriate for that purpose. Nevertheless, in response to public comment based the model prepared by Northwest Citizen Science Initiative, the ALOHA model was used to provide another perspective for the risks modeled in the QRA.

- Unacceptable (greater than or equal to one fatality in 1,000 years)
  - Level where further risk assessment or risk mitigation is required
- Broadly acceptable (less than or equal to one fatality in 1 million years)
  - Level where further risk reduction is not required
- Tolerable (one fatality in 1,000 to 1 million years)
  - Level where further, prudent risk reduction should be considered; region is typically referred as the "as low as reasonably practicable" zone

Societal risk evaluation builds on the individual risk results by considering the number of people at the proposed project site and groups of people in areas surrounding the proposed project. Societal risk is the risk to groups of people located in the hazard zone(s) affected during incidences such as fires, explosions and releases or spills. The societal calculation uses the same consequence and frequency results as the individual risk calculation, but also uses information about the number of individuals, their location, what type of building they are in and how long they are present to determine the risk.

See **Appendix G1**, QRA for additional Individual and Societal Risks information and calculations.

8.3.5 Spill Modeling

A numerical model was developed to identify the consequences of an accidental release of methanol from a vessel to the Columbia River (**Appendix G3**) (Geosyntec 2016). The model evaluated the consequences of a hypothetical "reasonable worst-case spill scenario," modeled at selected locations on the Columbia River.

The approach for the modeling and analysis included the following steps.

- Defining the spill scenario –A review of available literature was conducted on: (i) previous assessments of the frequency and magnitude of spills of petroleum hydrocarbons into surface waters following shipping accidents involving double-hull, multi-compartment tankers, (ii) the environmental conditions influencing the initiation of methanol biodegradation under aerobic conditions and the range of reported biodegradation rates of methanol in rivers, and (iii) fish migration periods and seasonal flow rates in the Columbia River;

- Developing and calibrating a numerical hydrodynamic and methanol fate and transport model – A 2-D (depth-averaged) hydrodynamic and water quality model was developed using a widely used model framework to simulate flow-rates, tidal forcing, temperature, salinity, and dissolved oxygen (DO) and methanol concentrations in the Columbia River from the mouth (River Mile [RM] 0) to the Port of Kalama (RM 72), calibrated the hydrodynamics (flow and water level) component of the model, and confirmed the water quality model predictions against reported data for selected variables in the Columbia River (i.e., temperature, salinity, and DO);

- Conducting model simulations for multiple spill scenarios – The calibrated model was applied to assess the impacts to DO concentrations and methanol concentrations in the river from a hypothetical methanol spill at (i) the Port of Kalama, (ii) near Astoria and the ocean boundary, and (iii) midway between the Port of Kalama and the ocean (~RM 35), locations that capture a range of anticipated hydrodynamic and mixing conditions; and

- Interpreting the model results –The model results were analyzed to define the magnitude or "size" and duration of the reduced DO concentration zone as it moves down the river for each hypothetical spill location. The model also provides the time history of methanol concentrations following the hypothetical spill event.

See **Appendix G3**, Spill Modeling Report, for more information regarding the model and its results.

8.4 Environmental Impacts

8.4.1 Proposed Project Alternatives

The two technology alternatives for the methanol manufacturing facility and two marine terminal alternatives, are assumed to generally pose the same potential for impacts to environmental health and safety. There is a difference between the air emissions of the two technology alternatives, as discussed in Chapter 4 (the ULE technology produces the least greenhouse gas emissions). The No-Action Alternative is discussed for comparison in the event that the proposed project is not completed.

The construction and operation of the proposed project has the potential to impact environmental health and safety. These include the potential impacts of construction of an industrial facility and potential operational impacts from the methanol manufacturing process and marine terminals. This section begins with a discussion of the chemicals used to manufacture methanol and associated risks and then addresses potential health and safety and impacts related to construction and operation of the proposed project.

8.4.1.1 Chemical Risk Factors

The proposed project technology alternatives would use chemicals with varying risk factors. The risks associated with the use of these chemicals depend on the individual chemical characteristics, storage, volume used, the potential for release and factors such as the quantity and duration of release, weather conditions, and surrounding terrain that influences the outcome of a release of and the associated risks.

The primary chemical substances of concern are natural gas (methane) and methanol (AcuTech 2016a). The following discussion provides a summary of risks associated with these chemicals. Additional detail is provided in **Appendix G2**. Chemicals used during construction or operation that have lower potential risks, such as diesel fuel and various catalysts, are discussed in the Petroleum Products and Miscellaneous Substances section below.

Natural Gas

Natural gas (methane) is the raw material that would be used to produce methanol. It would be provided to the site by an underground pipeline lateral from Northwest.

Natural gas is not considered to be chemically toxic but is an asphyxiate[3] with an inhalation hazard; exposure to high concentrations can result in serious injury or death. Mixtures of

[3] An asphyxiate is a substance that can cause death or unconsciousness by reducing or displacing normal oxygen concentrations leading to suffocation.

natural gas in air in unconfined conditions are generally dilute and do not typically present an asphyxiate hazard. Natural gas diluted in air is not generally flammable or explosive in an open site, such as the planned facility and the related pipeline corridor.

Natural gas can become highly concentrated in confined spaces or enclosed spaces and can displace oxygen in the air causing asphyxiation. Natural gas is flammable, can be explosive at room temperature, and can be ignited with a static charge.

Petroleum Products and Miscellaneous Substances

Various petroleum products, including diesel or other fuels, lubricants, paint, solvents, or other miscellaneous chemicals would be used and stored on site during construction and operation of the proposed project (AcuTech 2016a).

Petroleum products and various miscellaneous substances used on site during construction and operation of the proposed project are potentially hazardous when spilled or leaked outdoors. These products could threaten plant and animal species, particularly aquatic life, such as that found in the Columbia River. Spills of these products on the upland portion of the site could expose workers, soil, groundwater, plants, animals, and adjacent wetland resources to toxic substances.

Diesel Fuel

Diesel-powered generators would be used for emergency power on site during operation of the facility. Diesel fuel is a combustible petroleum product that must be handled, stored, and transported to avoid the risk of exposure to flame and sparks. Hazards include the risk of fire and explosion. A maximum volume of 500 gallons would be stored on site in an aboveground storage tank during operation.

Catalysts

The proposed project (both technology alternatives) would use catalytic process units to promote chemical reactions necessary for the reformation of natural gas to methanol. The catalytic processes would employ mixtures consisting primarily of oxides of aluminum, cobalt, copper, magnesium, molybdenum, nickel, zinc, and silicon and lower concentrations of other metallic compounds. The catalysts will be delivered to the facility in pellet form (2 to 17 millimeters in diameter). These pellets will be placed in fully contained process vessels. Neither the catalysts nor the catalytic process will be exposed to the environment or to occupational areas during normal operations.

A zinc oxide catalyst will be used to remove sulfur compounds from the incoming natural gas. Hydrogen sulfide, found in the incoming natural gas and also formed in the removal process, will react with the zinc oxide as the natural gas is passed through the catalyst bed. Hydrogen sulfide is a toxic gas, but it will be present only at very low concentrations in the natural gas, which will be fully contained in the catalytic process vessel. Eventually, the zinc oxide catalysts will lose effectiveness and must be replaced approximately once every 6 to 12 months. The spent desulfurization catalyst will consist primarily of zinc oxide and zinc sulfide. It will be disposed off site at a licensed waste disposal facility.

Catalysts used to reform natural gas to methanol will last three to five years. The metallic compounds in these spent catalysts generally will retain their original chemical composition and will be in the form of dust and larger particles. Some of these compounds may be toxic if inhaled and some may have potential to self-heat and combust when exposed to the atmosphere under certain circumstances. Therefore, they must be carefully managed when they are removed from the catalytic process vessels. These spent catalysts will be hauled off site to a facility that will recover valuable metals (depending on market conditions) or to a licensed disposal facility.

All spent catalysts must be removed and replaced by a specialty contractor to ensure the safety of the workers. Removal will entail first purging the catalytic process unit of all process gases with an inert gas, such as nitrogen. Once purged of process gases, the unit will be opened and the spent catalyst will be transferred to containers using appropriate dust control procedures. This work will be done by workers equipped with personal protective equipment to prevent inhalation of catalyst dust.

Aqueous Ammonia

To control nitrogen oxides (NO_x) emissions from the boilers, the proposed project would use a 19 percent aqueous ammonia solution (ammonia diluted with water at a ratio of 19 percent ammonia to 81 percent water) as a reducing agent and a catalyst (metallic oxide) to yield nitrogen and water that would be vented to the atmosphere. This process is commonly used to control NO_x emissions from large natural gas combustion sources and is known as selective catalytic reduction (SCR).

Aqueous ammonia is stable under normal storage conditions. The ammonia solution would be delivered by tank truck and stored in an on-site tank. Aqueous ammonia can burn skin, eyes, and lung tissue and could create a potential hazard to on-site workers if there were a spill or other significant release from the storage tank. The risk of injury, however, is low because the vaporization rate of ammonia from a 19 percent solution is low, and the hazard zone would be limited to the immediate spill area. Aqueous ammonia is much less hazardous than pure or anhydrous ammonia, which is a gas at room temperature.

The metallic catalysts used in the SCR will be similar to the catalysts used in the processes described above. The SCR process will be contained and catalyst replacement and disposal will be managed as described above for other catalytic processes.

Methanol

General Characteristics

Methanol is a clear, colorless, water-soluble liquid. It is flammable and considered a hazardous substance (40 CFR 302.4) under the Emergency Planning and Community Right-to-Know Act.

While methanol is a liquid at typical ambient temperature and pressure conditions, much of the proposed project methanol manufacturing process takes place at temperatures above methanol's boiling point; therefore, both vapor and liquid releases of methanol could occur. Methanol readily mixes with water and evaporates quickly into the atmosphere. Methanol releases to the environment present an inhalation risk in enclosed areas, explosion and fire risks, and potential toxicity to plants and animals located near the source of a release.

Humans can be exposed to methanol via ingestion and skin and/or eye contact. Methanol is oxidized in the liver by an enzyme and produces formaldehyde and formic acid, which is responsible for its toxicity. Chronic exposure to methanol, either orally or by inhalation, causes headaches, insomnia, gastrointestinal problems, and blindness. Methanol does not mutate nor cause cancer.

Methanol is less toxic to marine life than crude oil or gasoline and many effects of short-term exposure are temporary or reversible. The US EPA Office of Pollution and Prevention and Toxics indicates that methanol is essentially non-toxic to four aquatic fish species that were tested (EPA, OPPT, 1994). A methanol spill onto surface water would have some immediate effects to marine life in the direct vicinity of the spill. However, because its properties (i.e., methanol readily mixes with water and evaporates into the atmosphere), methanol would dissipate into the environment, and within fairly short distances from the spill would reach levels where biodegradation would rapidly occur (Malcom Prime, 1999). A reasonable worst-case methanol release to surface water is evaluated and discussed in section 8.4.3.3 below.

The characteristics of methanol in air and water are used to predict the risks and potential impacts of a release or spill. These characteristics are discussed in detail in the QRA and summarized below. See **Appendix G1**, QRA, and **Appendix G3**, Spill Modeling Report.

