# Grays Bay Road and Port Project Impact Statement

*Volume 7 – Freshwater Environment*

WEST KITIKMEOT RESOURCES CORP

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# Grays Bay Road and Port Fact Sheet

### *Proponent*

- **West Kitikmeot Resources Corp. (WKR):** established by the Kitikmeot Inuit Association in 2014 as an Inuit-owned and Inuit-led company to conduct mineral exploration, primarily on Inuit Owned Lands (IOL) in the Kitikmeot Region of Nunavut

### *Location*

- **Grays Bay Port** is located at approximately 67° 48' 21.62" N, 10° 52' 17.69" W
- Nearest communities to the port: Kugluktuk (approximately 180 km west) and Cambridge Bay (approximately 280 km northeast)
- Southern end of **Grays Bay Road** is located at Jericho Station; approximately 66° 01' 6.36" N, 111° 28' 28.27" W

### *Components and Activities*

- Development and operation of a **deep water port** at Grays Bay on the Coronation Gulf including two large vessel wharves, a medium vessel wharf, a barge landing area with two berths, and a small craft harbour for approximately 24 vessels
- Construction and operation of an **Aerodrome** at the port
- Construction and operation of a 230 km **all-season controlled access road** (Grays Bay Road), including the construction and operation of Jericho Station
- Construction and operation of a **winter road** connecting Jericho Station to the Tibbitt Contwoyto Winter Road (TCWR) alignment on Contwoyto Lake *(Tahikyoak)*

### *Phases*

- **Construction phase** of the Project will take approximately five years to complete (both pre-construction and construction) with a proposed starting date in September 2029
- **Operations and Maintenance phase** of the Project will start in 2035 and will continue in perpetuity

### *Knowledge Perspectives*

- WKR, as well as the previous proponents, the Government of Nunavut and the Kitikmeot Inuit Association, have been engaging on the Project since 2016
- one primary source: *Kitikmiut Knowledge of the Proposed Kogloktoakyok (Grays Bay) Port and Road Project* (Banci and Spicker 2024) that was compiled by the Kitikmeot Inuit Association and its consultants from the Naonaiyaotit Traditional Knowledge Project (NTKP), a repository of Inuit Knowledge maintained in a Geographic Information System (GIS)-based database
- Inuit, Indigenous, and community knowledge, as well as feedback from engagement, has been reviewed, considered, and integrated where appropriate into project planning and the IS

### *Environment*

- Two years of baseline studies building on decades of baseline work completed by previous proponents
- 11 volumes totalling over 7,000 pages of analysis
- With the implementation of mitigation, management, and enhancement measures, residual project and cumulative effects are predicted to be not significant
- Monitoring programs and ongoing engagement will inform adaptive management strategies

### *Benefits*

- **Economic – Transformative Benefits**
  - approximately **$750 million** additional annual GDP growth by 2040 because of the Project
  - an estimated **670 jobs** in Nunavut each year during construction
  - an estimated **390 jobs** during operations and maintenance created by the Project and related expenditure
- **Community and Social – Supply Chain Resilience**
  - new transportation route to the western Arctic will strengthen supply chain resiliency by creating alternative access to essential goods
  - enhanced safety for both marine and land travel, supporting more reliable and secure movement within the Coronation Gulf and throughout the Northwest Passage
- **Sovereignty and Security – Strategic Presence**
  - first deep water port in the western Arctic
  - critical year-round strategic presence in the region

# VS.7 Volume Summary – Scope of the Freshwater Environment Assessment

For Inuit, the freshwater environment is an essential resource relied upon for hunting, travel, and connection to the land. Freshwater fish are an important part of the Inuit seasonal diet, and essential during times of food shortages (Banci and Spicker 2024).

> *Ekalok (fish) were an important part of the Inuit seasonal diet, and essential during times of food shortages, especially if caribou did not arrive because of a change in migration route or calving area. People fished wherever they camped and travelled, primarily during the spring and fall, to coincide with spawning runs.* (Banci and Spicker 2024)

Over time, Inuit and Knowledge holders have observed significant changes in water quality and availability. These include the drying up of springs, reduced water levels in lakes and rivers, and changes in the taste and clarity of water. Inuit attribute these changes to a combination of climate change, reduced precipitation, melting permafrost, and increased contamination from industrial activities such as mining (KIA 2003). The freshwater environment holds an ecological and socio-economic importance, supporting aquatic and terrestrial ecosystems, human health, and traditional land, marine, and resource use.

WKR collected baseline condition information by combining Inuit-led and collaborative knowledge gathering (including the project-specific Inuit Knowledge report, compiled using information from the NTKP database and IAG workshops), publicly available information from Indigenous groups considered in the context of the Project, and engagement feedback shared by Kitikmiut, other Indigenous groups, and other potentially affected communities with technical studies collected through western scientific methods.

WKR used this integrated knowledge to inform the establishment of Project Assessment Boundaries and to support the Assessment of Project Effects and Cumulative Effects across valued components. The combined Inuit Knowledge and western scientific information also directly informed the determination of significance and the development of Mitigation, Management, and Enhancement measures. This knowledge base is critical to ensure that the Project assessment reflects Kitikmiut perspectives, lived experience, and observed environmental conditions. Continued knowledge sharing, collaboration, and incorporation of new information over the life of the Project will be essential to refine predictions, improve adaptive management, and enhance Project outcomes for Inuit and other potentially affected communities.

Grays Bay Road and Port Project (the "Project") is a deep-water port and 230 km all-season road development being proposed by West Kitikmeot Resources Corp. (WKR), located within the Kitikmeot region of Nunavut. The port will be located within the Coronation Gulf, approximately 50 km south of the North West Passage route through the Arctic and will connect via the all-season road to the closed Jericho Mine site at Jericho Station, on the northwest side of Contwoyto Lake, NU. The all-season road will connect seasonally to the Tibbitt to Contwoyto Winter Road (TCWR) annually. WKR has prepared an Impact Statement to identify and assess potential environmental and Socio-economic effects resulting from the Project that meets the requirements outlined in the Nunavut Agreement and the Nunavut Impact Review Board Guidelines for the Preparation of an Impact Statement for West Kitikmeot Resources

Corp's Grays Bay Road and Port Proposal (NIRB File No. 24XN038; NIRB 2026). This volume of the IS presents the assessment of potential environmental effects for water resources including surface water quantity, surface water and sediment quality, and groundwater quality and freshwater fish and fish habitat.

Spatial and temporal boundaries have been established to support the development of the valued components (VC) assessments, informed by the current understanding of potential Project effects and other relevant factors. The Project Development Area (PDA) encompasses the physical footprint of all Project components, including both permanent and temporary disturbances (e.g., extent of Project infrastructure, planned clearing, and laydown areas). The Local Assessment Area (LAA) is the maximum area where project-specific environmental effects can be qualitatively estimated with a reasonable degree of accuracy and confidence. For the Water Resources VC, and Freshwater Fish and Fish Habitat VC, the LAA was defined as a 1 km buffer centred on the PDA. The LAA also includes a 100 m buffer around the Port, Aerodrome and Jericho Station PDAs, plus an extension to the northwest side of the Kennarctic River west of the Aerodrome PDA and encompasses the Road PDA including an area extending 100 m upstream and downstream of the road centerline.

The Regional Assessment Area (RAA) encompasses the PDA and LAA and provides a regional context for how the project-related effects may influence the respective VCs, and how these effects may interact cumulatively with those of other past, present, or reasonably foreseeable projects. For the Water Resources VC, the RAA includes a 10 km land-based buffer around the PDA and extends to include the Kennarctic River watershed and the unnamed watershed that drains to the Arctic Ocean. The Freshwater Fish and Fish Habitat VC RAA also includes a 10 km land-based buffer around the Port and Aerodrome PDA, but for the Road portion of the RAA, it includes a 10-km buffer around the PDA for southern watersheds, and the entirety of the Arctic and Kennarctic watersheds at the north end of the PDA.

# VS.7.1 Water Resources

Water Resources was selected as a valued component (VC) due to the potential for adverse effects from project activities on surface water quality and quantity, groundwater quality, and sediment quality. These potential adverse effects may arise during the Construction phase, the Operations and Maintenance phase, or other Project-related disturbances that alter natural hydrological processes.

## VS.7.1.1 Baseline

Freshwater resources within the LAA remain largely in a natural state. Surface watercourses are driven by snowmelt and rainfall, with highly seasonal flows and periods of low water in late summer and winter. Lakes and ponds are interconnected by shallow channels, and permafrost limits groundwater exchange. Overall, baseline groundwater flow has limited connectivity between deep and shallow systems due to the presence of permafrost which acts as a barrier in most cases.

Water quality in lakes and waterbodies is generally characterized by low nutrient levels, low turbidity, and minimal anthropogenic influence. Natural seasonal variation occurs due to ice cover, meltwater pulses, and weather patterns. Fishing and travel along lakes and river channels relies on predictable water levels and clear, clean water.

## VS.7.1.2 Project Effects

The Project may influence surface water quantity, surface water and sediment quality, and groundwater quality through construction of the road, stream crossings, borrow sources, landside Port and Aerodrome, and camps. Potential effects pathways are particularly applicable to areas where land will be disturbed, water is withdrawn and discharged, or infrastructure interacts with natural drainage systems. Three Project effect pathways and results are summarized as follows:

Change in surface water quantity:

- Water withdrawals and discharges for dust control, winter road maintenance, and potable water use may temporarily alter water quantity, particularly during low-flow periods. After applying mitigation, management, and enhancement measures, residual effects are limited to the temporary withdrawal and discharge locations associated with construction and operation, and permanent withdrawal associated with potable water supply during operation. Given the Project's small footprint relative to watershed size, these changes are considered low magnitude (i.e., <10% change in streamflow or lake volume), as licence approvals consider guidelines and rates from waterbodies with sufficient assimilative capacity.
- Landcover changes associated with clearing, grading, embankments, culverts, borrow sources, and bermed areas can modify natural drainage patterns, creating localized changes to surface runoff, ponding, or the direction of flow. After applying mitigation, management, and enhancement measures, residual effects from landcover changes and altered runoff response along the Road PDA are also expected to be low in magnitude (i.e., less than 10% of change in streamflow and lake volume compared to existing conditions), are expected to be localized near infrastructure, short- to medium-term in duration, and reversible as disturbed areas are expected to stabilize during operations, particularly with the implementation of mitigation.

