

WATERCOURSE CROSSINGS

FACT SHEET



The proposed Northern Gateway pipeline system route traverses many watercourses, from very small brooks to large rivers. Most of the water crossings are technically straightforward and have minimal environmental impacts. The Project has established a strategic watercourse crossings team to conduct detailed site surveys at difficult crossings to ensure they can be built responsibly and with minimal impacts. The pipelines will cross 773 identified watercourses with defined bed and banks; 669 of the crossings are fish-bearing.

The following watercourse crossing methods will be used for the Project:

- open cut
- diversions
- isolation methods, including dam and pump, flume, coffer dams and silt curtains
- trenchless methods, including bore, horizontal directional drilling, aerial and micro-tunneling

Determining the most suitable watercourse crossing method requires consideration of a number of factors such as:

- fish and fish habitat (including the species and life stages) that are anticipated to be present in the potential zone of influence at the crossing location at the time of construction
- geotechnical issues - including Horizontal Directional Drilling (HDD) feasibility, the stability of the valley slopes and the risk of debris flow
- hydro-technical issues such as flow volumes and channel stability
- construction issues - including complexity, risk, safety, schedule and cost
- regulator, resource managers, Aboriginal group, community and stakeholder input
- temporary and permanent access requirements
- pipeline operational and pipeline integrity issues
- reliability, robustness, cost and maintenance issues over the life of the pipelines
- wildlife habitat, such as migration routes for animals and nesting areas for birds
- Aboriginal Traditional use

During the Project planning phase, discussions regarding watercourse crossings are ongoing with representatives from the Department of Fisheries and Oceans Canada, Environment Canada, provincial agencies, Aboriginal groups, local communities and interest groups. Enbridge wants to ensure each watercourse crossing is planned and carried out so as to cause the least disturbance possible.

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Watercourse Crossing Selection Process

To facilitate the watercourse crossing selection process for the Project application, a fish and fish habitat risk management framework (RMF) was developed. The risk associated with each crossing is categorized after consideration of the site-specific crossing methods and incorporation of standardized and project-specific mitigation measures.

The RMF is designed as an iterative process for relocating crossings, revising crossing techniques and modifying mitigation measures. As a component of the RMF, the fish and fish habitat sensitivity was a key parameter in the method selection process at each pipeline watercourse crossing. This process was conducted in two stages: an initial screening process and a detailed site review.

The first stage, an initial screening process, determined the proposed crossing method for watercourses that meet all of the following threshold conditions:

- low or medium fish and fish habitat sensitivity
- flow rate of less than 1.5 cubic metres per second expected at the time of construction
- channel width of less than 10 m
- no significant engineering or constructability issues

The proposed crossing methods for watercourses that are below these threshold conditions are open cut and isolation. In addition, many of these watercourses may be dry or frozen at the time of construction in which case the least impactful method will be open cut.

Of the 773 identified watercourse crossings, 690 of the crossings met these threshold conditions and had no other significant issues identified.

The second stage of the selection process entailed a detailed site review of the remaining 83 of 773 identified watercourse crossings. These crossings have potential issues and constraints related to one or more of the following areas:

- environmental
- engineering
- geotechnical
- public consultation
- constructability
- operability
- cost

The proposed crossing method for these review sites was initially based on the following general guidelines:

- Prefer a trenched crossing (open cut or isolated) where there is a history of successful crossings without major permitting issues or environmental effects
- Prefer HDD crossings for the large watercourses (for widths greater than 100 m) with high fisheries sensitivity
- Prefer bore crossings for medium-sized watercourses (for widths between 10 m and 100 m) with high fisheries sensitivity

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- Prefer isolation for smaller crossings (for widths of less than 10 m and flow of less than 3 cubic metres per second during construction)
- Prefer aerial only where geometrical constraints preclude other crossing methods
- Trenchless methods will have an isolated or open cut alternative crossing method, unless fisheries or other considerations preclude a trenched crossing method
- HDD and bore crossings will be subject to detailed engineering analyses to confirm technical feasibility (geotechnical, constructability, operations)
- The crossing method at the currently proposed HDD and bore crossings may be revised to the alternative crossing method (isolated or open cut) if, during detailed engineering, detailed site assessment and proposed mitigation at the crossing location determines that an isolated or open cut crossing can be completed without high fisheries risk or that constructability or technical risks of the trenchless method are substantially higher than the trenched alternative method.

The proposed crossing method for each review site was further refined taking into account the results of the fish and fish habitat RMF as well as additional studies, fieldwork, regulatory discussions and consultations.

Currently, a trenchless crossing method is proposed at 33 of the review sites, including:

- HDD crossings at 10 sites
- bore crossings at 19 sites
- aerial crossings at 4 sites

At all the HDD and bore trenchless crossings, an alternative crossing method and alternative timing for construction is identified. The crossing methods and timing for all of the review sites will be finalized during detailed engineering.

The minimum depth of cover at watercourse crossings will be 1.2 m, with the exception of crossings in rock where the minimum depth of cover will be 0.6 m. The depth of cover at HDD crossings will be much greater. Concrete weights, concrete coating and abrasion resistant coating will be used where required to provide buoyancy control and additional protection for the pipelines.

Vehicle and equipment watercourse crossings will be needed along the right-of-way and the temporary and permanent access roads used during construction and operations. Each access road crossing of a watercourse will be assessed for site conditions expected at the time of construction.

The Pipeline Water Crossing Plan was developed considering federal regulations and policy under the Fisheries Act, and Alberta and British Columbia legislation, regulations, codes of practice and guidelines. For each crossing method selected, construction and corresponding mitigation measures will follow DFO operational statements and provincial guidelines and best practices where practical. Otherwise, the appropriate provincial and federal agencies will be consulted beforehand for the necessary approvals and authorizations.