Methanol in Air

The quantity of methanol released into the air, its duration, weather conditions, and the nature of the surrounding terrain can influence the outcome of a release. Methanol vapor has nearly neutral buoyancy and would readily dissipate or disappear from locations with circulating air and in open-air areas. It may not dissipate from non-ventilated locations, such as sewers and enclosed spaces. Depending on the circumstances of a release, methanol liquid may pool and vapor may migrate near the ground and collect in confined spaces and low-lying areas. Methanol vapor can flash back to its source if ignited. These factors are discussed in detail in **Appendix G2**, Safety and Health Aspects (AcuTech 2016).

Methanol in Water

Methanol retains its flammability in water but would be expected to dilute rapidly to a nonflammable concentration if released to a large body of water, such as the Columbia River. Other factors affecting the rate of dilution include wave, tides, and currents. Methanol is known to biodegrade rapidly once it is diluted and is not expected to persist in surface water (Jamali et al. 2002; Malcolm Pirnie, Inc. 1999). Biodegradation of methanol in water can result in lowering of DO concentration in the waterbody.

8.4.2 Construction Impacts

Construction of the proposed project would have impacts similar to that of any large construction project and includes impacts to individual workers at the construction site and to the surrounding population. Risks that could result in a negative impact to on-site workers include, but are not limited to:

- Vehicle traffic
- Trips, slips, and falls
- Drowning (overwater and nearshore construction)
- Burns associated with welding or other hot equipment
- Blunt trauma associated with loose equipment impacts

- Overhead hazards, including cranes, excavators, and other equipment that has the potential to fall
- Exposure to spills or releases of hazardous materials used during construction (e.g., hot asphalt, fuel, oil, etc.)
- Encountering previously undiscovered contaminated soil or groundwater during excavations or other ground disturbing activities
- Construction risks/potential impacts to the environment related to hazardous materials releases

Hazardous materials would be used and stored on site during construction and may include fuel for heavy equipment and generators, hydraulic fluids, paints, and solvents. Releases on the upland portion of the site could expose workers, plants, animals, adjacent wetland resources, soil, and groundwater to hazardous materials.

Hazardous material spills into adjacent surface waters or onto the nearshore portion of the project site could contaminate Columbia River water and/or underlying groundwater. A release could expose plants, animals, aquatic habitats, shorelines, and people to contamination. The extent of the impacts from a release into surface water at the site would depend upon factors including the type and quantity of the spilled material, location of the release, physical and biological features of the affected environment, and the sensitivity of various species to the hazardous material.

Construction would include ground improvement, site grading for development and building activities typical to an industrial facility. These activities could result in temporary, localized increases in particulate matter, such as dust in the air.

Construction would require the use of heavy trucks, heavy equipment, and a range of smaller equipment, such as generators, pumps, and compressors. Emissions from diesel equipment could reduce ambient air quality, resulting in potential health risks.

Construction of the facility would include some activities such as asphalt paving that would generate odors. These odors may be perceptible for a short period during such activities. If oil-based paints were applied to structures or equipment at the site, paint odors may be perceptible nearby. These impacts are anticipated to be slight and of short duration within the area of the odor source. Construction contractor(s) would be required to comply with Southwest Clean Air Agency regulations, to use recognized best management practices (BMPs) to reduce such odors to a reasonable minimum.

Compliance with the applicable regulations, implementation of BMPs, and a spill prevention, control, and countermeasures plan (SPCCP) would avoid and minimize the potential for significant adverse impacts due to spills during construction activities. See section 8.7.1 for a discussion of upland and in-water spill safeguards, prevention measures, and response protocol.

The proposed project would not have significant adverse impacts during construction.

8.4.3 Operational Impacts

This section summarizes the potential environmental health and safety operational impacts from the operation of the proposed facility. The Health and Safety Aspects Report, QRA, and

Spill Modeling Report were used as resources in this evaluation. See **Appendices G1 to G3** for additional detailed information included in these reports.

8.4.3.1 Methanol Fire, Explosion, and Overpressure

Methanol is classified as a flammable liquid that could result in fires. The potential methanol fire impacts include pool fires, jet fires and vapor cloud explosions. A spill of methanol forming a liquid pool may cause vapor generation at or below ambient temperatures. These vapors may result in a flammable concentration. If ignited, the vapors could flash back resulting in a pool fire or flash fire. A flash fire is the combustion of a gas/air mixture that produces relatively short-term thermal hazards with a subsonic shock wave.

If the flammable vapors are confined, the ignition could cause a vapor cloud explosion resulting in an overpressure hazard. ~~The QRA did not develop fireball scenarios because the methanol storage tanks are all designed for atmospheric conditions (i.e., methanol will not be stored in pressurized tanks). If a tank failure were to occur, the result would be a large pool fire, not a fireball. A vapor cloud explosion in the methanol production area therefore was modeled as the worst-case incident at the proposed facility.~~ A vapor cloud explosion in the methanol production area was modeled in the QRA as the worst-case incident at the proposed facility. The QRA did not develop fireball scenarios or boiling liquid expanding vapor explosion (BLEVE) because the methanol storage tanks are all designed for atmospheric conditions (i.e., methanol will not be stored in pressurized tanks).

BLEVE is defined as a sudden loss of containment of a pressure-liquefied gas existing above its normal atmospheric boiling point at the moment of its failure, which results in rapidly expanding vapor and flashing liquid.

A BLEVE requires three key elements.

1. A liquid at a temperature above its normal atmospheric pressure boiling point.
2. Containment that causes the pressure on the liquid to be sufficiently high to suppress boiling.
3. A sudden loss of containment to rapidly drop the pressure on the liquid.

A BLEVE scenario is not possible at the methanol storage tanks because the tanks are not pressurized or capable of maintaining the pressure necessary to suppress boiling. If catastrophic tank failure were to occur, the resulting hazard would be a large pool fire, not a fireball or BLEVE.

8.4.3.2 Large-Scale Emergency Incident Impacts

The QRA quantified the potential risk to the public and workers from a large-scale emergency incident such as a methanol release, fire or explosion. Accident release scenarios defined for the QRA were developed through an initial HAZID workshop (see section 8.3.2 QRA for a description of the workshop.)

The QRA developed the likelihood of potential impacts using a risk model. The risk model includes specific site information for the proposed methanol facility, including weather conditions, ignition sources, obstructed regions, on-site building construction and occupancy, and off-site populations in close proximity to the proposed facility, as discussed in section 8.3.3.

Based on the risk model for the proposed project the potential risk and potential impacts were developed for individuals and groups of people, as follows:

For a single individual, the QRA concludes that the risk of one fatality in 100,000 years is maintained within the project site and that there is no measurable risk of fatalities outside the boundaries of the proposed facility. Therefore, under the HSE criteria, the individual risk is within the broadly acceptable (or negligible) risk level for public impacts. This conclusion applies to an individual present at any point or combination of points outside the facility boundary over an extended period of years.

The risk to people on site was calculated to be:

- 1 fatality in 100,000 years for people located in and around the methanol production lines, the shift tanks, and methanol pump pad; and
- 1 fatality in one million years in the bulk product storage area, periphery of the methanol production lines and pump pad and along the product piping between the bulk storage tanks and marine terminal.

This project risk level is lower than fatal injury rates than many other common industries such as logging, fishing, forestry, and structural workers. See the Worker Injury section below for statistics on worker injury and illness for all types of chemical manufacturers.

The QRA also calculated a broader societal risk, or risk to groups of people, that takes into account the number of individuals who may be present outside but near the facility boundaries at any given time and the duration of their presence. The evaluation of societal risks predicted that there is no measurable societal risk of offsite fatalities from operation of the proposed facility.

The QRA modeling of the worst-case scenario also indicated that an explosion at the proposed methanol facility would not result in deformation or collapse of any offsite buildings and individuals offsite would be protected from significant injury. No effects would be expected at the former Trojan Nuclear Power Plant across the Columbia River from the facility, where spent nuclear fuel remains.

ALOHA was used to model the predicted effects of a worst-case methanol release in the storage tank area involving a fire. The model concluded that the methanol concentrations would not reach even one-half of the lower flammability level outside the storage tank impoundment area and, therefore, that there would be no potential for a vapor cloud explosion.

ALOHA was also used to predict methanol toxicity impacts from human exposure to airborne methanol in a scenario involving a worst-case release without a fire. The model evaluated the following three AEGLs.

- AEGL-1 is the airborne concentration, expressed as parts per million (ppm) or milligrams per cubic meter (mg/m3), of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

- AEGL-2 is the airborne concentration (expressed as ppm or mg/m3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

- AEGL-3 is the airborne concentration (expressed as ppm or mg/m3) of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

The model predicts the following distances to the AEGL concentrations described above as (measured from the center of the methanol storage impoundment):

- 545 yards to AEGL-1 (530 ppm [60 min])
- 166 yards to AEGL-2 (2,100 ppm [60 min])
- 109 yards to AEGL-3 (7,200 ppm [60 min])

The AEGL-3 and AEGL-2 levels would not extend beyond the methanol tank impoundment area and are maintained within the NWIW plant boundary. Therefore, ALOHA predicts the risk of serious or permanent injury from the toxic effects of a worst-case methanol release would be limited to within the plant boundary.

AEGL-1 levels may extend beyond the NWIW plant boundary to the north of the methanol storage tanks. As discussed in section 8.3.3, the AEGL-1 concentration level is not disabling, and involves no long-term effects. Additionally, the off-site area north of the methanol storage tanks consists of an access road and wetlands and wildlife habitat with no residences or other occupied structures and would not have large concentrations of individuals present.

The ALOHA modeling results are consistent with the QRA results and further illustrate that the proposed project does not present significant potential for serious or permanent injury outside of the plant boundary from a large release of methanol from the storage area.

Worker Injury

Impacts to workers include injury due to accidents associated with day-to-day activities and accidents that are specific to operation of the proposed project. The risk of injury is relatively low for chemical manufacturing and water transportation in the United States and the proposed project is not expected to result in significant adverse impacts to on-site workers as discussed below.

The U.S. Bureau of Labor and Industries (BLS 2015) reports the following statistics for worker injuries or illness for all chemical manufacturers, of which methanol manufacturing is a subset, and for water transportation.

- Chemical manufacturing (North American Industry Classification System [NAICS] 325): The rate of injury and illness cases per 100 full-time workers ranged from 2.0 to 2.4 between 2011 and 2013 (the most recent year reported).

- Water Transportation (NAICS 483): The rate of injury and illness cases per 100 full-time workers ranged from 2.0 to 2.5 between 2011 and 2013 (the most recent year reported).

- Support Activities for Transportation (NAICS 488, includes ports as a subset): The rate of injury and illness cases per 100 full-time workers ranged from 3.6 to 3.7 between 2011 and 2013 (the most recent year reported).

