

SUMMARY OF PATHWAYS OF EFFECT FOR THE EVALUATION OF NATURAL ENVIRONMENT IMPACTS

Project Activity	Pathways of Effect	Measure/Indicator	Impact Identified	Impacted Valued Ecosystem Components
Construction Activities with potential to impact terrestrial lands	Construction activities will cause removal of vegetation with potential to provide habitat for wildlife → reduction in habitat results in decline in available nesting sites and cover available for incidental wildlife → decline in breeding success to result in reduced bird populations and reduction in cover leads to mortality of incidental wildlife.	Location of construction activity in relation to available habitat.  Size of construction/ operational footprint and extent of disturbance.	Mortality to incidental wildlife  Reduction in breeding success of birds	Terrestrial Fauna Specialized Habitat (ANSIs, ESAs, and Wetlands - PSW and Non PSW) Breeding and Foraging Habitat
	Use of heavy equipment will cause general disturbance through noise, vibration, and human activity during construction → disturbance results in displacement of wildlife from the area and reduced use of wildlife linkages.	Location of construction activity in relation to available habitat.  Size of construction/ operational footprint and extent of disturbance.	Displacement of wildlife.	Terrestrial Fauna Landscape Linkages and Connectivity to Adjacent Habitats
	Construction activities will cause physical vegetation removal → damage/ removal of existing terrestrial vegetation	Location of construction activity in relation to available habitat.  Size of construction/ operational footprint and extent of disturbance.	Damage/ removal of vegetation	Terrestrial Vegetation

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	Construction activities will cause vegetation removal → vegetation removal will result in exposed soils → Exposure of soils results in increased sedimentation and erosion of surrounding habitat → sedimentation of surrounding area leads to degradation of habitat → degradation of habitat results in displacement of wildlife from the surrounding area.	Location of construction activity in relation to available habitat.  Size of construction/ operational footprint and extent of disturbance.	Displacement of wildlife.	Terrestrial Fauna Specialized Habitat (ANSIs, ESAs, and Wetlands - PSW and Non PSW) Breeding and Foraging Habitat
	Dewatering of tunnelling shaft → results in increased runoff → runoff causes damage to vegetation and increased erosion of surrounding habitat → erosion leads to sedimentation of surrounding area leads to degradation of habitat → degradation of habitat results in displacement of wildlife from the surrounding area.	Location of construction activity in relation to available habitat.  Size of construction/ operational footprint and extent of disturbance.	Damage to vegetation Displacement of wildlife	Terrestrial Fauna Specialized Habitat (ANSIs, ESAs, and Wetlands - PSW and Non PSW) Breeding and Foraging Habitat Terrestrial Vegetation
Operational Activities with potential to impact terrestrial lands	Operation of facility will cause general disturbance through noise, vibration, and human activity → disturbance results in displacement of wildlife from the area and reduced use of wildlife linkages.	Location of operational activity in relation to available habitat.  Size of construction/ operational footprint and extent of disturbance.	Displacement of wildlife	Terrestrial Fauna ANSIs, ESAs, and Wetlands (PSW and Non PSW); Breeding and Foraging Habitat Landscape Linkages and Connectivity to Adjacent Habitats

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	Footprint of facility will cause a reduction of available vegetation with potential to provide habitat for wildlife → reduction in habitat results in decline in available nesting sites and cover available for incidental wildlife → decline in breeding success to result in reduced bird populations and reduction in cover leads to displacement of incidental wildlife.	Location of operational activity in relation to available habitat.  Size of construction/ operational footprint and extent of disturbance.	Displacement of wildlife	Terrestrial Fauna ANSIs, ESAs, and Wetlands (PSW and Non PSW); Breeding and Foraging Habitat Landscape Linkages and Connectivity to Adjacent Habitats
Construction Activities with potential to impact the aquatic environment	In-water construction activities will disturb lake bed materials and entrain sediment → entrainment of sediments results in increased concentrations of suspended sediment → exposure to increased suspended sediments can result in lethal to sub-lethal effects to fish and benthic invertebrates → can cause a decrease in abundance of fish and benthic invertebrates.	Location of construction activity in relation to available habitat.  Size of construction/ operational footprint to determine extent of disturbance.  Duration of disturbance.  Construction method.  Potential for changes to non-modelled water quality parameters (e.g. suspended sediments, contaminants) during construction.	Decline in fish abundance	Fish Benthic Invertebrates

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	<p>In-water construction activities will disturb lake bed materials and entrain sediment → entrainment results in increased concentrations of suspended sediments in the water column → deposition of suspended sediments can result in a change in composition of substrate in the area of deposition → change in substrate composition leads to change in habitat structure and food supply for fish.</p>	<p>Location of construction activity in relation to available habitat.</p> <p>Construction method.</p> <p>Potential for changes to non-modelled water quality parameters (e.g. suspended sediments, contaminants) during construction.</p>	<p>Change in habitat structure</p> <p>Change in food supply</p>	<p>Fish</p>
	<p>In-water construction activities will disturb lake bed materials and entrain sediment → entrainment of sediments results in an increase in suspended sediment concentrations → deposition of suspended sediments can smother eggs and spawning areas → smothering of eggs and spawning areas results in lack of spawning success</p>	<p>Location of construction activity in relation to spawning habitat</p> <p>Construction method.</p>	<p>Decline in fish spawning and recruitment</p>	<p>Fish</p>
	<p>In water detonation of explosives causes a rapid rise to high peak pressures in the water column followed by a rapid decay below ambient hydrostatic pressure → fish can experience damage to swim bladders and other internal organs where these types of pressure changes occur to result in mortality of fish</p>	<p>Location of construction activity in relation to fish habitat.</p> <p>Construction method.</p>	<p>Decline in fish abundance</p>	<p>Fish</p>