Change in surface water and sediment quality:

- Disturbance of soils and in-stream works may introduce suspended sediments to nearby waterbodies. These inputs can cause short-term increases in turbidity and localized sedimentation downstream of work areas. After applying mitigation, management, and enhancement measures residual effects are predicted to be low in magnitude, irregular in frequency and reversible.
- Surface water and sediment quality may also be affected by contaminants mobilized in runoff from disturbed surfaces, construction areas, bermed areas, and erosion and sediment control features. Exposed rock and borrow materials may contribute dissolved metals or acidity, and blasting may release nitrogen compounds. After applying mitigation, management, and enhancement measures, residual effects are predicted to be low in magnitude, irregular in frequency and reversible.

Change in groundwater quality:

- Shallow groundwater is sensitive to many of the same pathways as surface water, as mixing with affected surface water or runoff can alter groundwater quality. Deep groundwater is largely protected by thick permafrost that limits vertical mixing. Potential changes to groundwater quantity are not assessed because no groundwater extraction is planned for this Project.

## VS.7.1.3 Cumulative Effects

The Project's cumulative residual effects on surface water, groundwater, and sediment quality are characterized as low magnitude, reversible, and are geographically limited to the LAA. Cumulative effects on the distribution of permafrost in the shallow subsurface may not be reversible but are not expected to impact water quality. Overall, given the small contribution of Project effects to cumulative residual effects on surface water quantity and quality, and sediment quality within the RAA as well as expected mitigation measures for the Project and mitigation to be adopted by other projects and activities in the RAA, cumulative effects are expected to be not significant.

## VS.7.1.4 Significance

After mitigation, residual effects on water resources are predicted to be not significant. Changes to surface water quantity, surface water and sediment quality, and groundwater quality are not expected to change beyond natural variability outside the PDA. Cumulative effects are also predicted to be not significant.

## VS.7.1.5 Mitigation, Management, and Enhancement Measures

The Project will apply design practices, operational controls, and monitoring programs to avoid or reduce potential effects to freshwater resources. Key measures include:

- Designing culverts, bridges, and drainage structures to accommodate natural flow patterns and reduce upstream ponding or downstream scour
- Applying erosion and sediment control measures during instream works and grading
- Applying quarry-specific drainage and sediment management plans
- Applying a metal leaching / acid rock drainage (ML/ARD) Management Plan that will include managing ML/ARD material exposed during construction (e.g., road fill, platforms, borrow sources). Any rock material sourced for use above the high-water mark will be subject to acid rock drainage/metal leaching testing, with only acceptable material used in construction.
- Monitoring during construction to evaluate water quality, flow conditions, and drainage performance
- Using adaptive management to adjust practices if monitoring identifies unexpected changes

Continuing dialogue with Kitikmiut, other Indigenous groups, and other potentially affected communities will guide water-related planning, timing, monitoring, and management throughout the Project lifecycle.

# VS.7.2 Freshwater Fish and Fish Habitat

This Freshwater Fish and Fish Habitat VC includes fish and fish habitat as defined by the *Fisheries Act* as well as aquatic vegetation and benthic invertebrates, as applicable to freshwater.

## VS.7.2.1 Baseline

Freshwater fish and fish habitat within the LAA remain largely in their natural state, supporting a diverse community of fish species that vary across watersheds, including culturally important species such as Arctic char, lake trout, Arctic grayling, burbot, and round whitefish. These species are an important subsistence food source for Inuit communities. Habitat conditions range from larger permanent rivers to shallow tundra streams, lakes, and interconnected ponds. Fish habitat usage varies depending on seasonal flow regimes, freshet timing, ice thickness, and water depths. Flows are highly seasonal and driven by snowmelt, rainfall, and periods of low water in late summer and winter. Ephemeral and intermittent channels also contribute drainage, seasonal connectivity, and nutrient inputs to downstream fish-bearing systems. Overall, baseline habitats in the LAA experience minimal anthropogenic disturbance and provide overwintering, migration, spawning, and rearing functions that support continued harvesting by Kitikmiut and other Indigenous groups.

## VS.7.2.2 Project Effects

The assessment focused on two potential Project-related effects on freshwater fish and fish habitat:

Change in fish habitat:

- Project activities may alter, disrupt, or remove fish habitat through physical disturbance of watercourses, change in flow patterns, and construction of permanent infrastructure.
- Alteration of water quantity at crossings or within small drainage networks may also influence habitat availability at certain life stages.
- After applying mitigation, management, and enhancement measures, the residual effects resulting from change in fish habitat will be low to moderate in magnitude. The duration of these effects will vary from short-term to long-term, occur as multiple irregular events, and be limited to the LAA. The likelihood for Project-related effects to occur during sensitive life stages (e.g., spawning period) range from no sensitivity to high sensitivity. The residual effects are anticipated to be reversible in areas that are reclaimed (e.g., temporary workspaces or access roads) but irreversible for permanent Project components (e.g., airstrip, Road, Port infrastructure).

Change in fish health, growth or survival:

- Changes in fish health, growth, or survival are expected to be driven by the potential effects of changes in water quality due to sediment inputs and water quality chemistry, death of fish from injury or stranding, production of underwater noise, and increased fishing pressure.
- After applying mitigation, management, and enhancement measures, the residual effects are considered low in magnitude, limited to the LAA, and will occur as multiple irregular events. The timing of these residual effects will vary from short-term (i.e., Construction phase only) to long-term (i.e., extend throughout Operations and Maintenance phases). The likelihood of effects occurring during sensitive life stages (e.g., spawning period) range from no sensitivity to high sensitivity. The residual effects are anticipated to be reversible, with the exception of death of fish or fish eggs, which would be permanent at an individual level but reversible at the population level.

### VS.7.2.3 Cumulative Effects

Cumulative effects on freshwater fish and fish habitat are anticipated between the Project and certain identified physical activities in the RAA. Overall, the cumulative effects are predicted to be low in magnitude for change in fish health, growth, or survival from increased fishing pressure and changes in water quality and moderate in magnitude for change in fish habitat from the loss of habitat below the high-water mark and riparian clearing. The geographic extent of the direct effects will be the RAA but localized to the physical activities' local areas. The potential residual cumulative effects will be long-term in duration because of the long operating life of physical activities, and will occur as irregular events, and range from reversible (e.g., temporary workspaces, watercourse crossings on fish habitat) to irreversible (e.g., permanent infrastructure that overlaps fish habitat).

### VS.7.2.4 Significance

The Project will implement avoidance and mitigation measures, including measures to offset habitat loss, if required to counterbalance unavoidable effects. The residual effects to fish and fish habitat are therefore not anticipated to cause a measurable change in the productivity of relevant fish populations, including those of cultural or traditional importance to Kitikmiut, other Indigenous groups, or other potentially affected communities, and thus are predicted to be not significant. Cumulative effects are also predicted to be not significant.

### VS.7.2.5 Mitigation, Management, and Enhancement Measures

The Project will apply design practices, operational controls, and monitoring programs to avoid or reduce potential effects on freshwater fish and fish habitat. Key measures include:

- Designing watercourse crossings (culverts, bridges, and other structures) to maintain natural flow patterns, fish passage, and habitat connectivity.
- Using previously disturbed areas for infrastructure and workspaces where practical, and maintaining riparian vegetation, where feasible.

- Applying erosion and sediment control measures during instream works, grading, and construction to reduce sediment inputs to fish-bearing waters.
- Conducting in-water activities outside restricted activity timing windows, isolating work areas when needed, and maintaining downstream flow during dewatering.
- Implementing a fish salvage program prior to instream work, conducted by qualified personnel.
- Applying water management practices, including screened water intakes, controlled water withdrawal rates, and runoff and stormwater management.
- Implementing explosives, spill contingency, and dust control plans to limit nitrogen inputs, deleterious substances, and sedimentation.
- Closing and reclaiming temporary access roads, quarries, and workspaces once no longer required.
- Inspecting watercourse crossings and erosion and sediment control measures regularly and applying corrective actions, as needed.
- Using adaptive management, updating practices if monitoring identifies unexpected effects.

If DFO determines that Project components result in a harmful disruption or destruction (HADD) of fish habitat requiring authorization under the Fisheries Act, the Project will develop a Fish Habitat Offsetting Plan through engagement with DFO, Kitikmiut, and other potentially affected communities.

# VS.7.3 Freshwater Environment Impact Statement

An evaluation of the potential influence of the Grays Bay Road and Port Project on water resources, and freshwater fish and fish habitat predicted residual effects and cumulative effects to be not significant.

# VS.7 Imanga Avatingit

Hapkununga Inuinnarnun, imariktuq avatiit ihagiagiyauyuq ikayuutinun ihagiagiyauyuq anguniaqniqmun, aulaaqniqmun, uvalu atadjutinun nunamun. Tahikmiutat iqaluit akhuuqnaqtut ilauyut Inuit ukiutigut nigiyainun, ihagiagiyauyut atuqtilugu niqailiuqniq (Banci unalu Spicker 2024).

> *Ekalok (iqaluit) pihimayunik ipiknakpiaktunik ilidjuhikgivakgainik tahapkunani Inuit hila ilaani nigiyauvaktunik nikigiyakhainik, uvunalu nakukgutauvaktunik talvanitunik nikiikhailiulikpaktunik, kihimi tuktunik tikingitkaluaqhutik pidjutitkiyumikpaktunik alangukpaliayunik ingilgayanginik ingilgayanginik ingilgayanginik naliak ivaavit ingilgayanginik nunainiklu. Inuit iqalukhiuqpaktut humiitkaluaqhutik hiniktarvigiyamingni aulaaqhutiklu, upin'ngakhami ukiakhamilu, nallaumanahuaqhugit ivaviit*.
> (Banci unalu Spicker 2024)

Qakunguraangat, Inuit uvalu Ilihimanikkut tigumidjutiqaqtut tautuktait angiyumik aalanguqtiqniqmik imaq qanuginia uvalu piinagialik. Hapkua ilauyut paniqhiqpaliayut upingaami, ikikliyuumiqtut imait tattini uvalu kuukkani, uvalu aalanguqtiqniit tipaa uvalu imariktuq imaq. Inuit pipkaiyut ukuniga aalaguqniginik aalatqiinit hilap aalaguqniganit, nipalukpaliaIiqhutik, mahaktiliraagat nunap qiqumaniga, amigaiqpaaliqhutiklu halumailruit havakviuyunit hulijutinit uyarakhiuqtinit (KIA 2003). Imariktut avatingit pidjutiqaqtut nunatigut uvalu inugiangnikkut maniliungnikkut akhuuqnaqtut, ikayuutauyut imakmi uvalu nunami avatingit, inuit aaniaqtailidjutait, uvalu pitquhikkut nunat, tariumi, uvalu ikayuutikkut atuqniit.