- The American Chemistry Council tracks occupational incidence rates specific to chemistry businesses (ACC 2015). Their data includes the following:
  - The rate of recordable occupational injuries in the chemistry sector ranged from 2.0 (2013) to 5.5 (1995) per 100 employees between 1995 and 2013. This rate of injury is less than that recorded from the retail, agriculture, food store, and general merchandising business sectors for the years 2009 through 2013.
  - Total process safety incidents ranged from 225 to 281 reported incidents between 2008 and 2014 and resulted in 29 to 52 injuries to on-site personnel. One off-site injury was recorded in both 2008 and 2013.
  - The total number of reportable incidences associated with the transportation of hazardous materials ranged from 2,353 (1995) to 730 (2014) with the majority of the incidences reported as negligible with no associated injuries. The American Chemistry Council states that there are close to one million shipments of hazardous materials daily in the United States.
  - It is anticipated the worker injuries associated with vessels would be minimal. More than 20,000 tanker vessel called at U.S. ports in 2010 and 2011 (U.S. Department of Transportation Maritime Administration, 2013). The USCG tracks vessel-related injuries and reported between 15 and 28 injuries related to “tankship” vessels each year from 2010 to 2014, with the number of injuries decreasing over the years (USCG 2015).
- The Pacific Maritime Association (PMA) 2014 annual report (PMA, 2014) concluded that there were no fatalities recorded at West Coast seaports in 2014 and the lost-time injuries reported in 2014 had decreased by nearly 50 percent (Port of Oakland 2015).

Based on the individual and societal risk analysis conducted and the statistics stated above, the proposed project would not have a significant risk of injury to workers during operation.

8.4.3.3 In-water Accidental Release/Spill Impacts

The risks and impacts to the environment, fish and wildlife, human health and safety, and recreational activities associated with loading methanol onto ships and transporting it downriver would include potential incidents that could result in spills of methanol into the Columbia River.

The transport of chemicals in bulk is regulated by the International Convention for the Safety of Life at Sea and the International Convention for the Prevention of Pollution from Ships, as modified by the protocol of 1978 (MARPOL), as well as the regulations summarized in section 8.2. Methanol is categorized as a MARPOL Annex II, Category Y substance; MARPOL Annex II ~~are the regulations for~~ regulates the control of pollution by noxious liquid substances being carried in bulk, and Category Y is defined as “noxious liquid substance[s], which, if discharged into the sea from tank cleaning or deballasting operations, are deemed to present a hazard to either marine resources or human health or cause harm to amenities or other legitimate uses of the sea and, therefore, justify a limitation of the quality and quantity of the discharge into the marine environment” (International Maritime Organization [IMO] 2013).

The ships or vessels used to transport methanol would be double-hulled with segmented compartments for storing methanol during transport. The segmented compartments reduce the probability of a complete loss of vessel contents to a low potential. The methanol transport vessels would hold up to approximately ~~14 million gallons~~ 90,000 metric tonnes (approximately 29,970,000 gallons) of methanol when fully loaded (as limited by draft and keel clearance requirements). Each portion of the segmented holds in these vessels would hold less than 3 million gallons of methanol when fully loaded.

8.4.3.4 Vessel Traffic, Collision, and Spill Impacts

The proposed project would result in approximately 36 to 72 additional ships per year (depending on vessel size). The Columbia River accommodated approximately 1,581 cargo and passenger vessels, tank ships, and articulated tug barge vessel calls in 2014. According to vessel entry and transit data, the river historically has accommodated much higher numbers (Ecology 2015b). The increase in the number of ships per year would be minor and the total would be within the historical range.

Vessel incidents can occur from allisions (a moving vessel striking a stationary object, including another vessel), collisions (two moving vessels colliding), or groundings (moving vessel striking the bottom).Vessel incidents resulting in the accidental spills and releases of methanol are a risk from the proposed project along the Columbia River to its mouth and into the open ocean. The proposed project would not involve the transport of any chemicals via ship other than methanol except for the fuel that operates the ship.

Operating any vessel that uses onboard fuels poses the risk of spills either during fueling or from an accident. According to a study completed for Ecology, between 1995 and 2008 there were 119 spill events of 25 gallons or more and 1,035 near-miss vessel incidents in Washington waters that could have resulted in spills (Environmental Research Consulting 2009). Spills from cargo vessels represented 30 of these spill events.

~~Vessel Traffic~~

~~The proposed project would result in approximately 36 to 72 additional ship transits per year (depending on vessel size). The Columbia River accommodated approximately 1,581 cargo and passenger vessels, tank ships, and articulated tug barge vessel calls in 2014 and historically has accommodated much higher numbers according to vessel entry and transit data (Ecology 2015b). This increase in vessel traffic for the proposed project is minor and would be within historical trends.~~

~~Vessel Collisions~~

~~There is a risk of spills of onboard fuel used to operate vessels, either during fueling or accidents (e.g., collisions, allisions, groundings). There were 119 spill events of 25 gallons or more and 1,035 near-miss vessel incidents in Washington waters that could have resulted in spills between 1995 and 2008 according to a study completed for Ecology (ERC 2009). Spills from cargo vessels represented 30 of these spill events during this timeframe.~~

Environmental Research Consulting (ERC) evaluated the risk of cargo vessel spill ~~risk~~ relative to all spills from all methods of fuel/oil transport within Washington between 1995 and 2008. Based on historical records for Columbia River spills between 1995 and 2008, the ERC study concluded that there is a moderate relative risk of cargo vessel-related fuel/oil spills in the west portion of the Columbia River. However, the proposed project would not significantly increase the existing risk of fuel spills into surface waters because the vessel traffic associated with the project represents a minor increase to existing traffic, as discussed above.

The risk of a spill event associated with a project-related vessel in transit is considered to be low based on historical data ~~discussed~~ (see below) regarding vessel spills on the Columbia River for the type of vessels that would be used for the proposed project. Although the data addresses oil spills, it is assumed to represent the potential risk for spills from vessels carrying other liquids, such as methanol. Historical information considered for this evaluation ~~indicates~~ includes the following:

- Ecology identifies five spills with a volume of oil greater than 10,000 gallons on the Columbia River and near its mouth between 1971 and 1996.
- The largest spill on the Columbia River was the SS Mobil Oil tanker spill in 1984 (Ecology 1997 rev. 2007; Ecology 2015a). This spill resulted when the loaded 618-foot tanker lost steering because of an equipment malfunction and grounded on the riverbank approximately 1 mile upstream from Saint Helens, Oregon; approximately 200,000 gallons of oil were spilled. The SS Mobile Oil tanker had a single hull design that would not comply with current standards.
- From 1995 to 2008, tanker vessels spilled a total of 13,709 gallons (326 barrels) of oil in the waters of Washington in 14 incidents (ERC 2009).

Spill Evaluation

To evaluate the potential water quality impacts from a spill to the Columbia River, a numerical modeling was conducted. The numerical modeling simulated a hypothetical reasonable worst-case spill scenario that could occur from an incident involving a loaded vessel.

The spill simulation modeled the methanol and DO concentrations that would result from such an event (Geosyntec 2016). DO is important because it is necessary to sustain aquatic life. The results of the modeling are included as **Appendix G3**.

The modeling used a reasonable worst-case spill: a loaded methanol tanker collides broadside with another large ship, and both the tanker’s outer hull and an internal storage tank with a capacity of 9,000 metric tons (nearly 3 million gallons) of methanol are breached at the waterline. This scenario was selected for modeling because it would result in the maximum damage to the methanol tanker.

The worst-case scenario uses a broadside collision that results in a spill from one tank because:

- On the Columbia River, groundings are historically less likely than collisions to result in a spill, and at navigation speeds on the river, a collision is more likely than a grounding to puncture both the hull and an internal cargo tank and result in a spill.
- Bow-to-bow or side-to-side collisions are not likely to result in a release as bow-to-bow collisions are easiest to avoid and side-to-side collisions typically do not result in enough force to breach cargo tanks. Therefore, the worst-case scenario uses a broadside collision. However, a broadside collision is unlikely and, in much of the lower Columbia River, may not even be possible because the channel is too narrow for two large ships to collide broadside.
- No collisions involving a double-hulled tanker have resulted in the loss of cargo from more than one tank. This includes collisions that occurred on the open ocean at vessel speeds that are likely greater than the navigation velocity of a large tanker on the Columbia River. Thus, the likelihood of a methanol tanker breaching more than one tank in a collision on the

Columbia River is remote and not considered to have a reasonable likelihood of occurring and need not be considered in the EIS.

Therefore, the worst-case scenario used in the modeling involves a broadside collision that punctures the hull and results in the loss of cargo from one tank.

The modelling assumes that the methanol located above the waterline would drain by gravity into the ballast tank located between the cargo tank and the breached outer hull. The model assumes, conservatively, that this methanol (approximately one-third of the full cargo tank, or approximately 3,000 metric tons [999,000 gallons]) would be released to the Columbia River over approximately 1 hour. This is conservative because it is likely that some or most of the methanol emptied into the ballast tank would likely remain in the tank and not be released.

Pumps onboard the vessel would be able to transfer cargo from the breached cargo tank or ballast tank to undamaged tanks at a rate of approximately 800 metric tons per hour. The model conservatively assumes that the pumps would be activated after 1 hour and that they would operate at approximately 95 percent of the design pumping rate. The model assumes that of the 6,000 metric tons (1,998,000 gallons) of methanol remaining after the first hour, approximately 3,000 metric tons (999,000 gallons) would be transferred to undamaged tanks onboard, and approximately 3,000 metric tons (999,000 gallons) would be released over the next four hours. This volume of secondary release is based on the assumption that methanol below the level of the breach would continue to be released as river water sloshes in and out of the opening.

Summing the immediate and longer term release assumptions, the reasonable worst-case scenario involves a theoretical release of a total 6,000 metric tons (1,998,000 gallons) of methanol into the Columbia River over a period of 5 hours. See **Table 8-4**. This spill volume far exceeds any spills reported to date from collisions involving double hull tankers transporting petroleum products in a river or channel environment.

Table 8-4. Modeled Reasonable Worst-Case Spill Scenario[4]

Elapsed Time	Volume Released	Notes
0 to 1 hour	3,000 metric tons (999,000 gallons)	Rapid initial release of approximately 1/3 of contents of a single, full tank
1 to 5 hours	Additional 3,000 metric tons (999,000 gallons) released at approximately 750 metric tons (250,000 gallons) per hour	Remaining 2/3 of the contents of a single full tank released into breached cargo or ballast tank. Approximately 1/2 of this volume would be captured and pumped to undamaged tanks on board
Total	**6,000 metric tons (1,998,000 gallons)**	

The potential impacts to water quality were modeled using conservative assumptions regarding the hydrodynamics of the receiving water, mixing and dilution of methanol, and reductions in DO. Three locations were modeled: the project site (RM72), the approximate midpoint between Kalama and the river mouth (RM35), and in the lower estuary near Astoria. These locations

[4] Source: Geosyntec 2016

capture a range of anticipated hydrodynamic and mixing conditions within the confined river channel from the Port of Kalama and RM 35 to the more open conditions in the estuary.

