WATER QUALITY

Study geographic boundaries: The PEAA for water quality included watersheds crossed by the Right-of-Way (RoW) and included areas affected by other industrial areas activities such as mines, gas plants, pulp and paper mills, and smelters, as well as the relative locations of water intake structures within 5 km from RoW.

Study time boundaries: Construction, operations and decommissioning phases.

Project works and activities considered in the study*: Construction – site preparation (clearing, grading); in-stream activities; project releases (wastewater); infrastructure construction; temporary and permanent road development. Operations – project releases (emissions); decommissioning.

Study methods: There are six hydrological zones: Prairies (KP 0 to KP 81), Foothills (KP 81 to KP 485), Rocky Mountains (KP 485 to 714), Central Interior (KP 714 to KP 915), Central Mountains (KP 915 to KP 1052) and Coast Mountains (KP 1052 to Kitimat Terminal)

Historical data for surface water and sediment quality were obtained from governmental sources in Alberta and British Columbia. For surface water quality, data for 1995 to 2008 was used; for sediment, data from 1995 to present. Field surveys of water quality and sediments were done at Right-of-Way (RoW) watercourse crossings or at the closest location downstream of the RoW. Sampling focused on locations where upstream industrial activity or downstream water consumption was identified within 5 km. Watercourses with industrial activities were sampled to characterize baseline conditions with the potential effects of industrial activities. Watercourses with downstream water intakes were also sampled to gauge potential changes from the project on baseline water quality conditions.

Water quality effects were estimated using analytical models. The increase of total suspended solids concentrations above background levels during pipeline construction was calculated for typical drainage areas and typical pipeline lengths in each hydrologic zone by taking into account potential erosion that depends on physiographic and flow characteristics.

The environmental effects from pipeline installation on sediment loading in stream are assessed using regressions between total suspended solids concentrations and unit discharges, taking into account typical sediment texture characteristics. The effects from emissions at the Kitimat terminal are assessed using analytical Henrikson model for critical load (CL) calculation and comparison of CL with potential acidifying impact (PAI) depositions to surrounding water bodies.

VEC	Key Issues	KIR	Baseline Results	Measurable Parameter	Potential Project Effects**	Proposed Mitigation	Residual Effects	Cumulative Effects
Water Quality (Fresh Water)	Increased sediment loads In-stream channel substrate disturbance Acid deposition from air emissions	n/a	Because the pipeline crosses two provinces, respective provincial and federal guidelines were used for assessing baseline conditions. Sediment texture (i.e., the fraction of fine particles, such as silts and clay) and the relative organic content were reviewed in each hydrologic zone, as well as metal composition. No contaminants were observed. Some exceedances in water quality parameters were noted, but most were determined to be of natural origin. Buffering capacity and critical loads were assessed in water bodies at the Kitimat terminal area within a potential area of acid depositions from air emissions.	Altered runoff water quality	Vegetation clearing and grading on approach slopes to water bodies could affect sediment concentrations in runoff. Increased sediment loads due to pipeline site preparation, infrastructure construction, and temporary and permanent road development may occur. During operations, the project will have little to no measurable change on suspended solids runoff.	Erosion control measures during construction that will prevent sediment from entering runoff and reduce the amount of sediment during construction.	Currently being assessed.	Currently being assessed.
				Altered suspended sediment	Sediment disturbance from construction can lead to increased concentrations of total suspended solids (TSS) downstream. In-stream activities associated with trenched crossings may result in substrate disturbance, which could introduce sediment into the water column. However, sediment release from this activity generally only occurs for a short period of time (such as hours) when the isolation feature is removed and the stream flows encounter the backfilled ditch line.	Total suspended solids introduced by in-stream activities such as stream crossings will be reduced by isolating the portion of the channel at the site from flowing water. This could involve use of a dam and pumps or a flume.	Currently being assessed.	Currently being assessed.
				Altered water quality	The major point-source releases from the project include grey and black water from construction camps, hydrostatic test water, and groundwater encountered during the construction of the Holt-Clore tunnels. These activities could affect water quality in receiving streams during construction. Emissions from operations at Kitimat terminal could acidify local water. Modelling of potential acid depositions and associated effects on water bodies near Kitimat terminal show that buffering capacity of surface water is higher than the level of potential acid deposition. As a result, no effects on water quality are expected as a result of air emissions.	Sewage and wastewater from construction camps and Kitimat terminal will be stored and trucked off site to be properly disposed in a wastewater treatment facility. All water used in hydrostatic tests will be released into the host watershed. No inter-basin transport and discharge of hydrostatic test water will occur. Groundwater quality from the tunnel construction will be monitored for comparison to applicable guidelines. If these guidelines are met, groundwater will be drained into the nearest surface channel. If the guidelines are not met, appropriate water treatment measures will be implemented before release.	Currently being assessed.	Currently being assessed.

*Refer to Figure 3.1 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.