WKRkut katitiqhimayut aulavikhangit qanuritmangaangit naunairutingnik katitiqhugit Inuit hivuliqtiqaqhimayut havaqatigiiktuniklu ilihimayainik katitiqhimayut (ilauyut havaaqhangit aulahimayut Inuit Ilihimayainik ilitugidjutikharnik, katitiqhimayut atuqhutik naunairutingnik talvanga NTKP tutqumaviani IAGkutlu ayuiqhautikharnik), nunalaani pigiaqaqtun naunairutingnik talvanga Nunaqaqqaqhimayunik katimayiingit ihumagiyauyut talvani titiraqhimayunik Havaaqhangit, unalu ilaulukaarnikkut kiudjutikharnik iliqatigiikhimayut tapkuninga Kitikmiut, allatlu Nunaqaqqaqhimayunik katimayiit, allatlu ayungnautiqarniaqtun nunalaangit talvuuna qaritauyaliqidjutikharnik ihivriudjutikharnik katitiqhimayut talvuuna uataani nalunaqtunik ilituqhainahuarnikkut qanuriliurutingit.

WKR atuqhugit hapkua ilaliutihimayut ilihimanikkut kangiqhipkaqhugit havaktauyut Havaaghat Ihivgiugutit Kikliit uvalu ikayuutikhat Ihivgiugutit Havaaghat Hulaqutinun uvalu Katitiqhimayut Hulaqutit tamaini ihumagiyauyut iluani. Tamna katitiqhimayut Inuit Ilihimayaingit uataanilu nalunaqtunik ilituqhainahuarnikkut naunairutingnik ilituqhaivakhimayut naunairutikharnik anginirmik pivalliadjutikharnik Ihuaqhaidjutikharnik, Munagidjutikharnik, Ihuaqhaidjutikharnik uuktuutikharnik. Una ilihimanikkut pihimayut akhuuqnaqtuq piyaangini tapkua Havaatigut ihivgiugutit pidjutiqaqtut Kitikmiut ihumagiyainik, atuqhimayamingnik, uvalu tautukhimayamingnik avatingni qanuginiit. Aulahimaaqtumik ilihimanikkut uqautiginiq, havaqatigiingniq, uvalu atuliqnigit nutaat kangiqhidjutit aulaningani Havaaghap ihagianarniaqtuq ihuaqhiyuumigiangani itqungniarutit, ihuaqhiyuumiqlugit hungiutinikkut munagidjutit, uvalu ihuaqhiyuumiqlugit Havaaghat qanuginiit hapkununga Inuinnarnun uvalu aalat hulaqiniaqtut nunallaat.

Qurluqtuaryungmi Apqutikhaa Umiat Tulakvikhat Havaktauyukhaq (tamna 'Havaaqhaq') itiyumi imarmi tuluqtaqvikhaq taima 230nik kilaamitanik ukiuk tamaat apqutikharnik pivalliadjutikharnik tukhiqtauhimayuq tapkuninga Uataani Kitikmeot Resources Corp. (WKR), nayugaqaqtuq talvani Kitikmeotmi Nunavunmi. Tulaktaqvikhaq nayugaqarniaqtuq talvani Coronation Gulfmi, taima 50nik kilaamitanik ungahiktilaaqarniaqtuq hivuraani talvani Tunungani Uataani Apqutikharnik talvuuna Ukiuktaqtuniitunik katitiqhimaniaqturlu talvuuna ukiuk tamaat apqunmi talvunga umikhimayumun Jericho Uyaraqhiuqtunik nayugaanun talvani Jericho Stationmi, tunungani uativyaani haniani Contwoyto Tahiani, NU. Tamna ukiuk tamaat apqut katitiqhimaarniaqtuq ukiuk tamaat talvunga Tibbitt talvunga Contwoyto Winter Road (TCWR) ukiuk tamaat. WKR upalungaiyaiyut Hulaqutikkut Titiraqmik naunaiyagiangani uvalu ihivriuqlugu avatingnun uvalu Inuuhinut-piyangaiyautikkut hulaqutait pidjutauyut hapkunanga Havaatigut tapkua pidjutiqaqtut piyakhanun titiraqhimayut uvani Nunavunmi Nunataarutaanut Angirutaa uvalu Nunavunmi Avatilirinirmut Katimayiit Atugahait Upalungaiyautinun Hulaqutinun Titiqqat hapkununga Uataani Kitikmeoni Ikayuutikkut Kuapaliisit Qurluqtuaryungmi Apqutikhaa uvalu Tulakvikhaq Tukhiut (NIRB File No. 24XN038; NIRB 2026). Una aktilaanga haffuma IS pidjutiqaqtuq ihivgiugutinik avatingnun hulaqutauniaqtut imakkut ilauyut nunap qangani imaq aktilaangit, qangani imaq uvalu nunap qanurinia, uvalu nunap ataani imaq qanuginiit uvalu tariungungitut iqaluit uvalu iqaluit nayugait.

Inikhangit kiklivikhangitlu naunaiyagiikhimayut ikayuutikharnik pivalliadjutikharnik akhurnaqtunik hanaqidjutikharnik (VC) ihivriudjutikharnik, naunairutiqaqtun talvuuna aulayunik kangikhidjutikharnik pigiaqaqtun Havaaqhangit ayungnautiqarniaqtun allaniklu aulahimayut naunairutingnik. Tamna Havaaqhangit Pivalliadjutikharnik Nayugaani (PDA) ilauqaqtuq iqaiyaliqinikkut nayugaingit tamaita Havaaqhangit hanaqidjutikhangit, ilauyutlu tamangnik aulayukharnik tadjakaffuklu ayungnautiqaqtunik (imaatun itun, hivutunikharnik Havaaqhangit igluqpangit, upalungaikhimayut piiyaqtauniaqtun, iliugaivikhangitlu nayugaingit). Nunamingni Naunaiyainikkut Nayugait (LAA) anginiqhaq nayugaa humi havaaghanun-kitunun avatingnun hulaqutainun itqungniaqtauyaaqtut ihuangnikkut uvalu ihuangnikkut. Hapkununga Imakkut Ikayuutinun VC, uvalu Tariungungitut Iqaluit uvalu Iqaluit Nayugait VC, una LAA naunaiyaqtauhimayuq imaa 1 km kiklia qitqani PDA. LAA ilauyuqlu 100 m kiklighaa haniani Tulaktaqvik, Tingmitiqaqvik uvalu Jericho Station PDAs, ilaliutihimayuqlu uigunia tunungani uataani Kennarctic Kuugaani uataani Tingmitiqarviup PDA uvalu iluaniituq Apqut PDA ilauyuq aktilaanga 100 m qulvahiktumi uvalu anmun apqutip qitqani.

Avikturhimayumi Naunaiyainiq Nayuganga (RAA) ilaliutiyaa PDA unalu LAA tuniyuqlu avikturhimayumi qanurittaakhaanik qanuqtut havauhikhaq-piyut ayurhautingit pipkaidjutiniaqtuq nanminiriyait VCs, qanuqtullu hapkuat ayurhautingit ilaliutiniaqtuq tahapkununnga aadlanut qangaraaluknit, tadja, ihuaqtumikluuniit ihumagiyauyuq havauhikhat. Hapkununga Imakkut Ikayuutikkut VC, ukua RAA ilauyut 10 km nunami-pihimayut kikliit avatiini PDA uvalu hivituyuq ilaulugu Kennarctic Kuugaa uvalu atiqangituq imaq tamna kuuktuq Ukiuqtaqtup Tariunganut. Tariurmiutat Iqaluit Iqaluillu Nayugait VC RAA ilauyuqlu 10 km nunami-pihimayut kikliit haniani Tulaktaqvik uvalu Tingmitiqaqvik PDA, kihimi haffumunga Apqut ilanga RAAmi, ilauyuq 10-km kiklighaa avatiini PDA hivuraani immavaluit, uvalu tamaat Ukiuqtaqtumi uvalu Kennarctic immavaluit tunungani ihuani PDA.

# VS.7.1 Immaqnik Ihuaqutit

Imarnik Ihuaqutit tikuaqtauyut atuqniqatiaqniganik ilagiyaanik (VC) pijutaulaaqmat ihuilijutinik havaat hulijutauyunit nunap qangani immavaluit qanuriniginik amigainiginiklu, nunami immavaluit qanuriniginik, qanuriniginiklu qanuriniginik. Hapkuat nakuungittut ayurhautingit piniaqtuq Nappaqtiqtaulirumi, Aulapkaininnga Munarininngalu pitillugu, aadlalluuniit Havauhikhamut-piyut ulapiqutingit aadlanguqtiqtaa nunap imanganik piyuq.

## VS.7.1.1 Nalautiqhimayuq

Immigaq ihuaqutit LAA-mi aulayuitut agiyumik qanurinigani. Qangani immavaluit aulavaktut aput mahaktilirangat nipalliqhunilu, ukiup ilaani kuukpallaaqpakhuni ilaanilu imaiqpallaaqpakhuni auyami ukiumilu. Tattit tahiraallu atayut ikkattuni kuuknit, nunap qiqumania kikliqaqtitait nunap iluanni immavaluit himmauhiqniginik. Tamaini, nunap iluanni imaq kuukninga ikittunik atadjutiqaqtut itiyumi ikkattunilu pidjutigiplugu nunap qiqumania ayuqhautauvaktuq amihuni pidjutini.

Imaq qanuginia tattini uvalu imaqmi pidjutiqaqtut mikiyumik nigittiaguminaqtumik, imaqluangitumik, uvalu mikiyumik inungnin hulaqutinik. Idjuhiit ukiup ilaani aalanguqataaqtut hikuup qaangani, mahaktilirangat imaq aulania, uvalu hilap qanuginia. Iqalukhiurniq aulaarniqlu tahikkut kuukkanilu pidjutiqaqtuq naunaitpiaqtumik imaup aktilaanganik imariktumiklu, halumayumiklu imarmik.