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	<p>In-water construction activities will disturb lake bed materials and entrain sediment → entrainment results in increased concentrations of suspended sediments in the water column → deposition of entrained sediments has the potential to change the composition of substrate in the area of deposition → changes in substrate composition can result in changes to composition and abundance of the benthos community.</p>	<p>Location of construction activity in relation to available habitat.</p> <p>Construction method.</p> <p>Duration of disturbance.</p> <p>Potential for changes to non-modelled water quality parameters (e.g. suspended sediments, contaminants) during construction.</p>	<p>Change in habitat structure</p> <p>Change in food supply</p>	<p>Benthic Invertebrates</p>
	<p>In-water construction activities will remove lake bed materials → removal of habitat for fish and benthic invertebrates</p>	<p>Size of construction/ operational footprint and extent of disturbance.</p> <p>Construction method.</p>	<p>Loss of habitat</p>	<p>Fish</p> <p>Benthic Invertebrates</p>
	<p>Staging and construction activities on-shore (including storage of spoils) can result in vegetation removal/damage → vegetation removal/damage will result in exposed soils → Exposure of soils results in increased erosion and sedimentation of the nearshore zone → exposure to increased suspended sediments can result in sub-lethal to lethal effects to fish → stress and sub-lethal or lethal effects causes a decrease in abundance of fish.</p>	<p>Size of construction/ operational footprint and extent of disturbance.</p> <p>Potential for changes to non-modelled water quality parameters (e.g. suspended sediments, contaminants) during construction.</p>	<p>Decline in fish abundance</p>	<p>Fish</p>

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	<p>Operation of construction equipment on-shore can result in spills of deleterious materials (e.g. oil, gasoline) → spills will result in impaired water quality → impairment of water quality can result in lethal to sub-lethal effects to fish and other biota → sub-lethal or lethal effects to biota will reduce abundance</p>	<p>Location of construction activity in relation to available habitat.</p> <p>Size of construction/ operational footprint and extent of disturbance.</p> <p>Construction method.</p> <p>Potential for changes to non-modelled water quality parameters (e.g. suspended sediments, contaminants) during construction.</p>	<p>Decline in abundance of aquatic biota</p>	<p>Fish Benthic Invertebrates Plankton Macrophytes</p>
	<p>Release of groundwater from tunnel shaft (dewatering) back to aquatic environment → dewatering discharge impairs water quality → impairment of water quality can result in sub-lethal to lethal effects to fish → sub-lethal or lethal effects to fish reduce fish abundance</p>	<p>Location of construction activity in relation to available habitat.</p> <p>Construction method.</p> <p>Potential for changes to non-modelled water quality parameters (e.g. suspended sediments, contaminants) during construction.</p>	<p>Decline in fish abundance</p>	<p>Fish</p>
	<p>In-water works will cause general disturbance through noise, vibration and human activity in nearshore and offshore zones → disturbance deters fish from using habitat in the area.</p>	<p>Location of construction activity in relation to available habitat.</p> <p>Construction method.</p> <p>Duration of disturbance.</p> <p>Construction/Operational footprint and extent of disturbance.</p>	<p>Change in habitat function</p>	<p>Fish</p>

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Operation Activities with potential to impact the aquatic environment	Operation of extended or new outfall will result in permanent removal of lake bed materials → removal of habitat for fish and benthic invertebrates in nearshore (Alternative 4) or offshore (Alternative 5).	Size of construction/ operational footprint and extent of disturbance.	Loss of habitat	Fish Benthic Invertebrates
	Release of effluent at 630 MLD has potential to impair water quality → impairment of water quality can result in sub-lethal to lethal effects to fish and other biota → sub-lethal or lethal effects reduce abundance of biota.	Change in size and location of TP and UIA mixing zones during operation in relation to available habitat.	Decline in abundance of biota	Fish Benthic Invertebrates Plankton Macrophytes