The modeled simulation period was 1 August to 15 August, a time when the volume of water in the river is low and several sensitive life stages of aquatic species could be present. In addition, baseline DO levels are lower in the river because the temperature of the water is typically higher during August. The model used a daily average flow rate of 110,900 cubic feet per second (cfs) and a range of flows between 90,800 and 131,000 cfs during the simulation. Because these flows are relatively low, they yield conservative estimates of the amount of mixing, dilution, and re-oxygenation.

A methanol release to the Columbia River could affect environmental resources through two primary pathways: (1) the direct impacts associated with temporarily elevated concentrations of methanol in the water, and (2) the effects associated with the temporarily reduced DO concentrations that would result as methanol is biodegraded. The simulation calculated concentrations of methanol concentrations and DO at 6, 12, 24, 48, 72, and 96-hour increments after the start of the spill.

Methanol Concentrations

The model shows that the flow of the river (including tidal reversals) would transport the methanol downstream. As the methanol moves downstream, its concentration would be attenuated as the it mixes with the water and is diluted and degraded by microbial action. The maximum concentration of methanol predicted by the model was approximately 1,200 mg/L. This concentration was predicted within a single computational cell in the model, near the immediate site of the spill, for approximately 1 hour. Within approximately 2 hours, the concentration decreases to between 500 mg/L and 800 mg/L and decreases further as it is transported downstream. It is important to note, however, that the model does not estimate the methanol concentrations that would be expected to occur at the immediate point of the release. The concentrations immediately adjacent to the vessel would be expected to exceed the concentrations predicted in the model.

Mixing, dilution, and degradation of methanol cause the maximum concentrations to decrease in the downstream direction. For example, a spill at the project site would result in maximum methanol concentrations at Longview (approximately 8 miles downstream of a hypothetical spill at Kalama) of approximately 260 mg/L; at Beaver Army Terminal (approximately 20 miles downstream from Kalama) of approximately 80 mg/L; and at Skamokawa (approximately 40 miles downstream) of less than 20 mg/L. Methanol concentrations would be even lower in the lower estuary where substantial additional ambient water would be available for mixing and dilution.

Dissolved Oxygen (DO) Concentration

The model predicts that the effects to the concentration of DO depend on the tidal flow reversals in the river, as well as the time required for the DO to be consumed as the methanol is aerobically biodegraded. The results of the model indicate that the concentrations of DO at the project site and in the immediate vicinity of a spill would remain relatively unchanged – it takes time for bacterial populations to reach levels that have a measurable effect on concentrations. The model assumes that methylotrophic bacteria[5] in the vicinity of the spill would increase at a doubling rate of 3.6 hours. At this rate, according to the model, approximately 36 hours from

[5] Methylotrophic bacteria use C1 compounds like methanol to grow.

the spill would elapse before the bacterial population would reach a level at which the DO concentration in the river would begin to be measurably affected.

The model predicts that for a spill at or near the facility, DO concentrations would be reduced to a minimum concentration of approximately 2.7 mg/L approximately 30 miles downstream. This minimum DO concentration would occur only for a few hours of one tidal cycle and in only a single grid cell of the model, while most of the grid cells in the model would have minimum DO concentrations of approximately 4 mg/L or greater. The model predicts that DO concentrations would not drop below 3.0 mg/L at any time, and that DO concentrations below 4.0 mg/L would occur for no longer than 6 hours. If a spill were to occur at RM 35, the model predicts that DO concentrations would be reduced to a minimum concentration of approximately 6.9 mg/L downstream of Skamokawa. A spill in the lower estuary would have no measurable effect on DO concentrations in the river because of the lag time necessary for bacterial populations to multiply and the volume of water available for dilution.

~~**In-Water Spill Impacts**~~

~~The fate and transport of methanol spilled to surface water and the potential toxic effects of such spills is presented in *Fate of Methanol Spills into Rivers of Varying Geometry* (Jamali, 2002). Jamali (et al. 2002) developed four conceptual models for waterways (small, medium, large, and very large rivers) to calculate the fate of a methanol spill to a river based on characteristics of discharge, width, depth, velocity, and length. The models included spill scenarios from piping during ship loading and from failure of a ship compartment due to internal or external causes. The Columbia River would fall between the large and very large river categories Jamali modeled. The results from Jamali's large river model are assumed to be conservative estimates for the Columbia River.~~

~~The Jamali study used three concentrations of methanol in drinking water as a benchmark for human health impacts. The benchmark concentrations were:~~

Resource Impacts – Human Health

A methanol spill to the Columbia River would have the potential to affect human health and safety by temporarily elevating levels of methanol in the aquatic system and because humans could be exposed to methanol through water contact or by drinking water that comes from the Columbia River.

As described previously, the maximum concentration of methanol predicted in the spill simulation and numerical modeling was approximately 1,200 mg/L. This concentration occurred in a single cell in the model for a brief period near the immediate site of the spill It is important to note, however, that the model does not estimate the methanol concentrations that would be expected to occur at the immediate point of the release. Methanol concentrations immediately adjacent to the vessel would be expected to exceed the concentrations predicted in the model.

The extent of potential human exposure in the event of a spill would depend on the location of the spill. It is unlikely that humans (with the exception of emergency responders or personnel on the vessel) would be present on or in the water in the immediate vicinity of the vessel during a spill, and they therefore would not be likely to be exposed to the highest concentrations of methanol. Humans present in the water downstream of the spill could be exposed to elevated levels of methanol through dermal absorption. However, the modeled concentrations of methanol predicted, even very close to the spill, are such that only minor temporary effects (minor irritation, headache, drowsiness, dizziness, nausea) would be possible if an individual were in the water close to the spill.

Downstream water supply or well intakes could be affected by a methanol spill, depending on the size of the spill and its proximity to intakes. The closer to an intake, the greater the potential for methanol to enter the water supply before biodegradation. If necessary, water intakes could be closed temporarily until methanol concentrations in the surface water at the intake return to acceptable levels. However, even if a spill occurred in the immediate vicinity of a water intake, the methanol level in the water at the intake would still not exceed the one-day drinking water health advisory limit established for methanol (200 mg/L).[6]

Based on this analysis, a potential methanol release into the Columbia River from ship loading or an accident in transport would not result in any significant adverse effects to human health or safety because of the very large size of the river and the short-lived duration of methanol in the environment. Complying with regulatory requirements and implementing BMPs and mitigation measures during ship loading and transport as discussed below would reduce the chance of a release occurring and would improve emergency response in the event of a release.

Resource Impacts – Plants and Animals

The extent and magnitude of any potential effects to plant and animal resources would depend upon the size and duration of the spill, as well as a number of environmental and biological factors. Environmental factors include water volume and velocity at the time of the spill, and hydrodynamic forces such as tidal forces, turbulence, and freshwater inputs. Biological factors include the location of the spill relative to biological receptors, species-specific tolerance or susceptibility, and the timing relative to the presence or absence of sensitive species and/or life stages of a given species.

Elevated Methanol Concentrations

Elevated concentrations of methanol in the aquatic environment can have two types of impacts to aquatic resources: (1) acute – effects associated with a sudden and short-term exposure to elevated concentrations of methanol, and (2) chronic – effects associated with long-term exposure (typically over months or years) to methanol in the water. Chronic impacts would not be expected to occur from a spill because a spill is a single punctuated event, and would not result in long-term repeat exposure.

Acute impacts associated with a sudden increase in concentration of methanol in the aquatic environment can result in a range of effects depending upon concentration, duration, exposure, and species biology. These range from lethal (mortality) to sublethal effects, such as decreased growth and reproduction, reduced foraging success, and avoidance behaviors.

The EPA considers methanol to have low acute toxicity to aquatic organisms (U.S. EPA 1994). However, at sufficiently high concentrations, lethal effects have been observed. The EPA has

[6] A 2002 study analyzed the fate and transport of methanol spilled to surface water and the potential toxic effects of such spills (Jamali 2002). This study established the following three concentrations of methanol in drinking water as a benchmarks for evaluating potential human health impacts:
•1-day drinking water health advisory limit (DWHAL) of 200 mg/l for children and 350 mg/l for adults.
•10-day (DWHAL) of 100 mg/l for children and 350 mg/l for adults.
•Lifetime (DWHAL) of 3.5 mg/l.

reported LC-50[7] levels for several aquatic species, including fathead minnow (*Pimephales promelas*) (96-hour LC50 = 28,100 mg/L), rainbow trout (*Oncorhynchus mykiss*) (96-hour LC50 = 20,100 mg/L), bleak (*Alburnus alburnus*) (96-hour LC50 = >28,000 mg/L), common carp (*Cyprinus carpio*) (48-hour LC-50 = 28,000 mg/L), goldfish (*Carassius auratus*) (48-hour LC-50 = 1,700 mg/L), brine shrimp (*Artemia salina*) (24-hour LC-50 = >10,000 mg/L), and mosquito (*Culex restuans*) (18-hour LC-50 = 20,000 mg/L) (AQUIRE 1994 in U.S. EPA 1994). There is no available published literature regarding LC-50 levels for marine mammals, but the EPA has cited oral LD-50 values for methanol in animals of 0.4 gram per kilogram (g/kg) for mice, 6.2 to 13 g/kg for rats, 14.4 g/kg for rabbits, and 2 to 7 g/kg for monkeys (Rowe and McCollister 1981).

The maximum concentration of methanol observed in the simulation was 1,200 mg/L, in a single computational cell in the model, near the immediate site of the spill. Even this maximum concentration is well below the concentration at which lethal effects would be expected, and it would occur for much shorter duration than the exposure times for which the LC-50s listed above are established. As stated previously, methanol concentrations immediately adjacent to the vessel could exceed those concentrations predicted in the model, but they would be expected only for very short durations. Acute lethal impacts could occur at the immediate location of a spill – where the methanol enters the river – and in the immediate vicinity. Beyond this area, however, the model predicts that methanol concentrations would be diluted to levels where lethal effects would not occur.

A variety of sublethal impacts to aquatic organisms also could occur from temporarily elevated methanol concentrations resulting from a spill. These include symptoms of intoxication, such as incoordination, salivation, lethargy, and narcosis (Rowe and McCollister 1981) as well as potential changes in behavior, growth, mobility, reproduction, and equilibrium (Malcolm Pirnie 1999).

Relatively little literature is available about the concentrations of methanol at which sublethal effects to plant/animal resources can occur. The EPA has established EC-508 levels for methanol exposure for rainbow trout (216-hour EC-50 =13,000-13,000 mg/L) and bluegill (216-hour EC-50 =16,000-16,100 mg/L) (Malcolm Pirnie 1999). These levels are well above the concentrations predicted by the model (except potentially at the immediate site of a spill), and also require a much longer duration than those predicted to occur by the model. However, some species are likely to be more susceptible, and could be exposed to levels of methanol that have sublethal effects.

With regards to aquatic plants, the EPA reported effects of growth inhibition for four strains of Anabaena (blue-green algae) over a range of concentrations from 25,700 to 31,300 mg/L from 10 to 14 days exposure (AQUIRE 1994 in U.S. EPA 1994). These concentrations are much greater than any concentrations predicted to occur as a result of a spill, except potentially at the immediate site of the spill.