## VS.7.1.2 Pihimayut Huliqtiit

Havaaghaq pidjutiqaqniaqtuq nunap qangani imaq aktilaanga, qangani imaq uvalu nunap qanurinia, uvalu nunap ataani imaq qanuginia haffumuuna havaknikkut apqutimik, kuukkat ikaaqviit, atukiqnikkut ikayuutit, nunami tulakvikhat uvalu tingmitiqaqviit, uvalu hiniktaqviit. Pidjutauniarungnaqhiyut hulaqutinun apqutit ihuaqtut nayugainun humi nuna ulapiqutauniaqtuq, imaq unguvaqtaukpat kuvipkaqtaulunilu, uvaluuniin igluqpait atadjutiqaqtut qurluarviit auladjutainun. Pingahuuyut Havaaqhangit ayungnautiqaqtunik aulavikharnik naunairutikhangitlu naitumik titiraqhimayut imaatun:

Aalanguqtiqnia nunap qangani imaq aktilaanga:

- Imaq unguvaqtiqniit uvalu kuviniit puyuulaitkutighat, ukiumi apqutit ihuaqhaidjutait, uvalu imigahamik imarmik atungniq tadjakaffuk aalanguqtitiniaqtuq imarmik, tapkualuat kuukpalaangitumik. Kinguani iliugaqhugit ihuaqhaidjutit, munagidjutit, uvalu ihuaqhiyuumiqnikkut aktilaangit, ilakuit hulaqutait kikliqaqtut tadjakaffuk unguvaqtiqniit uvalu kuvigaqviit nayugait ilauyut hananikkut uvalu auladjutinun, uvalu unguvaqtiqnikkut ilauyut imigahamik imarmik aulatilugit. Pidjutigiblugit Havaaghap mikiyut nayugait ilauyut immavaluit aktilaangit, hapkua aalanguqtirnirit ihumagiyauyut mikiyut aktilaangit (imaa <10 pusat aalanguqtirniq kuukkap uvaluuniin tahiq aktilaanga), laisit angirutait ihumagiyauyut atugahat uvalu akiit imaqarviit ihuaqtumik aktilaangit.
- Nunap qaanga aallannguqtirutit pitjutiqaqtut halummaqtirinikkut, manirarnikkut, hinaaniit, turhuat, atukkirviit, imaalu avataagut nunat aallannguqtirutauvaktut qurluarviit, aallannguqtirutauvaktut nunap qangani kuukviit, tahirait, imaaluuniit humit kuukviit. Kinguani iliugaqhugit ihuaqhaidjutit,

munagidjutit, uvalu ihuaqhiyuumiqnikkut aktilaangit, ilakuit hulaqutait nunap qaanganun aalanguqtiqniit uvalu aalanguqtiqniit kuuknikkut kiudjutit apqutaani PDA nigiuktauyut mikiyumik aktilaangit (imaa ikitqiaq 10 pusat aalanguqtiqnia kuukkap uvalu tahiq aktilaanga aadjiliugutigiblugit atuqtauyut qanuginiit), nigiuktauyut haniani igluqpait, naittumik-qitqani kikliit hivituniit, uvalu utiffaaqlutik ulapiqutauyut nayugait nigiuktauyut ihuaqhivalialutik auladjutini, talvuunaluaq auladjutikharnik ihuaqhaidjutikharnik.

Aalaguqnigit nunap qangani immavaluit qanuriniginiklu:

- Ihuilijutaunigit nunat kuukmilu havaat hatqirutaulaaqtut nuutpaliayunik nunavalungnik qanituani immavaluit. Hapkuat iliuraidjutit pidjutittaaqtut hivikittumut amigaikyuummiklutik imarluliqpiaqluni nunamilu marlungnik avataani havagviuyunit. Kinguani iliugaqhugit ihuaqhaidjutit, munagidjutit, uvalu ihuaqhiyuumigutit aktilaangit ilakuit hulaqutait itqungniaqtauyut mikiyut anginiqhait, ihuangitut uvalu utiffaaqtaaqtut.
- Nunap qangani imaq marluvaluitlu qanuritmangaangit ayungnautiqarniaqtun halumailrungnik aulayut kuviraqtunik talvanga ayungnautiqaqtunik qanganiitunik, hanaviuyunik, avaliqangitunik, nunat nungutiqhimayunik nunat qanuritmangaangitlu. Tautungnaqtut uyaqqat uvalu atungnikkut hunat pidjutauyut nungutiqlugit havigalgit uvaluuniin acidity, uvalu qagaqtautit anipkaqniaqtut nitrogenmik hunanik. Iliugaqtaugumik ihuaqhaidjutikharnik, munagidjutikharnik, ihuaqhaidjutikharnik uuktuutikharnik, ilakungit ayungnautiqarniaqtun itqumayumik anginirmik, ihualuangitumik aulavikhangit utiffaagiaqaqtunlu.

Aadlangurninnga nunap iluanni imaq qanurittaakhaanik:

- Ikkattuni nunap imaq qayangnaqtuq amihunut aadjikutariyainut ingilravingit qanganit imaq, taimaa avgurniq aktuqtauhimayumut nunap qangani imaq kuviraqtuqluuniit aadlanguqtaaqtaa nunap ataanit imaq qanurittaakhaanik. Itiyumi nunap ilua immavaluit munariyauvaktut ivyuyumik nunap qiqumaninganik kikliqarutauyuq avguqpalianiganik. Aallangurniarungnaqhiyut nunap iluanni imarnik aktilangit ihivriuqtaungittut nunap iluanni imarmik unngavaqtiqtaunginmata umani Havaakhami.

## VS.7.1.3 Katimatillugit Pihimayut

Havaakhap amigaigyuumiyut ilakungit aktuutauniit nunap qangani imarnik, nunap iluanni imarnik, marluvalungnik qanuritmangaangit naunaiqtauyut mikiyut anginiqhait, utiffaaqtaaqtut, nunauyaliuqhimayullu kigliqaqtut LAA-mut. Angikliyuumiqtuq ayurhautingit tuniqhaininnganut nunap qiqumaninganit ikkattuni nunap iluanit himmautilimaittuq kihimi ihumagiyauyuq pilaqutiniaqtuq imanganik. Tamainun, pidjutigiblugit mikiyut ikayuutit Havaaghanun hulaqutainun amigaiqyuumiyut ilakuit hulaqutainun nunap qangani imaq aktilaangit uvalu qanuginiit, uvalu nunavaluit qanuginiit iluani RAA imaalu niriuktauyut ihuaqhainikkut aktilaangit haffumunga Havaaghamun uvalu ihuaqhaidjutit tiguaqtauyukhat aalanin havaaghanin uvalu hulidjutini uvani RAAmi, katitiqhimayut hulaqutit nigiuktauyut angivalaangitut.

## VS.7.1.4 Ilingnaqtut

Kinguani ihuaqhaidjutit, ilakuit hulaqutait imakkut ihumagiyauyut angivalaangitut. Aalanguqtiqniit nunap qangani imaq aktilaangit, qangani imaq uvalu nunap qanurinia, uvalu nunami imaq qanuginiit nigiuktaungitut aalanguqlutik hilataani PDA. Angikliyuumiqtuq qanuriliurutingit itqurnarutauyuqlu akhuurutaungittuq.

## VS.7.1.5 Ihuaqhaidjutikharnik, Munagidjutikharnik uvalu Ihuaqhiyuumiqnikkut Havaakhat

Tamna Havaaqhaq aulatitiniaqtun hanadjutikharnik atuqtakharnik, auladjutikharnik munagidjutikharnik, munagidjutikharniklu havaaqhangit pinaitumik ikikliyumiqtitiyaangatluuniit ayungnautiqarniaqtun imarnik hanaqidjutikharnik. Maliqatqujauhimajut ilaujut:

- Havaklugit turhuat, ikaarutit, uvalu qurluarviit igluqpait pidjutigiyaangini idjuhiit uvalu ikiliyuumiqlugit qungmun tahiraq uvaluuniin anmun kuviraqniq
- Iliuraqlugit nunap nungutiqpalianikkut uvalu marlungnik munagidjutikkut aktilaangit havaktautilugit uvalu manikhaitigut
- Iliuraqlugit uyagakhiuqviit-kitunun qurluaqviit uvalu marluvalungnik munagidjutikkut upalungaiyautit
- Iliuraqlugit havigaliknik kuviqpinikkut / acid uyaqqat qurluaqviit (ML/ARD) Munagidjutikkut Upalungaiyautit tapkua ilauyut munagidjutit ML/ARD tamayat tautungnaqtut havaktautilugit (imaa, apqutit iliuraiviit, tungaviit, atukirnikkut ikayuutit). Quyaginaq uyaqqat atuqtauyut qulaani imaquqtuhinikkut pidjutiqangniaqtut acid uyaqqat kuviqnikkut/havigaliknik kuviyaaqtunik uuktuqtaulutik, ihuaqtut hunat atuqtauyut igluqpinikkut.
- Munariniq nappaqtiqtillugu naunaiyariami imaq qanurittaakhaanik, kuukninnganik, qurluarvingillu qanurittaakhaanik
- Aturluni hungiutiyumik munariniq ihuarhigiami ayuirhainiq taimaa munariniq ilitarigumiuk ihumagiyaungittut aadlangurninngit

Uqaqatigihimmaarlugit Kitikmiut, aadlat Nunaqaqqaarhimayut katimayiit, aadlallu ayurhaqtitauniaqtut nunallaat naunaiyarniaqtait imaqmut piyut ihumaliurniq, ikaarninnganik, munariniq, munariniqlu taimaa Havauhikhaq aturninngani.

# VS.7.2 Tahikmiutat Iqaluit Iqaluilu Nayuqpaktait

Una Tariurmiutaq Iqaluit uvalu Iqaluit Nayugait VC ilauyut iqaluit uvalu iqaluit nayugait naunaiyaqhimayut uvani Iqalukhiuqnikkut Maligaani imaalu imarmiutat nauhimayut uvalu benthic hauniqaqtut hauniqaqtut, ihuaqtut imariktunun.

## VS.7.2.1 Nalautiqhimayuq

Tahikmiutat iqaluit uvalu iqaluit nayugait hamani LAA aulayuitut anginiqhakkut idjuhiit, ikayuutauyut aalakiit nunallaat iqaluit aalakiit tapkua aalakiit avatiini immait, ilauyut pitquhikkut akhuuqnaqtut hugadjat imaatun Iqalukpiit, ihuuraqyuit, Ukiuqtaqtumi grayling, burbot, uvalu kapihiliit. Tahapkununa nirgitinik pihimayunik ipiknakpiaktunik ihaagiahutigiyauvaktunik nikikhautikhanik tahapkunani Inuit nunalingnilu. Nunagiyaingit qanuritmangaangit aulayut talvanga angiyunik kuukkanik ikatuniklu nunami kuukkanik, tattinik, katitiqhimayuniklu tahirarnik. Iqaluit nayugait atuqtauyut aalakiit qanuginiitigut ukiup aulaniitigut, mahaktiqnikkut, hiku ivyuhinia, uvalu imap itiniani. Kuungnirit aghut ukiutigut pidjutiqaqtut aput mahaktirniranun, nipalliqhutik, uvalu imaiqtigaangat nunguligaangat auyami ukiumilu. Qakungugaangat uvalu qakungugaangat kuukviit, ukiutigut atadjutit, uvalu niqigiktut pidjutauyut kuugaanun iqaluknik auladjutainun. Tamainun, nayugait nayugait uvani LAA atuqhimayut mikiyumik inungnin ulapiqutauyut uvalu tunihiyut ukiinikkut, aulaniit, huviuviit, uvalu pamiqhinikkut auladjutit tapkua ikayuutauyut aulahimaaqtumik anguniaqniq hapkunanga Kitikmiut uvalu aalat Nunaqaqaaqtut katimayiit.

