

MARINE ECOLOGICAL RISK

Study geographic boundaries: PEAA.

Study time boundaries: Operations phase.

Project works and activities considered in the study*:

Hydrocarbon storage at terminal; on-shore infrastructure operations (gas venting, minor operational spills); in-water infrastructure operations; moored tankers (and associated combustion emissions, bilge and ballast water management; gas venting at the tanker berth, minor operational spills).

Study methods: The Marine Ecological Risk Assessment (ERA) is being completed to assess the potential environmental effects of routine terminal operations on ecological health. The marine terminal will handle large amounts of hydrocarbons, including condensate and oil. Although the marine terminal will be a state-of-the-art facility, it is possible that over its operating life there will be low levels of hydrocarbon emissions either with stormwater runoff, or as volatile emissions from tanks and other infrastructure. To assess potential effects on ecological health, chronic or long-term effects were modeled over a 50-year period. Note that the marine ERA does not consider the potential environmental effects of construction or decommissioning of the marine terminal, or hydrocarbon spills that could occur as a result of a marine shipping accident. These effects will be considered as part of the assessment of accidents and malfunctions (see Accidental spills, page 16).

To determine whether the potential exists for adverse environmental effects to occur, a standard ERA methodology is being conducted involving the following key steps:

Problem Formulation— a process of defining the characteristics of the ecosystem under consideration, the characteristic flora and fauna, as well as the characteristics of the project that might lead to release of chemicals of potential concern (COPC) and defining what those COPC substances may be.

Exposure Assessment— a formal process of defining COPC concentrations in environmental media such as water, sediment and biological tissues and defining the various pathways by which the individual organisms may be exposed to COPC.

Hazard Assessment— a process through which the toxicities of the various COPC are defined for the individual KIRs.

Risk Characterization— the process by which the risk of harm to KIRs is estimated, taking into consideration their unique exposure and sensitivity to COPC.

Uncertainty Analysis— a final review step in which the various assumptions and calculations leading to the risk characterization are reviewed to evaluate the level of confidence that may be placed on the conclusions.

Baseline concentrations of COPCs in the environment were measured at several locations within Kitimat Inlet, including near the proposed marine terminal. Where appropriate, baseline concentrations of COPCs, including total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAHs) and trace elements were measured in water, sediment and biota including seaweed, mussels, crabs and fish. The measured baseline COPC concentrations are assumed to integrate the environmental effects of all existing natural conditions and human activities around Kitimat Inlet.

VEC	Key Issues	KIR	Baseline Results	Measurable Parameter	Potential Project Effects**	Proposed Mitigation	Residual Effects	Cumulative Effects
Marine Ecological Risk	Potential effects on ecological health, chronic or long-term, originate from potential exposures to chemical stressors that have been or might be introduced into the environment. Any chemical can have the potential to affect an ecosystem, but it is the concentration, duration of exposure, and mechanisms by which the various organisms are exposed to various chemicals of potential concern (COPC) that determines whether they will experience harm as a result of exposure.	Bald eagle Crabs Harbour porpoise Marbled murrelet Mink Mussels Seaweed Spotted sandpiper Steller sea lion Surf scoter Aquatic community (fish, plankton) Sediment community (benthic infauna)	Chemical concentrations found in seawater were generally non-detectable or consistent with values expected in marine coastal environments. Baseline concentrations of TPH in sediment were generally non-detectable or very low. Low concentrations of PAHs including naphthalene, phenanthrene and acenaphthene, possibly originating from existing industrial facilities in Kitimat, were detected in sediments at concentrations close to the Canadian Council of Ministers of the Environment (CCME) interim sediment quality guideline (ISQG) levels near the marine terminal. Trace element concentrations in sediment were generally below the CCME ISQG values, where such guidelines exist. Concentrations of chemical substances detected in biological tissues were below levels considered to be of concern for human consumers.	Chemicals of potential concern (COPC). Hydrocarbons, including benzene, toluene, ethylbenzene and xylenes (BTEX), total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), selected volatile organic carbons (VOC) and phenols, and trace elements.	Although the marine terminal will be a state-of-the-art facility, it is possible that over its operating life there will be low levels of hydrocarbon emissions either with storm-water runoff, or as volatile emissions from tanks and other infrastructure. The various biological KIRs discussed earlier, which are broadly representative of the marine ecosystem, are assumed to be exposed to a suite of COPCs in water, sediment, and biological tissues that includes hydrocarbons, PAH and trace elements that are constituents of hydrocarbons that will be handled at the marine terminal (such as diluted bitumen, synthetic oil and condensate).	Currently being assessed.	Currently being assessed.	Currently being assessed.

*Refer to Figure 3.3 in section 3, Project description, for the full list of physical works and activities. **The effects of spills and malfunctions will be included in the update for the supplemental filing.