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[7] LC-50 is a standard measure of surrounding medium toxicity, which is defined as the concentration of a given substance in a surrounding medium wherein half of the sample population (50%) of a specific test species in a specified period of time die from exposure via inhalation or respiration. LD-50 is also referred to as the median lethal dose – the amount of a material, given all at once, which causes the death of one-half of a sample population (50%) of a specific test species.

[8] EC-50 is the estimated concentration that is expected to cause an effect other than death to 50% of the test animals or plants of a specific test species.

In summary, the results of the numerical spill modeling indicate that in the event of an accidental release of methanol to the Columbia River during vessel loading or transport, methanol concentrations in the river would be diluted rapidly below the levels at which acute lethal or sublethal effects would be expected in aquatic species. However, some individual plant or animal species in the immediate vicinity of a spill could be exposed to concentrations of methanol that could result in acute effects. The extent of these potential effects would depend on the size and duration of the spill, as well as environmental and biological factors. These factors include (1) water volume, velocity, and temperature at the time of the spill; (2) hydrodynamic forces, such as tidal forces, turbulence, and freshwater inputs; (3) the location of the spill relative to biological receptors; (4) species-specific tolerance or susceptibility; and (5) whether sensitive species and/or life stages are present.

Reduced Dissolved Oxygen (DO) Concentration

As noted previously, an accidental release of methanol also has the potential to result in temporary reductions in DO in portions of the river, as oxygen is consumed during the aerobic biodegradation of methanol.

DO concentration depends on factors, including temperature, atmospheric pressure, and degree of biological activity and, as such, can vary widely in a natural system. DO concentrations in the Columbia River measured downstream of the project site between 1995 and 2016 ranged between approximately 7.8 mg/L and 15.0 mg/L (USGS 2016). By comparison, minimum DO levels in the lower estuary have been shown to occasionally drop as low as 2.1 mg/L (Roegner et al. 2011). These periodic drops in DO concentration in the lower estuary are generally attributed to natural upwelling of nutrient-rich and low DO waters into the photic zone and a subsequent stimulation of phytoplankton growth (Roegner et al. 2011).

Washington's water quality standards (WAC 173-201A) establish 9.5 mg/l as the DO concentration that is fully protective of freshwater aquatic life, and 7.5 mg/L as the DO concentration that is fully protective of marine aquatic life in extraordinary quality marine waters (Ecology 2002). A 2011 study of DO levels in the Columbia River estuary (Roegner et al. 2011) established five threshold levels of DO concentration specific to the biological requirements of migrating salmon:

- hypoxic or severe biological stress (0 to 2 mg/L);
- moderate biological stress (>2 to 4 mg/L);
- mild biological stress (>4 to 6 mg/L);
- normoxic (>6 to 9 mg/L); and
- supersaturated (>9 or 10 mg/L)

Aquatic species are adapted to survive within a range of variable DO concentrations, and acute exposure to reduced DO concentrations can have a range of sublethal and lethal effects. The extent of the effect would depend on the extent and duration of the reduction and the species-specific response. Chronic exposure to reduced DO concentrations can also result in effects to aquatic species, but because a spill is a punctuated event, chronic effects (from repeated long-term exposure) would not be expected.

With regards to potential acute lethal effects, the data in the literature varies widely and is species-specific. At very low levels of DO (at or below 1.5 mg/L), a relatively short exposure has been shown to result in lethal effects, with the potential for lethal effects increasing at higher water temperatures and longer exposures. The EPA has suggested that an exposure to concentrations of 3 mg/L DO for a period of less than 3.5 days should result in no direct mortality of salmonids (U.S. EPA 1986).

The EPA has stated that with the exception of larval forms, most non-salmonids appear to be more tolerant of low DO levels than salmonids. However, this is a generalization based on a relatively small subset of data for a relatively small number of non-salmonid fish species. In most cases, the EPA states that adults and juveniles of all species survive for at least a few hours at concentrations of DO as low as 3 mg/L, and non-salmonid fish appear to be able to survive a several-day exposure to concentrations below 1 mg/l (U.S. EPA 1986).

Available literature indicates that acute sublethal effects of reduced DO concentration in Pacific salmon include increased temporary avoidance behavior and subsequent habitat constriction, impaired swimming ability, and reduced feeding and growth (U.S. EPA 1986). These types of sublethal effects can be observed at a wide range of DO concentrations and durations, and are highly species-specific. A 2011 study (Roegner et al.) reports that a review by Davis concluded the average minimum incipient response threshold for salmonids in freshwater was 6.0 mg/L. Whitmore et al. (1960) found juvenile Chinook and coho salmon avoided water with concentrations of 4.5 and 6.0 mg/L, respectively, and both species showed a preference for DO concentrations of 9.0 mg/L.

Migrating adult fish, as well as juvenile fish of many species, are relatively motile and would likely attempt to avoid areas of reduced DO concentration. Less motile species or life stages (e.g., larval eulachon or eulachon eggs) would have more potential to be affected by a temporary reduction in DO concentration. Adult and juvenile fish naturally seek out waters with optimal concentrations of DO (Whitmore et al. 1960). Adult and juvenile fish and other aquatic species would likely seek refuge in tributary streams if they were available. They also may seek out areas of higher DO concentration deeper in the water column. Methanol is less dense than water, and would be expected to concentrate at or near the surface. This would keep the zone of reduced DO concentration nearer the surface. Deeper waters would be expected to retain more DO for a longer period, and could provide additional areas of temporary refuge and/or passage for motile species such as adult and juvenile fish.

Air-breathing species, such as marine mammals and sea turtles, would not be directly affected by a reduction in DO concentrations, but could be indirectly impacted via shifts in the distribution or movement of prey. If fish or other aquatic organisms are forced to seek refuge in suboptimal environments, and/or if they are metabolically stressed, they could be more susceptible temporarily to predation.

The spill simulation and numerical modeling indicate that the effects to DO concentration depend on the tidal flow reversals in the river, as well as the time required for the DO to be consumed as the methanol is biodegraded. The results of the model indicate that DO concentrations at the site of, and in the immediate vicinity of, a spill would remain relatively unchanged – it takes time for bacterial populations to reach levels that will result in a measurable effect to DO concentrations. The model assumes that methylotrophic bacteria in the vicinity of the spill would increase at a doubling rate of 3.6 hours. At this rate, according to the model, approximately 36 hours from the spill would elapse before the bacterial population reached a level at which the DO concentration in the river would begin to be measurably affected.

The model predicts that, for a spill at or near the facility, DO concentrations would be reduced to a minimum concentration of approximately 2.7 mg/L approximately 30 miles downstream.

The model predicts that DO concentrations would not drop below 2.0 mg/L at any time, and that DO concentrations below 4.0 mg/L would occur for no longer than 6 hours. If a spill were to occur at RM 35, DO concentrations would be reduced to a minimum concentration of approximately 6.9 mg/L downstream of Skamokawa, while a spill in the lower estuary would have no measurable effect on DO concentrations because of the lag time necessary for bacterial populations to multiply and the volume of water available for dilution.

These results indicate that, in the event of a reasonable worst-case spill scenario, DO concentrations would not be reduced to a level where lethal effects would occur, however, fish and other aquatic species could potentially be temporarily exposed to DO concentrations below the level at which sublethal effects could occur. The duration for which any given location on the river will be exposed to these concentrations will be relatively short, and will be shorter than the durations for which significant effects would be expected for most species. Individuals could be exposed to DO concentrations for short periods that could result in moderate biological stress for a period of up to 6 hours, depending on the location of the spill, and levels that could result in mild biological stress for a period of up to 30 hours. The extent of these potential effects would depend on the size and duration of the spill, as well as environmental and biological factors, such as (1) water volume, velocity, and temperature at the time of the spill; (2) hydrodynamic forces such as tidal forces, turbulence, and freshwater inputs; (3) the location of the spill relative to biological receptors; (4) species-specific tolerance or susceptibility; and (5) the presence or absence of sensitive species and/or life stages.

8.4.3.5 Upland Spill Impacts

The largest potential source of a spill from the upland portions of the proposed project site would be from a full methanol storage tank, with a volume of approximately 2,275,000 gallons. See section 8.7 Mitigation, Upland Area Spill Prevention and for design features for storage tanks that would avoid or minimize environmental impacts.

Upland methanol releases could potentially occur as a result of damage to the on-site piping systems. These releases would likely be localized and temporary due to safeguards such as leak detection systems, the presence of pavement at the site that would prevent the release from entering soil or groundwater.

Methanol, has a half-life of one to seven days in soil, depending on soil characteristics (e.g., chemical and microbiological characteristics), and is highly soluble in water (Malcolm Pirnie, Inc. 1999). Surface spills of methanol to soil may enter groundwater depending on the size of the spill and depth to groundwater, but would likely dissolve and/or degrade rapidly. Large methanol plumes would not likely form or persist in the subsurface because of the rapid rate methanol disappears in soil and groundwater and its ability to vaporize from dry soils.

A laboratory study (Novak et al. 1985) investigated methanol biodegradation, or its ability to decompose, in three soil sites. The study indicated that methanol contamination in groundwater is unlikely to remain for lengthy periods because of its ability to biodegrade under both aerobic and anaerobic conditions. Biodegradation would eventually destroy the methanol present in the soil and/or groundwater assuming the presence of three factors: (1) indigenous methanol-degrading microbial populations; (2) electron acceptors and nutrients; and (3) adequate pH and temperature levels.

There may be localized areas close to the release source where the methanol concentration would be at a level that it is toxic to the microbiota needed for biodegradation. This situation would be avoided by spill response, and cleanup and is not anticipated to be a potential impact.

Petroleum-based spills (i.e., fuel or oils) are not readily dissolvable and tend to bind to soil particles. Petroleum products or other hazardous materials are not expected to be stored on site in large quantities. Any of these materials would be stored on site in designated areas and close to spill response kits. The implementation of an operational SPCCP would trigger a rapid cleanup response.

The proposed project, would not result in significant adverse impacts to soil or groundwater from accidental spills of methanol or petroleum-based products due to all methanol storage tanks meeting regulatory requirements, leak detection systems, site paving, the small volume of petroleum based products stored on the site, and methanol's ability to biodegrade and vaporize.

8.4.3.6 Recreation Impacts

The Columbia River is used by recreational boaters and there are numerous parks and recreation facilities located along the river from the project site to the Pacific Ocean. An informal recreation area is located immediately north of the project site. A spill or release on the upland portion of the project site would not likely extend off-site and directly impact the recreational area due to on-site controls such as containment structures around the storage tanks. However, users could be evacuated from the area or excluded from the area for their safety if an incident occurred on the site that could result in impacts in the recreational area.

A vessel spill or release during vessel loading and transport could temporarily affect the public's recreational use of the Columbia River or other park and recreation facilities along the river. The impact to recreation use would be temporary and localized based on the characteristics of methanol and the availability of rapid spill response. In the event of a spill, the area affected by the spill would be closed and any human exposure to the spill material minimized.

The proposed project would not result in a significant adverse impact to recreation due to the temporary and localized characteristics of methanol after a release or spill.