## VS.7.2.2 Pihimayut Huliqtiit

Ihivgiugutit tugaaqhimayut malguknik Havaaghanun-ilauyut hulaqutainun imangmi iqaluit uvalu iqaluit nayugait:

Aalanguqtiqniit iqaluit nayugait:

- Havaaghat hulidjutit aalanguqtiqniaqtut, ulapiqutauyut, uvaluuniin unguvaqtiqlugit iqaluit nayugait haffumuuna iqaiyaqnikkut ulapiqutaitigut imait, aalanguqtiqniit kuukviit, uvalu havaklutik igluqpaknik.
- Aalanguqnia imaq aktilaanga ikaaqvikni uvaluuniin mikiyuni qurluaqviit pidjutiqaqniaqtut nayugait piinagialgit kituni inuuhiqni.
- Iliugaqtaugumik ihuaqhaidjutikharnik, munagidjutikharnik, ihuaqhaidjutikharnik uuktuutikhangit, ilakungit ayungnautiqarniaqtun talvuuna allanguqtiqhimaaqtunik iqalungnik nayugaingit ikikliyumirniaqtun anginirmik anginirmik. Hivituniit hapkua hulaqutait aalakiingniaqtut naittumik-kikliqaqtumik hivituyumun, atuqtauyut amigaitut ihuangitumik hulidjutit, kikliqangniaqtut hapkununga LAAmun. Piniarungnaqhiyuq Havaaghanun-ilauyut hulaqutait atuqtauyut atuqtilugu qayangnaqtut inuuhiit (imaa huviuliqqata) aktilaangit qayangnautaitumik anginiqhaqmun qayangnautait. Ilakuit hulaqutait nigiuktauyut utiffaaqlutik nayugaini tapkua ihuaqhaqtauyut (imaa atukaffuktut havakviit uvaluuniin apqutit) kihimi utiffaalimaitut hapkununga atuqtauhimaaqtughanun Havaaghap iluaniitut (imaa milviit, Apqutit, Tulaktaqvikhat igluqpait).

Aalanguqniit iqaluit aaniaqtailinikkut, angiklivalianikkut uvaluuniin annaumanikkut:

- Aalanguqtiqniit iqaluit aaniaqtailinikkut, angiklivalianikkut, uvaluuniin annaumanikkut nigiuktauyut pidjutiqaqniaqtut hulaqutinun aalanguqtiqniitigut imaq qanuginiit pidjutauyut marlungnik pidjutauyut uvalu imaq qanuginiit, huiqtut iqaluit aaniqnikkut uvaluuniin nutqanganikkut, nipaaqnikkut, uvalu amigaiqyuumiblutik iqalukhiuqnikkut akhuugutit.
- Kinguani iliugaqtaugumik ihuaqhaidjutikharnik, munagidjutikharnik, ihuaqhaidjutikharnik uuktuutikharnik, tamna ilakungit ayungnautiqarniaqtun ihumagiyauyut mikiyumik anginirmik, kiklivikhaqaqtun talvani LAAmi, aulaniaqtunlu qaffiuyunik ihuangitumik hulilukaaktunik. Pivikhaqaqniga ukua akitunigit aktuqnigit aalaganiaqtut hivigitumi (ilaa Hanayaunigani havaaginaq) hivunikhamut (ilaa hivitunikhaagut Aulanigagut Munarinigagulu havaagini). Tahapkununa pilaktauvaktunik nakungikgutivaktunik havakhikhimayunik talvanitunik kayaknaktunik uumayunik ilidjuhikgivakgainik (uvunngat, huviuligumik) nallautakgutauvaktunik mikharut kayaknaitunik uvunalu. Tahapkununa ilakuit nakungikgutivaktunik kanukgilidjutivaktunik kanukgilidjutivaktunik hungiutilangnikmunlu, kihiani kanukgilidjutivaktuniklu kanukgilidjutivaktuniklu kanukgilidjutivaktuniklu kanukgilidjutivaktunik kanukgilidjuti

## VS.7.2.3 Katimatillugit Pihimayut

Katitiqhimayut ayungnautiqarniaqtun tariurmiutanik iqalungnik iqalungnilu nayugaingit nigiuktauyut akunganirmi Havaaqhangit naunaituniklu ilitagiyauhimayunik iqaiyaliqinikkut hulilukaaktunik talvani RAAmi. Tamainun, katitiqhimayut hulaqutait itqungniaqtauyut mikiyut aktilaangit aalanguqtirnirmun iqaluit aaniaqtailinikkut, angiklivalianikkut, uvaluuniin annaumanikkut amigaiqyuuminikkut iqalukhiuqnikkut akhuugutit uvalu aalanguqtiqniit imaup qanuginiit uvalu angivalaangitut aalanguqtiqniit iqaluit nayugait tamaqpalianikkut nayugait ataani imaquqtuhinikkut uvalu hinaaniit. Nunauyatigut aktilaangit hulaqutit RAA kihimi nayugaqaqtut iqaiyangnikkut hulidjutit nunamingni nayugaini. Amigaiqpaliayut hulaqutait hivituyumik taimaali hivituyumik auladjutit iqaiyangnikkut hulidjutit, uvalu atuqtauniaqtut ihuangitumik hulidjutit, uvalu pidjutiqaqtut utiffaaqtaaqtut (imaa tadjakaffuk havakviit, imakkut ikaaqviit iqaluit nayugaini) hamunga utiffaalimaitut (imaa igluqpait tapkua qaliriiktut iqaluit nayugainun).

## VS.7.2.4 Ilingnaqtut

Tamna Havaaqhaq aulatitiniaqtun atuqtailinikkut ihuaqhaidjutikharnik uuktuutikharnik, ilauyutlu uuktuutikhangit ikikliyumiqtitiyaangat nayugaingit tamaqpalianikkut, taima pigiaqagumik ihuaqhaidjutikharnik atuqtailinikkut ayungnautiqaqtunik. Tahapkununa ilakungit nakungikgutivaktunik kanukgilidjutivaktunik tahapkununa iqaluit nayugainiklu pidjutitaktunik kanukgilidjutivaktunik kanukgilidjutivaktunik alanguktikattakpaktunik nauvakgiakhainik nallautakgutauvaktunik iqaluit kufiutilanginik, ilauhimayunik tahapkununa pitkuhiktukpaktunik naliak ingilgangnitanik atuktauvaktunik ipiknakpiaktunik tahapkunani Kitikmiut, alauyunik Nunatuttukanik katimayinik, naliak alauyunik ihuilukakgutauvaktunik nunalingnilu, talvunalu kanukgilidjutivaktunik kanukgilidjutivaktunik havakhiktaulimaitunik. Angikliyuumiqtuq qanuriliurutingit itqurnarutauyuqlu akhuurutaungittuq.

### VS.7.2.5 Ihuaqhaidjutikharnik, Munagidjutikharnik uvalu Ihuaqhiyuumiqnikkut Havaakhat

Tamna Havaaqhaq aulatitiniaqtun hanadjutikharnik atuqtakharnik, auladjutikharnik munagidjutikharnik, munagidjutikharniklu havaaqhangit pinaitumik ikikliyumiqtitiyaangatluuniit ayungnautiqarniaqtun tariurmiutanik iqalungnik iqalungnilu nayugaingit. Maliqatqujauhimajut ilaujut:

- Havaklugit imakkut ikaaqvikhat (turhuat, ikaarutit, uvalu aalat igluqpait) pihimayaangani idjuhiit aulaniit, iqaluit aulaviit, uvalu nayugait atadjutait.
- Atuqlugit kinguani ulapiqutauyut nayugait igluqpinikkut uvalu havakviit humi ihuaqqat, uvalu munagiblugit hinaani nauhimayut, humi piyaaqqat.
- Iliuraqhugit nunap nungutirninga nunavaluillu munaridjutikhat kuukkami havaktautitlugit, manikhainikkut, nappaqtirinikkullu ikiglinahuarutikhanik marlungnik iqaluqaqtunut imarmut.
- Havaklugit imarmi hulidjutit hilataani pittailidjutikkut hulidjutit kiklighait, avaliingaaqtilugit havakviit ihagiagiyaukpata, pihimablugillu anmun kuungnirit imaiyaqtilugit.
- Atuliqtilugit iqaluknik atuffaaqtaaqtunik pinahuagutinik hivuani kuukmi havaliqtinagit, havaktauyut ayuittiaqhimayunin havaktinin.
- Atuqlugit imarmik munaridjutit atuqtauyut, ilauyut naunaiyaqhimayut imarmik itiqtirviit, munarittiaqhugit imarmik piiyaqtaunikkut aktilaangit, uvalu kuviraqviit uvalu hilalungnikkut imarmik munagidjutit.
- Atuliqtilugit qagaqtautit, kuvinikkut qilamiurutit, uvalu puyuulaitkutikhat upalungaiyautit kikliqariangani nitrogenmik iliurainiq, hivuuranaqtut hunat, uvalu marlungnik.
- Umiktirlugit utiqtiffaarlugillu atuqtaukaffuktut apqutit, uyarakhiurviit, havagviillu ihariagiyauhuiqqat.
- Ihivriuqlugit immavaluit ikaaqviit uvalu nungutiqtut uvalu nunavaluit munagidjutikkut aktilaangit qakungugaikpat uvalu atuqlugit ihuaqhaidjutit, ihagiagiyaukpata.
- Aturluni hungiutiyumik munariniq, nutaanguqtiriniq ayuirhainiq taimaa munariniq ilitarigumiuk ihumagiyaungittut qanuriliurutingit.

DFO ihumaliugumik tapkua Havaaghap iluaniitut pidjutiqaqniaqtut qayangnaqtumik ulapiqutauyuq uvaluuniin ahiguqtiqniq (HADD) iqaluit nayugait piyakhaqaqtut angigutinik ataani Iqalukhiuqnikkut Maligaani, Havaaghaq havakniaqtut Iqaluit nayugainik Ihuaqhainikkut Upalungaiyautinik havaqatigiblugit DFOkut, Kitikmiut, uvalu aalat hulaqutauniaqtut nunallaat.