SUMMARY OF PATHWAYS OF EFFECT FOR THE EVALUATION OF SOCIAL/CULTURAL ENVIRONMENT IMPACTS

Project Activity	Pathways of Effect	Measure	Impact Identified	Valued Ecosystem Components
Construction	Location and extent of construction → Restriction of access to site and surrounding area→ causes disruption and conflicts with surrounding land/water users	<p>Change in recreational user access to the Waterfront Trail and waterfront parks and amenities.</p> <p>Level of interference with commercial shopping routes based on separation distances.</p> <p>Change in boater access to and on the lake during construction (temporal and spatial)</p>	<p>Changes in trail or lake access and detours resulting in inconveniences to recreational users and commuters.</p> <p>Marine traffic related incidences</p>	<p>Tourism</p> <p>Lake and Lakefront Recreational Uses</p> <p>Lake transportation and shipping routes</p> <p>Shoreline Aesthetics (visual, odour, turbidity)</p>
Construction	Site preparation (on-site)→ removal of vegetation, sediments, → causes erosion and sedimentation → erosion and sedimentation degrade the quality of the lake and lakefront → degradation of lake and lakefront impact recreational uses and tourism	<p>Location of construction activity in relation to nearshore areas</p> <p>Size of construction footprint and extent of disturbance.</p>	<p>Increased water turbidity due to runoff over land</p> <p>Visual impacts from vegetation removal, excavation and construction equipment.</p>	<p>Tourism</p> <p>Lake and Lakefront Recreational Uses</p> <p>Shoreline Aesthetics (visual, odour, turbidity)</p>



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Construction	Site preparation (in-water) → removal of lakebed, marine excavation, → causes re-suspension of sediment and silt → re-suspension of sediment and silt degrade the quality of the lake and lakefront → degradation of lake impacts other lake users	Location of construction activity in-lake and extent of construction areas in relation to other lake uses	Increased water turbidity that can travel with water currents	Tourism  Lake and Lakefront Recreational Uses  Shoreline Aesthetics (visual, odour, turbidity)  Water quality at the Ajax Water Intake
Construction	Site preparation → land or lakebed excavation (e.g. grading, facility or /tunnel shaft construction/, open cut or tunnelling) → Encountering archaeological resources	Location of construction activity in relation to areas of high archaeological potential. Heritage potential of sites for proposed construction works.	Damage to or losses of terrestrial and marine archaeological resources	Aboriginal and Euro-Canadian Archaeological and Cultural Resources (Terrestrial and Marine)
Construction	Construction activities require use of heavy equipment → will cause noise, vibration, emissions and increased human activity → results in disruption and enjoyment of surrounding community and recreational features	Type of construction activities and equipment necessary  Location of construction activity in relation to residential and recreational areas  Size of construction footprint and extent of disturbance.	Disruption to use and enjoyment of community and recreational features, and enjoyment of property due to nuisance effects (e.g. dust, noise, vibrations)  Risks to health and safety	Tourism  Lake and Lakefront Recreational Uses  Community Health and Safety  Worker Health and Safety

Project Activity	Pathways of Effect	Measure	Impact Identified	Valued Ecosystem Components
Construction	Construction requires supply construction materials and/or transport construction spoils → results in increased truck and/or marine traffic → will cause increased noise, emissions, dust → results in disruption of surrounding community	<p>Type and size of construction (to identify supply and disposal requirements)</p> <p>Location of construction activity in relation to supply and disposal sites</p>	<p>Disruption to use and enjoyment of community, enjoyment of property due to nuisance effects (e.g. dust, noise, traffic)</p> <p>Risks to health and safety</p>	<p>Tourism</p> <p>Community Health and Safety</p>
Construction	Operation of construction equipment and performance of construction activities → results in worker exposure to noise, vibrations, emissions, heavy equipment, and other hazards → results in increased occupational health and safety risk	<p>Type of equipment and construction activities,</p> <p>Work related incidents (on-site and in-water) based on history of similar construction projects</p>	Occupational hazards and related impacts	Worker Health and Safety

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Operation	Plant and outfall operations results in effluent quality discharged to the nearshore and offshore lake environment →effluent quality impacts water quality→ water quality impacts recreational and other lake users.	Change in E. coli levels at beaches from baseline conditions Size of mixing zones for TP and UIA	Beach closures  Mixing zone impingements to the shoreline and Ajax Water Intake	Tourism  Lake and Lakefront Recreational Uses  Shoreline Aesthetics (visual, odour, turbidity)  Water quality at the Ajax Water Intake  Community Health and Safety
Operation	Plant and outfall operations results in new facilities and general disturbance (e.g noise, vibration, emissions) →impact surrounding land users	Location of operations in relation to residential areas  Size of infrastructure  Level of noise, vibration, emissions within buildings and at the property line	Disruption to use and enjoyment of community and recreational features, and enjoyment of property.  Visual impacts to shoreline areas	Tourism  Lake and Lakefront Recreational Uses  Community Health and Safety  Shoreline Aesthetics (visual, odour, turbidity)

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	Supplies, chemicals and equipment are needed for operation and maintenance → results in increased truck traffic → will cause increased noise, emissions, dust → results in disruption of surrounding community	Location of operations in relation to residential areas	Disruption to use and enjoyment of community and recreational features, and enjoyment of property due to traffic	Tourism  Lake and Lakefront Recreational Uses  Community Health and Safety
Operation	Operation and maintenance of facilities → results in worker exposure to noise, vibrations, emissions, heavy equipment, operating facilities/outfall → results in increased occupational health and safety risk	Type of equipment and construction activities,  Work related incidents (on-site and in-water) based on history of similar construction projects	Occupational hazards and related impacts	Worker Health and Safety