8.4.3.7 Fire Protection and Emergency Services

The proposed project would include emergency response capabilities for incidents within the proposed manufacturing facility (NWIW 2015). NWIW met with Cowlitz County Fire District No. 5 on 15 January 2015 to discuss the proposed project and general emergency response protocols. The proposed project response planning reflects the results of that meeting, including the concept that the manufacturing facility operator would be the primary responder to all incidents in the methanol manufacturing facility with Cowlitz County Fire District No. 5 providing support

The proposed project would have trained emergency personnel to respond to plant emergencies, including fires, explosions, and injury. Personnel would be certified in compliance with OHSA standards, Process Safety Management guidelines, and National Fire Protection Association (NFPA) requirements. In addition, emergency responders would maintain training and certification in all required areas. The manufacturing facility operators, Port of Kalama, and Cowlitz County Fire District would participate in emergency response drills at the project site (NWIW 2015).

As described in Chapter 2, Proposed Project and Alternatives, an extensive fire suppression system and on-site fire brigade, made up of staff trained in appropriate firefighting response procedures, would be housed at the proposed project to address fires in the methanol production facility (see **Figures 2-5 and 2-6** in Chapter 2). The brigade would be housed in an on-site fire station, which would also house the emergency response vehicle used by the brigade. The fire station would also house other required supplies and would be used as a secondary command post during an emergency at the proposed project (NWIW 2015).

Other fire protection measures at the proposed project would include an emergency alarm system, a fixed foam fire suppression system designed to meet NFPA 11 standards, a portable foam generator, a 5-million-gallon fire water pond with hydrants and monitors throughout the facility, a deluge system, and fire extinguishers located throughout the facility (NWIW 2015).

The on-site fire brigade would act as the primary responder to a fire in the methanol production facility because it would be equipped and trained to fight this specific type of fire. Cowlitz County Fire District No. 5 would provide assistance. NWIW would conduct emergency response drills with the Cowlitz County Fire District and the Port of Kalama. Cowlitz County Fire District No. 5 would serve as the primary responder to a fire in the proposed project area outside of the methanol production facility (such as in the administrative building) and the on-site fire brigade would provide assistance.

On-site emergency responders would also have the capabilities to respond to non-fire incidents including hazardous materials leaks or spills, injuries, and bomb threats. A summary of response procedures and capabilities at the plant for each type of incident follows:

- Hazardous material leak or spill: The facility would have a hazardous material pre-plan in place to ensure all emergency response equipment is on site. Local and state authorities would be informed if a hazardous material release above reporting thresholds occurs per Washington Administrative Code (WAC), RCW 90.56.
- Injuries: On-site responder would be trained in the use of first aid equipment, including first aid kits, Water-Jel blanket (for burns), 40-minute oxygen kits, backboards, neck braces, and Zephiran solution to address injuries. The on-site incident commander would contact 911 to inform them of the type of injury that needs medical attention. Safety data sheets addressing procedures for treating persons with chemical exposure would be distributed to local hospitals and would accompany injured persons transported by ambulance to the hospital.
- Security threats: All involved employees would be notified of reliable threats and the plant would be evacuated. Local police and fire personnel would be notified (NWIW 2015).
- Public safety in the site area: In the event of an emergency with potential off-site impacts, a hierarchy of notifications will be made to alert neighboring businesses and members of the public to the existence of a potentially hazardous condition. NWIW facility local notifications will include immediate notification to the Port of an incident or emergency. As part of the notification system, audible and visible alarms will be placed throughout the facility and its perimeter. Notification of federal, state, and local stakeholders will follow established protocol as defined by statute and industry best practices. The Port will work with NWIW facility/security personnel and will jointly develop a shoreline evacuation plan to address procedures for an incident or an emergency at the plant site.

Peace Health St. John's Medical Center is the nearest hospital to the project site and is located approximately 9 miles away in Longview. St. John's has a fully functional emergency department and is a certified Level 3 Trauma Center by the American Trauma Society with 24-hour coverage by emergency medicine physicians and prompt availability of surgeons and anesthesiologists. Ground transport ambulance services to St. Johns are provided by Cowlitz

County Fire District No 5. The hospital also has air transport ambulance with a Life Flight helicopter located on the hospital's parking structure. Response times are approximately 9 minutes for ground transport to arrive at the project site from the hospital and 15 to 20 minutes by helicopter. Severely traumatized patients would be transferred from St. John's to Legacy Health Emanuel Hospital in Portland, which is a full-status Level 1 Trauma Center. However, if a severe injury occurred at the plant, a more likely scenario is that the patients would be taken directly to Legacy Emanuel Hospital via Life Flight according to a St. John's Medical Center Emergency Department representative (Peace Health 2015a and Legacy Health 2015).

The Maritime Fire and Safety Association (MFSA), an association of ports and private facilities, would provide fire safety and response, oil spill response and communication coordination for fire and spill incidents occurring on member commercial shipping vessels on the Lower Columbia and Willamette Rivers. MFSA only provides response to participating members and enrolled vessels. Members pay a per-vessel assessment to MFSA that funds equipment, operations, and programs. MFSA strives to provide a comprehensive system that ensures fast, well-coordinated, and effective response to ship fire and spill incidents on the Lower Columbia and Willamette Rivers. The Port of Kalama is an MFSA member and NWIW vessels calling at their marine terminals are expected to be covered by the MFSA for fire and spill incidents. MFSA provides response as outlined in the Lower Columbia Maritime Fire Safety Plan and the MSFA Vessel Response Plan – Master Oil Spill Contingency Plan for Covered Vessels. Additional information is located at http://www.mfsa.com/mfsa-vessel-response-plan.

The proposed project would introduce up to six shipping vessels per month to the Columbia River (up to 72 per year). This increase would be relatively small compared to the typical historical levels for river traffic. According to vessel entry and transit data, the river accommodated approximately 1,581 cargo and passenger vessels, tank ships, and articulated tug barge transits in 2014 (Ecology 2015b). Historically, the Columbia River has supported even higher levels of ship traffic, with a recent peak of 2,269 vessel, tank ship, and barge vessel calls in 1999 (Ecology 2014).Therefore, the vessel traffic associated with the proposed project would not have the potential to result in substantial new demands on the MFSA for fire and spill response. See above discussion related to MFSA for additional information on the association.

In addition to publicly provided services, the proposed project would provide process-specific on-site fire suppression and emergency response capabilities with substantial response coverage in the event of a fire or explosion. These capabilities would reduce the new demands on fire protection and emergency service providers. Therefore, the proposed project would not result in a significant adverse impact to fire protection and emergency service providers.

8.5 Related Actions

Two related actions would be completed in association with the proposed project: substation and associated electrical transmission improvements and Kalama Lateral Project. The risks associated with the construction and operation of the substation are considered to be low and are representative of risks associated with small construction projects and typical substation operation. As a result the substation is not addressed further. The Kalama Lateral Project is discussed below.

8.5.1 Construction: Kalama Lateral Project

Northwest is proposing to construct and operate a 3.1-mile, 24-inch-diameter natural gas (methane) pipeline. The proposed pipeline would connect to an existing 30-inch-diameter mainline and provide methane to the proposed project's facilities. The pipeline would be constructed within a 50-foot-wide permanent pipeline easement. Facilities that are used during testing operations to allow the pipeline to be filled with water without entrapping air would be installed at the connection to the existing pipeline and at the new delivery meter station. The facilities would be located at the proposed project's site within an approximate 150-foot by 200-foot fenced area.

The construction impacts associated with the pipeline project are considered to be similar to the construction impacts of the proposed project. The pipeline project is discussed in detail in Kalama Lateral Project EA (FERC, July 2015). Section 7.1, Safety Standards of the EA, discusses the minimum safety standards required for the project to protect against risks posed by pipeline facilities under Title 49, U.S.C. Chapter 601.

Construction impacts would be mitigated by implementing BMPs and standard construction mitigation measures summarized in section 8.8.1.

8.5.2 Operation: Kalama Lateral Project

The impacts associated with transporting methane through pipelines are historically related to releases resulting from external forces that are not associated with the normal operations of the pipeline, line breaks or leaks due to material defects, or corrosion. These external forces include seismic forces, damage to the pipeline from third-party digging near the pipeline, geologic hazards, hydraulic hazards, and other natural occurrences. These impacts can be minimized with proper signage, monitoring programs, and public officials' education programs for landowners, the public, contractors, and emergency responders. A One-Call notification to utilities would be required prior to any excavations within the pipeline vicinity. Any digging, blading, grading, or similar activity that results in the removal of ground cover of the pipeline are not permitted without express consent and on-site observation/direction from Northwest's field operations personnel (Williams 2014).

The restrictions prohibiting permanent structures in the pipeline right-of-way and educational measures would minimize the impacts of potential methane releases from the proposed pipeline as a result digging or excavation activities. Northwest has emergency response plans in place for its entire system and would coordinate potential needs with emergency responders. Northwest would also comply with all safety standards set forth by the PHMSA, the federal safety authority for ensuring the safe, reliable, and an environmentally sound operation of the nation's pipeline transportation system (Williams 2014).

The pipeline project is discussed in detail in the Kalama Lateral Project EA (FERC 2015). Section 7.1 Safety Standards discusses the minimum safety standards required for the project to protect against risks posed by pipeline facilities under Title 49, U.S.C. Chapter 601. The EA concludes that available data show that natural gas transmission pipelines continue to be a safe, reliable means of energy transportation, the risk is low for an incident at any given location along the pipeline and the operation of the gas line would represent only a slight increase in risk to the nearby public (FERC 2015).

8.6 No-Action Alternative

The proposed project is not constructed on the project site under the No-Action Alternative. However, the Port of Kalama would pursue future industrial or marine terminal development at this site, consistent with the Port's *Comprehensive Scheme for Harbor Improvements.* Until such improvements take place the proposed project site would remain a dredged material disposal site with the same exiting conditions and impacts as currently found on the site. There are no new impacts to environmental health and safety anticipated under the No-Action Alternative.

8.7 Mitigation Measures

8.7.1 Project Mitigation

The design features and BMPs the Applicant proposes to avoid or minimize environmental impacts during construction and operations and those required by agency standards or permits would be assumed to be part of the Project and have been considered in assessing the environmental impacts to environmental health and safety.

It is also important to note, if a large scale release of methanol to surface water were to occur, the potential exists for temporary adverse impacts to surface water quality and plants and animals near the source of the spill. Similarly, a large scale fire or explosion could result in adverse impacts to people within the facility boundaries. For these reasons, the project design has been refined to include mitigation measures to further reduce these risks. The following section discusses the measures that would be used during construction and operation of the proposed project to avoid, minimize and mitigate impacts associated with environmental health and safety.

Construction

The contractor(s) for the proposed project would follow all required state and federal safety regulations (e.g., the Washington Industrial Safety and Health Act of 1973 [WISHA] and Occupational Safety and Health Administration [OSHA]) to ensure worker safety and would develop a SPCCP to protect human health and the environment from accidental spills and releases of toxic substances. The plan would include, but not be limited to, such items as the following:

- Notification to applicable regulatory state and federal agencies as needed when working with hazardous materials.
- Management, storage and disposal of hazardous materials (such as paint, solvents, asphalt, landscaping chemicals) and/or petroleum products.
- Safety precautions to control airborne particulates during excavation.
- Soil management to minimize adverse impacts to construction workers and or the environment during the excavation of potentially contaminated soils.
- Work stoppage due to potential exposure of construction workers to hazardous materials.