## VS.7.3 Imanga Avatiliqinikkut Hulaqutinun Uqaqtait

Ihivgiugutit hulaqutainun haffuma Qurluqtuaryungmi Apqutaani uvalu Tulaktaqvikhaq Havaaghaq imarmun, uvalu tariungungitut iqaluit uvalu iqaluit nayugait itqungniaqtauyut ilakuit hulaqutait uvalu amigaiqpaliayut hulaqutait angivalaangitut.

# VS.7 ᐅᖃᓕᒫᒐᖅᑕᑦ ᐃᓗᓕᖕᒥᑦ ᓇᐃᓈᖅᓯᒪᔪᑦ – ᐱᓕᕆᔾᑲᓐ ᐃᒪᕐᑭᑦᑐᓄᑦ ᐊᕙᑎᒋᔭᖕᒥᑦ ᓇᓗᓇᐃᔭᕐᓂᖕᒥᑦ

ᐃᓄᖕᓄᑦ, ᑖᒻᓇ ᐃᒥᒐᐅᔪᖕᓇᖅᑐᖅ ᐃᒪᖅ ᐊᕙᑎᖓ ᐊᑐᓪᓚᕆᒃᑐᖅ ᐱᑕᖃᕐᓂᖓ ᓈᓱᕆᔭᐅᔪᖅ ᐊᖑᓇᓱᖕᓂᕐᒧᑦ, ᐊᐅᓚᕐᓂᕐᒧᑦ, ᐊᒻᒪ ᐊᑦᔾᔪᑕᐅᓂᖕᒐᓄᑦ ᓄᓇᒧᑦ. ᐃᒥᒐᐅᔪᖕᓇᖅᑐᖅ ᐃᒪᕐᒥ ᐃᖃᓗᐃᑦ ᐊᑐᒻᒪᕆᒃᑐᑦ ᐃᓚᒋᔭᖓ ᐃᓄᐃᑦ ᐅᑭᐅᑉ ᐃᓚᖕᒐᓂ ᓂᕆᕙᒍᓲᑦ, ᐊᒻᒪ ᐊᑐᒻᒪᕆᒃᑐᑦ ᐊᑐᖅᑎᓪᓗᒍ ᐃᓚᓂᒃᑯᑦ ᓂᕿᑦ ᐊᒥᒐᕐᓂᖕᒐᓂ (Banci ᐊᒻᒪᓗ Spicker 2024).

*ᐃᖃᓗᐃᑦ ᐊᑐᒻᒪᕆᒃᑐᑦ ᐃᓚᒋᔭᖕᒥᑦ ᐃᓄᐃᑦ ᐅᑭᐅᑉ ᐃᓚᖕᒐᓂ ᓂᕿᒋᕙᒃᑕᖕᒥᑦ, ᐊᒻᒪ ᐊᑐᓪᓚᕆᒃᑐᑦ ᐊᑐᖅᑎᓪᓗᒍ ᓂᖃᐃᓕᐊᕋᖕᓂᖕᒥᑦ, ᐱᓗᐊᖅᑐᒥᒃ ᑐᒃᑐᑦ ᑎᑭᙱᓕᖅᐸᑕ ᐱᑉᓗᒍ ᐊᓯᔾᔨᕐᓂᖓ ᐊᐅᓚᑦᑕᖕᒥᑦ ᐊᑉᕿᑎᖕᒥᑦ ᐅᕝᕙᓘᓐᓃᑦ ᓄᑦᐅᖅᑲᖕᒥᑦ. ᐃᓄᐃᑦ ᐃᖃᓗᒃᓯᐅᖅᑐᑦ ᓯᒥᑐᐃᓇᖅ ᓯᓂᒃᑕᖅᓱᑎᒃ ᐊᐅᓚᖅᓱᑎᓪᓗ, ᐱᓗᐊᖅᑐᒥᒃ ᐊᑐᖅᑎᓪᓗᒍ ᐅᐱᕚᒥ ᐊᒻᒪ ᐅᑭᐊᒃᓴᒥ, ᐊᑕᐅᑦᑎᒃᑰᕐᓂᖓᓂ ᓯᕗᐅᑎᐊᖅᑐᓄᑦ.* (Banci ᐊᒻᒪᓗ Spicker 2024)

ᐊᑯᓂᐅᓂᖓᓂ, ᐃᓄᐃᑦ ᐊᒻᒪ ᐃᓕᓯᒪᓂᑦ ᑎᒍᒥᐊᖅᑎᑦ ᑕᐅᑐᒃᑕᖕᒥᑦ ᐊᖏᔪᒥᒃ ᐊᓯᔾᔨᕐᓂᑦ ᐃᒪᖅ ᐊᑲᐅᓂᖓ ᐊᒻᒪ ᐱᔪᖕᓇᕐᓂᖓ. ᑕᒪᒃᑯᐊ ᐃᓚᓕᑦ ᐸᓂᖅᐸᓕᐊᓂᖕᒥᑦ ᐃᒪᐃᑦ ᓄᓇ ᐃᓗᐊᓂᖓᖅᑐᑦ ᑎᖕᒥᑉᑕᕐᓃᑦ, ᒥᒃᓵᒋᐊᕐᓂᖕᒥᑦ ᐃᒪᐅᒐᕐᓂᑦ ᑕᓯᕐᓂ ᐊᒻᒪ ᑰᒐᐃᑦ, ᐊᒻᒪ ᐊᓯᔾᔨᕐᓂᖕᒥᑦ ᑎᐱᖕᒥᑦ ᐊᒻᒪ ᐃᒪᓇᖕᓂᖕᒥᑦ. ᐃᓄᐃᑦ ᐱᓂᖅᑕᖕᒥᑦ ᑕᒪᒃᑯᐊ ᐊᓯᐊᒍᕐᓃᑦ ᑕᒪᒃᑯᓇᖓ ᓯᓚ ᐊᓯᔾᔨᕐᓂᖓ, ᒥᒃᓵᒋᐊᕐᓂᖕᒥᑦ ᒪᑯᓚᕐᓂᖅ ᖃᓐᓂᕐᓃᑦ, ᐊᐅᒃᐸᓕᐊᕐᓂᖕᒥᑦ ᕿᕐᑯᒪᐃᓐᓇᕐᓂᖕᒥᑦ, ᐊᒻᒪ ᐃᓚᒋᐊᕐᓂᖕᒥᑦ ᐊᑦᑕᕐᓇᖅᑐᑦ ᓴᓇᕙᐅᔪᓂᑦ ᐱᓕᕆᐊᑦ ᑕᒪᒃᑯᐊᑐᑦ ᐅᔾᔭᖅᓯᐅᕐᓃᑦ (ᕿᑎᕐᒥᐅᓂ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᒌᖕᒥᑦ 2003). ᑖᓐᓇ ᐃᒥᒐᐅᔪᖕᓇᖅᑐᖅ ᐃᒪᖅ ᐊᕙᑎᖓ ᐱᓯᒪᔾᔪᖓ ᐆᒪᔪᓕᕐᑯᑎᑦ ᐊᒻᒪ ᐃᓄᓕᕐᑯᑎᑦ–ᑮᓇᐅᔾᔭᓕᐅᕈᑎᑦ ᐊᑐᓪᓚᕆᖕᓂᖓ, ᐃᑲᔪᖅᑐᕐᓂᖕᒥᑦ ᐃᒪᕐᒥᐅᑕᑦ ᐊᒻᒪ ᓄᓇᒥᐅᑕᑦ ᐆᒪᔪᕐᑯᑎᑦ, ᐃᓄᐃᑦ ᐋᓐᓂᐊᖅᑕᐃᓕᓂᖕᒥᑦ, ᐊᒻᒪ ᐱᖅᑯᓯᑐᖃᖅ ᓄᓇᒥᒃ, ᑕᕆᐅᕐᓂᒃ, ᐊᒻᒪ ᐱᖃᕐᓂᒃ ᐊᑐᕐᓂᖕᒥᑦ.

WKR–ᒃᑯᑦ ᑲᑎᖅᓱᐃᓚᐅᖅᑐᑦ ᑭᒻᓕᕆᔾᔪᔪᑦ ᖃᐅᔨᓕᖅᓴᓂᖕᒥᓐᓂ ᑐᓴᐅᒃᓴᓂ ᑲᑎᑎᑦᑎᔩᓐᓂᖅᑐᑦ ᐃᓄᖕᓄᑦ–ᐊᐅᓚᑕᐅᔪᓄᑦ ᐊᒻᒪᓗ ᓴᓇᕐᑲᑎᒌᒃᑐᓂᙵᖅᑐᓂ ᖃᐅᔨᒪᓂᕐᒥ ᓄᐊᑦᑎᓂᕐᒥ (ᐃᓚᖃᖅᖢᓂ ᐱᓕᕆᐊᖑᔪᓄᑦ–ᑐᕌᖓᔪᓄᑦ ᐃᓄᐃᑦ ᖃᐅᔨᒪᔾᔪᑎᓐᓂ ᐅᓂᒃᑳᒥ, ᑲᑎᑕᐅᔪᑦ NTKP ᑐᓴᒃᓴᓂ ᖃᐅᔨᔾᔭᐅᓯᒪᔪᓂ ᐊᒻᒪᓗ IAG ᑲᑎᒪᓂᕐᒥ ᐊᑐᖅᖢᑎᒃ), ᐃᓄᓕᒫᓄᑦ ᐊᑐᐃᓐᓇᐅᔪᓂᑦ ᑐᓴᒃᓴᓂ ᓄᓇᖃᖅᑳᖅᑐᓂ ᐱᓕᕆᖃᑎᒌᓂᑦ ᐱᓕᕆᐊᖑᔪᖅ ᐅᓂᒃᑳᖓ ᐃᓱᒪᒋᓪᓗᒍ, ᐊᒻᒪᓗ ᐱᓕᕆᖃᑎᒌᖕᓂᕐᒥ ᑐᓴᖅᑎᑕᐅᔪᑦ ᕿᑎᕐᒥᐅᓄᑦ, ᐊᓯᖕᒥᓐᓂ ᓄᓇᖃᖅᑳᖅᑐᓂ ᐱᓕᕆᖃᑎᒌᓂᑦ, ᐊᒻᒪᓗ ᐊᓯᖕᒥᓐᓂ ᓄᓇᓕᖕᓂ ᐊᒃᑐᖅᑕᐅᑐᐃᓐᓇᕆᐊᓕᖕᓂ ᐱᔭᕆᐊᑐᙱᑦᑐᓂ ᖃᐅᔨᓴᕐᓂᕐᒥ ᑲᑎᑕᐅᔪᓂᑦ ᖃᐸᓗᓈᓂᑦ ᑭᒻᓕᓯᓂᐊᕐᓂᕐᒥ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᖕᓂ ᐊᑐᖅᖢᑎᒃ.

WKR ᐊᑐᖅᑕᖓ ᐅᓇ ᐃᓚᓕᐅᔾᔭᕐᓂᖕᒥᑦ ᐃᓕᓯᒪᓂᑦ ᑐᓴᐅᒪᑎᓐᓂᖕᒥᑦ ᐱᖑᖅᑎᓐᓂᖕᒥᑦ ᐱᓕᕆᐊᑉ ᖃᐅᔨᓴᕐᓂᖕᒥᑦ ᑭᒻᓕᒃᓴᖕᒥᑦ ᐊᒻᒪ ᐃᑲᔪᖅᖢᑎᒃ ᑕᒪᒃᑯᐊ ᖃᐅᔨᓴᕐᓂᖕᒥᑦ ᐱᓕᕆᐊᖑᔪᒥᑦ ᐊᒃᑐᐊᓂᑦ ᐊᒻᒪ ᑲᑎᖅᓱᕐᓂᑦ ᓱᒥᑐᐃᓇᖅ ᐊᑐᓪᓚᕆᒃᑐᑦ ᐃᓚᒋᔭᖕᒥᑦ. ᑲᑎᑕᐅᓯᒪᔪᑦ ᐃᓄᐃᑦ ᖃᐅᔨᒪᓂᖕᒥᑦ ᐊᒻᒪᓗ ᖃᓪᓗᓈᑦ ᑭᒻᓕᓯᓂᐊᕐᓂᕐᒥ ᑐᓴᒃᓴᖕᒥᑦ ᑐᓴᖅᑎᑦᑎᑲᐅᑎᔪᑦ ᓇᓗᓇᐃᖅᓯᓂᕐᒥ ᐱᑦᑕᐅᓂᖅᐸᓪᓂᑦ ᐊᒻᒪᓗ ᐃᓪᓗᐊᖅᓴᐃᕐᒥ ᖃᐅᔨᓴᖅᐳᑎᓂᑦ ᐅᑯᓇᖓ ᐱᔾᔪᑎᓕᖅᓂ ᐊᒃᑐᐃᓗᐊᖅᑕᐃᓕᑎᑦᑎᓂᕐᒥ, ᐊᐅᓚᑦᑎᓂᕐᒥ, ᐊᒻᒪᓗ ᐱᑦᑕᐅᓯᕚᓕᖅᑎᑦᑎᓂᕐᒥ. ᑖᓐᓇ ᑭᒻᓕᕆᔾᔪᔪᖅ ᖃᐅᔨᓴᕐᓂᖅ ᐱᒻᒪᕆᐅᔪᖅ ᓇᓗᓇᐃᖅᓱᖅᑯᓗᒋᑦ ᐱᓕᕆᐊᖑᔪᒧᑦ ᖃᐅᔨᓴᕐᓂᖅ ᑕᑯᑎᑦᑎᓂᖓᓂ ᕿᑎᕐᒥᐅᑦ ᐃᓱᒪᒋᔭᖕᒥᓂ, ᐃᓅᓯᕐᒥ ᐊᑐᖅᓯᒪᔭᖕᒥᓂ, ᐊᒻᒪᓗ ᑕᑯᓯᒪᔭᖕᒥᓂ ᐊᕙᑎᐅᑉ ᖃᓄᐃᑦᑑᓂᖓᓂ. ᖃᐅᔨᓴᕐᓂᕐᒥ ᑐᓴᐅᒪᖃᑎᒌᖕᓂᕐᒥ ᑲᔪᓯᕐᒥ, ᐱᓕᕆᖃᑎᒌᖕᓂᕐᒥ, ᐊᒻᒪᓗ ᐃᓚᓕᐅᑎᓂᕐᒥ ᓄᑖᑦ ᑐᓴᒃᓴᓂ ᐱᓕᕆᐊᖑᔪᑉ ᐃᓱᓕᕝᕕᒃᓴᖓ ᑎᑭᓪᓗᒍ ᐱᒻᒪᕆᐅᓂᐊᖅᑐᖅ ᓇᓚᐅᑖᖅᑕᐅᔪᓂᑦ ᐱᑦᑕᐅᓯᕚᓕᖅᑎᑦᑎᓂᕐᒥ, ᐱᑦᑕᐅᓕᖅᑎᓪᓗᒋᑦ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐃᓚᓕᐅᑎᕙᓪᓕᐊᔪᓂ, ᐊᒻᒪᓗ ᐱᑦᑕᐅᓯᑎᓪᓗᒍ ᐱᓕᕆᐊᖑᔪᒧᑦ ᓴᕿᑕᐅᕙᓪᓕᐊᔪᑦ ᐃᓄᖕᓄᑦ ᐊᒻᒪᓗ ᐊᓯᖕᒥᓄᑦ ᓄᓇᓕᖕᓄᑦ ᐊᒃᑐᖅᑕᐅᑐᐃᓐᓇᕆᐊᖅᑐᓄᑦ.

ᖁᕐᓗᖅᑐᐊᕐᔪᐸ ᐊᑉᖁᑎᖓᓄᑦ ᐊᒻᒪ ᑐᓚᒃᑕᕝᕙᖓᓄᑦ ᐱᓕᕆᐊᖅ (“ᐱᓕᕆᐊᖅ”) ᐃᑎᔪᒥ ᑐᓚᒃᑕᕝᕙᐅᕗᖅ ᐊᒻᒪ 230 km–ᓂᒃ ᐊᕐᕋᒍᓕᒫᖅ ᐊᑉᖁᑎᐅᕝᕙᐅᔪᒪᓪᓗᓂ ᑐᒃᓯᕋᐅᑕᐅᓯᒪᔪᖅ West Kitikmeot Resources Corp–ᒃᑯᓐᓄᑦ (WKR), ᕿᑎᕐᒥᐅᓂ ᓄᓇᕗᒻᒥ. ᑐᓚᒃᑕᕝᕙᒃ ᐃᓂᖃᕐᓂᐊᖅᑐᖅ ᑖᓯᒪ ᑯᕈᓇᐃᓴᖓ ᐃᒪᕐᑯᑖᓂᒃ, ᓇᓚᐅᓂᖅᓯᒪᔪᖅ 50 km–ᓂᒃ ᐱᖓᓐᓇᖅᐸᓯᐊᓂ ᓱᓪᓗᐊᓗᒃ ᐅᐊᓕᓂᕐᒥᒃ ᕿᑭᖅᑖᓘᑉ ᑕᓇᐅᖓᒍᑦ ᐊᑉᖁᑕᐅᕌᑦᑕᖅᑐᒃᑯᑦ ᐅᑭᐅᖅᑕᖅᑐᒥ ᐊᒻᒪ ᐊᒃᑐᐊᓂᒃᖅᓯᒪᓂᐊᖅᓱᓂᓗ ᑕᒪᐃᖕᓄᑦ ᓯᓚᐅᑉ ᐱᕙᓪᓕᐊᓂᖓᒍᑦ ᐊᑉᖁᑎᖅᑲᖅᓯᒪᓗᓂ ᐅᒃᑯᐊᖅᓯᒪᔪᒥᒃ ᔨᐅᕆᑯ ᐅᔾᔨᖅᓂᓂᐊᕐᕕᖕᒥᒃ ᔨᐅᕆᑯ ᑐᑦᑕᕝᕙᖓᓂ,

ᐅᐊᓇᐅᑉ ᐊᒻᒪ ᓂᒡᒋᖅᐸᓴᖓᓐᓂᒃᑯ ᐊᑯᖓᓂ ᐃᒃᑯᐊᓃᓯᒪᔪᖅ Contwoyto Lake−ᒧᑦ (ᑕᓯᕐᔪᐊᖅ) ᓄᓇᕗᒻᒥᑦᑐᒥ. ᑕᒪᐃᓐᓄᑦ−ᐅᑭᐅᓕᒫᒧᑦ ᐊᐸᖅᑯᑎᒃᓴᖅ ᑲᑎᑦᑎᔪᒻᒥᖅᑐᖅ ᐅᑭᐅᑉ ᐃᓚᖓᒍᑦ ᐊᑐᖅᑐᒃᓴᒥ ᐊᐸᖅᑯᑎᒥ Tibbitt−ᒥᑦ Contwoyto−ᒧᑦ ᐅᑭᐅᒥ ᐊᐸᖅᑯᑎᒥ (TCWR) ᐅᑭᐅᑕᒫᑦ. WKR−ᒃᑯᑦ ᐋᖅᑭᒃᓱᐃᓚᐅᖅᐳᑦ ᐊᒃᑐᐃᓂᖅᑲᕐᓂᕐᒧᑦ ᑎᑎᕋᖅᓯᒪᔪᓂᒃ ᓇᓗᓇᐃᖅᓯᔪᒪᓪᓗᑎᒃ ᖃᐅᔨᓴᕈᒪᓪᓗᑎᒡᓗ ᐊᕙᑎᒧᑦ ᐃᓅᖃᑎᒌᖕᓂᕐᒧᓪᓗ−ᑮᓇᐅᔭᓕᐅᕋᓱᖕᓂᕐᒧᑦ ᐊᒃᑐᖅᓯᓂᐅᑐᐃᓐᓇᕆᐊᓕᖕᓂᒃ ᐱᓕᕆᐊᖑᔪᒥ, ᒪᓕᒃᑐᖃᖅᑰᓂ ᐊᑐᖅᑕᐅᔭᕆᐊᓕᖕᓂᒃ ᓄᓇᕗᒻᒥ ᐊᖏᖃᑎᒌᒍᑕᐅᓯᒪᔪᒥ ᓄᓇᕗᒻᒥᒍ ᐊᕙᑎᓕᕆᔾᔾᑯᑦ ᑲᑎᒪᔨᖏᑕ ᒪᓕᒋᐊᖃᖅᐸᒃᑕᖏᓐᓂᒃ ᐋᖅᑭᒃᓱᐃᓂᐊᕐᓗᓂ ᐊᒃᑐᐃᓂᖅᑲᕐᓂᕐᒧᑦ ᑎᑎᕋᖅᓯᒪᔪᓂᒃ ᐆᒧᖓ West Kitikmeot Resources Corporation−ᒃᑯᑦ ᖁᕐᓗᖅᑐᐊᕐᔫᑉ ᐊᐸᖅᑯᑎᖓᓄᑦ ᐊᒻᒪ ᑐᓚᒃᑕᕐᕕᖓᓄᑦ ᑐᒃᓯᕋᐅᑎᖓᓄᑦ (NIRB−ᒃᑯᑦ ᑐᖅᑯᖅᓯᒪᕝᕕᐊᑕ ᓈᓴᐅᑖ 24XN038; NIRB 2026). ᐅᓇ ᐅᖃᓕᒫᒐᖓ ᑖᓐᓇ IS ᓴᑦᑭᖅᑎᑕᖏᑦ ᖃᐅᔨᓴᕐᓂᖏᑦ ᐊᑐᕋᔭᖅᑕᖏᑦ ᐊᕙᑎᓗᓕᖅᑯᑎᑦ ᐊᒃᑐᐊᓂᖏᑦ ᐃᒪᖅᑲᕐᓂᐅᔪᑦ ᐃᓚᐅᑎᓪᓗᒋᑦ ᓄᓇ ᖃᖓᓂ ᐃᒪᖅ ᐊᖏᓂᖓ, ᓄᓇᖃᖓᓂ ᐃᒪᖅ ᐊᒻᒪ ᓄᓇᕙᓗᐃᑦ ᐊᑲᐅᓂᖓ, ᐊᒻᒪ ᓄᓇᒥ ᐃᒪᖅᑕᖏᑦ ᐊᑲᐅᓂᖓ ᐊᒻᒪ ᐃᒪᑦᑎᐊᕙᒃᑐᑦ ᐃᖃᓗᐃᑦ ᐊᒻᒪ ᐃᖃᓗᖃᕐᓂᐅᔪᑦ.