Chapters 2, 3, 5, and 6 provide specific mitigation measures for environmental impacts.

General Incident Response

NWIW would have full emergency response capabilities to respond to all incidents within the plant site or at the marine terminal. The MFSA and Cowlitz County would have primary responsibility if an event involves a ship, but would be supported by NWIW. Details of incident response are presented in **Appendix G2** and are summarized here.

The plant operations and risk management system would meet or exceed local, state and federal codes and regulations and the insurance underwriter requirements. A process hazard analysis (PHA) would be conducted during detailed design and as part of the process safety management (PSM) guidelines regulated by WISHA and OSHA.

The project proponent would prepare an emergency response plan specific to the facility and operations and provide the plan to local and state agencies for review and approval. Cowlitz County Fire District No. 5 has agreed that NWIW would manage the response to any incident with the Fire District providing support.

Spill Prevention and Response

The facility would be required to prepare and maintain a SPCCP. The SPCCP would guide response procedures in the event of a spill. Response procedures would likely involve containing the spill and allowing it to degrade or evaporate naturally. Pumps may be used to a release pools in an impervious surface location. The facility would also maintain an Integrated Contingency Plan or a HAZWOPER-compliant spill response plan.

Specific details about spill prevention and response at the facility and during vessel loading are discussed below.

Representative Safeguards

The proposed project would be designed and constructed with comprehensive safeguards to prevent accidental spills, releases and leaks, detect releases, and contain and minimize the impacts of spills and releases should they occur. A preliminary list of safeguards, including key engineering and administrative controls, has been identified for the proposed project. These safeguards listed in **Table 8-5** includes those identified in **Appendix G2**, ~~Health and~~ Safety and Health Aspects Report (AcuTech 2016a).

Table 8-5. Proposed Project Safeguards

Safeguard	Type	Purpose
Pipelines, Vessels, and Equipment Designed to Current Codes and Standards	Engineering	Ensures adequate vessel/ equipment strength for intended service.
Preventive Maintenance Program	Engineering Administrative PSM element	Ensures ongoing integrity of equipment and training/ certification of maintenance personnel.
Corrosion Control Program	Engineering Administrative	Ensures equipment is sufficiently robust to minimize releases due to corrosion.
Process Plant Control Systems (Monitoring, Alarm and Communications)	Engineering	Ensures ongoing control of regular plant operations.
Process Hazard Analyses	Administrative PSM element	Reviews design and operating procedures in detail to identify and address deviations from normal operation.

Safeguard	Type	Purpose
Management of Change	Administrative PSM element	Ensures any changes to equipment, procedures or personnel are adequately reviewed and potential impacts on operation are addressed prior to change implementation.
Operating Procedures	Administrative PSM element	Ensures plant operations are conducted per approved and effective processes.
Training	Administrative PSM element	Ensures personnel are capable of performing all regular and emergency tasks.
Isolatable Inventories	Engineering	Ensures hazardous material equipment contains means to quickly stop leaks/releases.
Relief, Blowdown, and Flare Systems	Engineering	Ensures high pressure events can be safety controlled by safe disposal of released materials. Ensures startup/shutdown events do not result in releases of hazardous materials to the atmosphere.
Ignition Source Control Program	Engineering Administrative	Ensures installed electrical equipment is designed to minimize ignition sources. Ensures sources of ignition (vehicles, hot work, etc.) are controlled in areas where hazardous materials are located.
Fire and Gas Detection Systems	Engineering	Ensures incipient fires or hazardous material releases can be detected quickly to allow automatic response (i.e., isolation valves) or emergency response.
Equipment Spacing and Layout	Engineering	Ensures equipment layout minimizes the risk of domino or knock-on effects in the event of fire/explosion.
Fire Protection System	Engineering	Ensures firewater/foam can be delivered to suppress/extinguish fires.
Emergency Response Plan	Administrative PSM element	Ensures that plant emergency response activities are managed. Addresses responder training, procedures, drills, emergency response equipment, etc.
Safety Instrumented Systems (Interlocks and Emergency Shutdown)	Engineering	Identifies deviations from normal via automated systems independent of routine plant controls and then returns system to a safe state by means of process interlocks.
Fixed Foam Systems within Dikes	Engineering	Ensures releases of methanol to diked areas can be suppressed by covering the spill with a fire suppression foam layer.
Fixed-Roof Methanol Tanks, Internal Floating Roofs	Engineering	Ensures tank integrity per national standards for tank construction

Safeguard	Type	Purpose
Closed-Circuit TV System	Engineering Administrative	Provides operations and emergency response with overview of site activities. Fixed cameras for specific locations. Also provides site security.
Earthquake Valves	Engineering	Designed to interrupt flow of hazardous material in the event of: (a) an earthquake of sufficient magnitude, or (b) low pressure due to a line leak or rupture.
NW Pipeline Remotely Actuated Shutdown Valve at Takeoff Point to Plant Lateral; Activation from NW Pipeline Gas Control	Engineering	Provides ability to interrupt flow of natural gas in the event of a line leak/rupture (indicated by low line pressure) or if manual activation is required.
Barricades around Tanks and Equipment	Passive	Minimizes the likelihood of vehicles impacting tanks/equipment causing releases of hazardous material.
Drainage and Berms To Control Releases	Passive	Provides means to control releases and route to a contained area.

Additional Safeguards

A number of additional safety and environmental protection systems would be included in the facility design for the proposed project. They are as follows:

The proposed project design would feature fixed gas detection systems to warn of a release of natural gas or syngas (depending upon the production area) and to automatically take the process to a safe state by closing automatic isolation valves. Pressure monitors within the pipeline itself would be able to sense potential loss of containment and shut the isolation valves automatically.

Firefighting systems in the proposed project would be designed to address a potential methanol fire. Methanol does not present any unique hazards from a firefighting perspective, given its characteristics. Fixed analyzers throughout the processing and storage areas would continuously monitor for the presence of organic vapors and provide warnings to personnel and take automatic actions if concentrations approach flammability limits.

The proposed project design would include fixed ammonia monitors in the vicinity of the aqueous ammonia system to provide personnel warning of ammonia leaks.

Upland Area Spill Prevention and Response

The largest potential upland source of a spill would be from a full storage tank, with a volume of approximately 2.275 million gallons. Secondary containment berms around storage tanks have been designed to capture 110 percent of the tank contents plus precipitation from a 24-hour, 100-year event. Berm construction includes an impervious liner that would prevent infiltration. Spilled product would gravity drain to a sump where it would be pumped through a treatment system and reintroduced into the methanol production process.

The risk of release from storage and use of hazardous materials on site during operations would be minimized through implementation of a project-specific response plan and hazardous materials response training for workers on site in addition to the safety in addition to safety infrastructure designed as part of the facility. Spill kits would be stationed throughout the site so that trained workers could respond rapidly to releases that may occur.

Releases that may occur on the upland portion of the property would be contained and cleaned up as soon as they are observed. The type of material and duration of the release may impact the amount of cleanup required in response to a spill. Soil impacted by a release, if any, would need to be evaluated for treatment or removal based on Model Toxic Control Act requirements. Rapid spill response on the upland portion of the site would minimize related impacts to the groundwater and adjacent surface waters of the Columbia River.

In-Water Spill Prevention and Response

The MFSA is an association of ports and private facilities along the Lower Columbia and Willamette Rivers that provides fire safety, oil spill response, and communication coordination for fire and spill incidents involving commercial vessels along the two rivers from the Portland/Vancouver area to Astoria. The MFSA would provide fire safety and oil spill response for incidents for participating members and enrolled commercial vessels. The Port of Kalama is an MFSA member and NWIW vessels calling at their marine terminals are covered by the MFSA for fire and spill incidents. Additional information is located at http://www.mfsa.com/mfsa-vessel-response-plan.

The marine terminal infrastructure includes shut-off valves on product lines and stormwater systems. Product lines would be shut off to prevent additional product from spilling in the event of a spill during loading. Stormwater lines would be shut off and stormwater would be redirected to a return line to the methanol plant. Contaminated water on the dock would be pumped to the plant for treatment and reuse in the methanol production process.

Accidental Release, Fire and Explosion Response

The federal Department of Transportation (DOT) has exclusive authority for enforcing federal safety standards for natural gas pipelines. DOT prescribes the minimum standards for operating and maintaining natural gas pipeline facilities including requiring each pipeline operator to establish an emergency plan that includes procedures to minimize the hazards of a natural gas pipeline emergency. According to the FERC, “the DOT requires pipeline operators to establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency, and to coordinate mutual assistance.” Prior to beginning pipeline operations, Northwest would provide training to local emergency service personnel (FERC 2015).

The proposed pipeline and aboveground facilities must be designed, constructed, operated, and maintained in accordance with the DOT Minimum Federal Safety Standards in 49 CFR 192. The regulations are intended to ensure adequate protection for the public and to prevent natural gas facility accidents and failures. The DOT specifies material selection and qualification; minimum design requirements; and protection from internal, external, and atmospheric corrosion.

The DOT also defines area classifications, based on population density in the vicinity of the pipeline, and specifies more rigorous safety requirements for populated areas. The class location unit is an area that extends 220 yards on either side of the centerline of any continuous 1-mile length of pipeline. The four area classifications are as follows:

- Class 1 – Location with 10 or fewer buildings intended for human occupancy.
- Class 2 – Location with more than 10 but less than 46 buildings intended for human occupancy
- Class 3 – Location with 46 or more buildings intended for human occupancy or where the pipeline lies within 100 yards of any building, or small well defined outside area occupied by 20 or more people on at least 5 days a week for 10 weeks in any 12-month period.
- Class 4 – Location where buildings with four or more stories aboveground are prevalent.

The proposed pipeline would be a Class 1 designation for its entire length based on the population density in the vicinity. However, Northwest has committed to building the pipeline to meet more stringent Class 3 standards in several categories including depth of cover over the pipeline (at least 36 inches in all areas), pipe wall thickness (0.375 inch), 100 percent weld testing and the use of an automated shut-off valve at the proposed pipeline's starting point.

Each pipeline operator is required to establish an emergency plan that includes procedures to minimize the hazards of a natural gas pipeline emergency. Key elements of the plan include procedures for:

- Receiving, identifying, and classifying emergency events, gas leakage, fires, explosions, and natural disasters;
- Establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- Emergency system shutdown and safe restoration of service;
- Making personnel, equipment, tools, and materials available at the scene of an emergency; and
- Protecting people first and then property, and making them safe from actual or potential hazards.

The DOT also requires that each operator establish and maintain liaison with appropriate fire, police, and public officials to learn the resources and responsibilities of each organization that may respond to a natural gas pipeline emergency, and to coordinate mutual assistance. The operator must also establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a gas pipeline emergency and report it to appropriate public officials. Northwest would provide the appropriate training to local emergency service personnel before the proposed pipeline is placed in service (FERC 2015).

Flare System

A flare system would be provided as part of the safety systems to dispose of flammable gases and vapors that are released from the methanol. See **Appendix <u>G2</u>**, Safety and Health Aspects (AcuTech 2016), for more detailed information on the methanol production process. The flare system would be used during a process interruption or an emergency.

Fire Suppression

The proposed project would include an emergency alarm system and a comprehensive fire suppression system with features discussed in Chapter 2 and **Appendix <u>G2</u>** that would provide 100 percent coverage to the plant. The features would include a fixed foam system, portable foam generators, and a 5.0-million-gallon water supply stored in the fire water pond located at the northwest end of the plant. The system also would include two fire water pumps, one driven by a diesel engine and the second by an electric motor, a deluge system, and fire extinguishers throughout the facility.

The following measures would be implemented to avoid and reduce potential impacts to public services and utilities:

- To address risks related to a chemical release or fire, NWIW would conduct a PHA to identify the various incidents that could occur and to help design the on-site systems to prevent spills or fires, to warn of operating conditions that could lead to an incident, or to identify if an incident has occurred.
- To respond to incidents within the project site, including fire, explosion, injuries, bomb threats, security emergencies, and hazardous materials leaks or spills, the following measures would be implemented.
  - NWIW would prepare a written emergency response plan, which would be reviewed and approved by local and state agencies before the first production of methanol.
  - NWIW would have all necessary emergency equipment on site, including an on-site fire station, an emergency alarm system, an emergency response vehicle, and a comprehensive fire suppression system including a fixed foam system, portable foam generators, fire water system, deluge system, and fire extinguishers.
  - NWIW would provide emergency response training and certification to emergency responders at the proposed facility in compliance with OSHA, PSM, and NFPA requirements. In addition, emergency responders would maintain training and certification in first aid, emergency alarm system, evacuation and vapor cloud monitoring, respiratory emergencies, rescue from electrical contact, self-contained breathing apparatus, bunker gear inspection/cleaning, fire water system, fire hose handling, vapor suppression system, confined space rescue, hazmat, fire extinguisher, and incident command.
  - NWIW, Port of Kalama, and Cowlitz County would conduct emergency response drills at the proposed facility.

NWIW would secure the project site with a perimeter fence and entry gate with security guards and would employ a private security contractor. Employees would be required to obtain the transportation worker identification credential. In addition, there would be security cameras throughout the facility.

Training

Emergency responders would be stationed on site during all operating hours, and the facility would include an on-site fire house and fire brigade. The plant emergency response team would be trained and certified in compliance with OSHA, WISHA, PSM, and NFPA requirements and would be required to pass a medical examination and written and hands-on testing and maintain appropriate certifications. Selected management and supervisory staff would be trained at a facility certified by the Federal Emergency Management Agency.

Emergency Response Mandates and Agreements

The National Contingency Plan (NCP) is the federally mandated comprehensive system for responding to oil spills and releases of hazardous substances. The NCP was designed to develop a national response capability and to promote coordination among the hierarchy of responders and contingency plans. Area committees have been established for each area of the United States (40 CFR Part 300). The NCP establishes the National Response Team and 13 Regional Response Teams; they are responsible for national and regional planning and preparedness activities before a response action.

The Region 10 Regional Response Team and the Northwest Area Committee are responsible for implementing the NCP in the Northwest area. Their mission is to protect public health and safety and the environment by ensuring coordinated, efficient, and effective support of the federal, state, tribal, local, and international responses to significant oil and hazardous substance incidents within the Pacific Northwest Region as mandated by the NCP. Together, these agencies have published the Northwest Area Contingency Plan (NWACP). The purpose of the NWACP is:

- To provide for orderly and effective implementation of response actions to protect the people, natural resources, and property of the coastal and inland zones of the Northwest area, including the states of Washington, Oregon, and Idaho, from the impacts of a discharge or substantial threat of discharge of oil or a release or substantial threat of a release of a hazardous substance from inland and marine sources.
- To promote the coordination of and describe the strategy for a unified and coordinated federal, state, tribal, local, potential responsible party, response contractor, response cooperative, and community response to a discharge or substantial threat of discharge of oil or a release or substantial threat of a release of a hazardous substance from inland and marine sources.
- To be consistent with the NCP and to be adopted as the Regional Contingency Plan and Area Contingency Plan for the Northwest.
- To provide guidance to all facility and vessel response plan reviewers and Plan holders to ensure consistency with the NWACP.

The NWACP has been adopted as Washington’s oil spill and hazardous substance release response per the requirements of RCW 90.56.060. This plan applies to the activities of all state and local agencies involved in managing oil and hazardous substance spills where federal, state, and local agencies respond to a spill or potential spill of oil or hazardous substances (NWACP 2015).

Federal requirements mandate all spills of hazardous substances into navigable waters, as defined by the Clean Water Act, must be reported to the National Response Center. The National Response Center would than then notify USCG or EPA offices as appropriate. State requirements mandate all spills of hazardous materials to notify the nearest Ecology regional office. The USCG Sector Columbia must be notified for spills occurring in the coastal navigable waters of the Columbia River.

Cooperative Agreements

Ecology and Oregon Department of Environmental Quality have entered into an interagency agreement (Ecology 2010) in a cooperative effort to protect the water and resources of the Columbia River. Both agencies would provide personnel and equipment to implement spill prevention, preparedness, and response efforts on the Columbia River. These efforts include a cooperative unified command for incident response; joint investigation of maritime incidents; and coordinated drill schedules and planning efforts.

Industry Partnerships

The MFSA and the Clean Rivers Cooperative (CRC) provide emergency spill response services on the Lower Columbia River. The proposed facility would become a member of both the MFSA and CRC.

Marine Fire and Safety Association

The MFSA has tasked themselves with developing a system to ensure an adequate, timely, and well-coordinated response to ship fires along the Lower Columbia River shipping channel. MFSA's shipboard fire program is directed by the Fire Protection Agencies Advisory Council, made up of 12 participating public fire agencies.

The Lower Columbia Marine Fire Safety Plan, originally developed in 1984 and revised in 1991, provides for building a marine fire response capability along the Columbia and Willamette rivers from the Portland/Vancouver harbor area to Astoria, near the mouth of the river, and extending 3 miles into the Pacific Ocean. Members pay a per-vessel assessment to MFSA that funds the equipment and operations of the program. The purpose of the plan is to set forth a comprehensive system that ensures fast, well-coordinated, and effective response to ship fire incidents in the Lower Columbia region.

Clean Rivers Cooperative

CRC is a nonprofit oil spill response organization that was created to provide mutual aid to companies with a vested interest in maintaining an efficient and rapid response to marine spills (CRC 2015). CRC has become the region's foremost marine spill solution, with over $3 million of equipment dedicated to members and their operations in Oregon and Washington. The CRC is the preferred contractor for spill response through the MFSA, and is equipped to respond to spills between River Mile 0 and the Glen Jackson Bridge in Portland, Oregon.

Cleanup Actions

Fuel or oil releases are expected to be managed at the site of the release through rapid spill response, containment, and cleanup enabled by implementing the facility's SPCCP and by ready access to spill kits, cleanup training, and response vessels.

The high rate of methanol biodegradation makes natural cleanup processes an inexpensive and effective strategy to remediate soil and/or water impacted by residual methanol. Natural cleanup times for methanol releases would be faster than time required for active cleanup.

Surface Water Cleanup

Surface water cleanup actions would vary depending upon the type of hazardous material that is spilled into the aquatic environment.

A release of fuel or oil would be contained with absorbent booms deployed from the vessel or terminal, depending on location, as soon as it is discovered. Absorbent material and or oil skimmers would be used to remove as much fuel or oil as possible from the water surface.

The source of a methanol release or spill would be identified and contained as soon as the release is discovered. Methanol spilled into surface water would be difficult to contain due to its solubility. Cleanup of methanol could include pumping the methanol water mixture from the area of highest concentration, near the release source, into a tank pending treatment. Natural cleanup (i.e., mixing and biodegradation) times are likely to be faster than active cleanup times for methanol releases due to methanol's characteristics.

Design

Johnson Matthey, the project design firm, has developed a list of codes and standards that would be used during the detailed design phase of the project. These codes and standards are developed by internationally recognized authorities and would be used to ensure the facility meets environmental health and safety standards. See **Appendix** **G2**, Safety and Health Aspects Report, for the list.

Process Safety Management

The processes at the proposed project facility that produces and handles methanol would be designed, operated, maintained, and monitored under the principles of Process Safety Management (PSM). The requirements for PSM in Washington are found at WAC 296-67 Process Safety Management of Highly Hazardous Chemicals. Highlights of the protective measures include, but are not limited to, the following:

- Employee participation in PSM;
- Process safety information maintained up-to-date;
- PHA to determine where hazards may occur and whether controls detailed in the design are sufficient to prevent and/or mitigate these hazards;
- Operating procedures for all reasonably foreseeable situations including startup, shutdown and operation during normal and emergency conditions;
- Training for all affected personnel – initial and ongoing;
- Contractors working on or near a covered process would be verified as appropriately trained and qualified to do the work being performed;
- Pre-startup safety review to provide a methodical, detailed approach to ensure that construction of the facility is in accordance with design and that all requirements for safe operation have been completed before start up or restart of the process;
- Maintain all equipment to recognized and generally accepted good engineering practices;
- Due to the potential flammable nature of chemicals used in the process, any work that can produce sparks, heat, flames or other ignition sources would be managed to prevent ignition;
- Use of management of change to determine if changes to the design process can negatively impact plant safety and if so what can be done to eliminate or mitigate the impact;
- Investigation of all safety incidents and near misses, injuries and illnesses to identify casual factors leading to the incident and make appropriate recommendations for lessons learned;
- A comprehensive emergency response plan to address a broad range of contingencies and the appropriate response measures; and
- Compliance audits to ensure that the principles and practices of PSM are properly followed and effective.

8.7.2 Additional Mitigation

There are no significant impacts identified for environmental health and safety and therefore no additional mitigation measures are identified.

8.8 Unavoidable Significant Adverse Impacts

The proposed project is not expected to result in unavoidable significant adverse impacts to environmental health and safety. Given the nature of the chemicals used at the facility and the process taking place the possibility of a spill to land or water or a fire or other emergency event at the facility cannot be eliminated. Such an emergency event could result in:

- Injuries or fatalities within the boundaries of the facility from a catastrophic release of methanol that is ignited and produces a large pool fire, flash fire, or vapor cloud explosion; or
- Temporary/localized significant adverse impacts to surface water quality and aquatic species (plants and animals) in the high concentration areas near the source of a large methanol spill.

No mitigation measures would completely eliminate the possibility of a large methanol spill, nor would mitigation measures eliminate the adverse impacts associated with a large methanol spill or a methanol-related fire or explosion. However, the potential impacts associated with a large spill of methanol to the Columbia River are expected to be temporary and localized because of methanol's characteristics and because of monitoring and rapid containment and cleanup (oil/fuel release). The risk of such release events is considered low based on the information reviewed. The planned monitoring, training, and response programs that would be implemented as part of the project would further minimize the risk of significant adverse impacts to human health and the environment.

8.9 References

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