ᐃᓂᕆᕙᒃᑕᖏᑦ ᖃᖓᒃᑯᕐᓂᖏᓐᓄᓪᓗ ᑭᒡᓕᕆᔭᐅᔪᑦ ᐋᖅᑭᒃᑕᐅᓯᒪᕗᑦ ᑕᓯᐅᖅᓯᔾᔪᑕᐅᔪᒪᓪᓗᑎᒃ ᐱᕙᓪᓕᐊᓂᕆᔭᐅᔪᒧᑦ ᐱᒻᒪᕆᐅᕆᔭᐅᔪᓄᑦ ᐃᓗᓕᖏᓐᓄᑦ (VC) ᖃᐅᔨᓴᖅᓯᓂᕐᓄᑦ, ᑕᒪᓇ ᑐᙵᕝᕆᖅᑎᑕᐅᓪᓗᓂ ᒫᓐᓇ ᑐᑭᓯᐅᒪᓂᕆᔭᐅᔪᒥᒃ ᐱᓕᕆᐊᖑᔪᒧᑦ ᐊᒃᑐᖅᓯᓂᐅᑐᐃᓐᓇᕆᐊᓕᖕᓂᒃ ᐊᓯᖏᓐᓂᒃᑯ ᐊᒃᑐᐊᓂᓕᖕᓂᒃ ᐱᔾᔪᑕᐅᕙᒃᑐᓂᒃ. ᐱᓕᕆᐊᒧᑦ ᐱᕙᓪᓕᐊᓂᕐᒧᑦ ᐃᓂᕆᔭᐅᔪᖅ (PDA) ᐃᓚᖃᖅᐳᖅ ᐃᓂᕆᔭᐅᕙᒃᑐᒥᒃ ᑕᒪᐃᓐᓄᑦ ᐱᓕᕆᐊᖑᔪᒧᑦ ᐃᓗᓕᕆᔭᐅᔪᓄᑦ, ᐊᑕᖑᓪᓗᓂ ᑕᒪᐃᓂ ᐊᑕᐃᓐᓇᕐᓂᐊᓕᖅᑐᓂᒃ ᐊᑐᖅᑕᐅᓚᐅᒃᖓᓂᐊᖅᑐᓂᒃᑯ ᐸᒡᕕᓴᒃᑕᐅᓯᒪᔪᓂᒃ (ᓱᕐᓗ ᐱᓕᕆᐊᖑᔪᒥ ᓇᑉᐸᖅᑎᖅᑕᐅᓯᒪᔪᓂᒃ, ᐱᕙᕌᔭᖅᑕᐅᓯᒪᔪᓂᒃ ᐃᓗᐃᖁᕕᐅᓂᐊᖅᑐᓂᒃ, ᐃᓕᐅᖅᑲᐃᖁᕕᐅᕙᒃᑐᓂᒃᑯ). ᓄᓇᓕᖕᓂ ᖃᐅᔨᓴᕐᕕᐅᔪᖅ (LAA) ᐊᖏᓛᖑᕗᖅ ᐊᕙᑎᒧᑦ ᐊᒃᑐᐃᓂᐅᔪᑦ ᐱᓕᕆᐊᒧᑦ ᓇᓚᐅᑦᑖᖅᑕᐅᔪᓐᓇᖅᐳᑎᒃ ᓈᒻᒪᒃᑐᒃᑯᑦ ᑕᒻᒪᖅᑕᖅᓯᒪᙱᓪᓗᑎᒃ ᐊᒻᒪ ᐅᒃᐱᕆᓴᐅᑎᐊᕐᓗᑎᒃ. ᑖᑉᑯᓄᖓ ᐃᒪᖅᑲᕐᓂᐅᔪᓄᑦ VC, ᐊᒻᒪ ᐃᒪᑦᑎᐊᕙᒃᑐᑦ ᐃᖃᓗᐃᑦ ᐊᒻᒪ ᐃᖃᓗᖃᕐᓂᐅᔪᑦ VC, ᑖᓐᓇ LAA ᐅᓐᓂᖅᑐᖅᑕᐅᔪᖅ ᑖᓐᓇᐅᓂᖓ 1 km ᐊᕙᑦᑯᒪᑎᖓ ᕿᑎᖓᓂ ᑖᓐᓇ PDA. ᑖᓐᓇ LAA ᐃᓚᒋᖕᒥᔭᖓ 100 m ᐅᖓᑦᑯᔾᔪᑎᖓ ᐊᕙᑎᖓᓂ ᑖᓐᓇ ᑐᓚᒃᑕᕝᕕᒃ, ᓯᓚᓕᕆᕝᕕᒃ ᐊᒻᒪ ᐳᐅᕆᑯ ᑐᑦᑕᕝᕕᖓ PDAs, ᐊᒻᒪ ᐅᐃᒍᓂᖓ ᑕᒪᓇ ᐅᖓᓛᑕ ᐅᐊᑖᓂ ᓴᓂᕋᖓ ᑖᓐᓇ ᑭᓈᒃᑎᒃ ᑰᖓ ᐅᐊᑖᓂ ᓯᓚᓕᕆᕝᕕᒃ PDA ᐊᒻᒪ ᐃᓚᓕᒃ ᑖᓐᓇ ᐊᐸᖅᑯᑦ PDA ᐃᓚᐅᑎᓪᓗᒍ ᐃᓂᖓ ᐅᐃᒍᓂᖓ 100 m ᑰᑉ ᖁᓕᓂ ᐊᒻᒪ ᐊᑎᖓᓂ ᑕᒪᑐᒪ ᐊᐸᖅᑯᑎᐅᑉ ᕿᑎᖓᓂᑦ.

ᐊᕕᒃᑐᖅᓯᒪᔪᓄᑦ ᖃᐅᔨᓴᕐᕕᐅᔪᖅ (RAA) ᐃᓗᓕᖅᑲᖅᑐᖅ PDA−ᒥ ᐊᒻᒪᓗ LAA−ᒥ ᐃᓂᐅᔪᓂ ᐊᒻᒪᓗ ᑐᓴᐅᒪᑎᑦᑎᔪᖅ ᐊᕕᒃᑐᖅᓯᒪᔪᓂ ᐅᓂᒃᑳᖑᔪᓂ ᖃᓄᖅ ᐱᓕᕆᐊᖑᔪᓄᑦ−ᐃᓚᒋᔭᐅᔪᑦ ᐊᒃᑐᖅᑕᐅᓂᖏᑦ VC−ᖑᔪᑦ ᓱᕐᑯᓯᖅᑕᐅᔪᓐᓇᕐᓂᕆᓐᓂ, ᐊᒻᒪᓗ ᖃᓄᖅ ᑖᒪᒃᑯᐊ ᐊᒃᑯᐃᓂᐅᔪᑦ ᐊᑕᐅᑦᑎᒃᑯ ᐃᓗᐃᑦᑐᒥ ᐊᒃᑐᖅᑕᐅᕙᔾᔪᕐᓂᕆᓐᓂ ᐱᓕᕆᐊᖑᔪᒪᔪᓂ ᐊᓯᖏᓐᓂ ᑭᖑᓂᑦᑎᓐᓂ ᐱᓕᕆᐊᖑᔪᕝᕕᓂᕐᓂ, ᒫᓐᓇᐅᔪᒥ, ᐅᕝᕙᓘᓐᓃᑦ ᖃᓂᒃᑯ ᓯᕗᓂᑦᑎᓐᓂ. ᑖᑉᑯᓄᖓ ᐃᒪᖅᑲᕐᓂᐅᔪᓄᑦ VC, ᑖᓐᓇ RAA ᐃᓚᒋᔭᖓ 10 km ᓄᓇᒦᑦᑐᑦ ᐅᖓᑦᑯᔾᔪᑎᖓ PDA ᖃᓂᒋᔭᖓᓂ ᐃᓚᓕᐅᑎᑉᓗᒍ ᑖᓐᓇ ᑭᓈᒃᑎᒃ ᑰᖓᖅ ᐃᒪᖅᑲᕐᓂᖓ ᐊᒻᒪ ᑖᓐᓇ ᐊᑎᖅᑲᙰᑦᑐᖅ ᐃᒪᖅᑲᕐᓂᐅᔪᖅ ᑰᒃᑐᖅ ᐅᑭᐅᖅᑕᖅᑐᖅ ᑕᕆᐅᖓᓄᑦ. ᑖᓐᓇ ᐃᒪᑦᑎᐊᕙᒃᑐᑦ ᐃᖃᓗᐃᑦ ᐊᒻᒪ ᐃᖃᓗᖃᕐᓂᐅᔪᑦ VC RAA ᐃᓚᒋᖕᒥᔭᖓ ᑖᓐᓇ 10 km ᓄᓇᒥᖓᖅᑐᖅ ᐅᖓᑦᑯᔾᔪᑎᖓ ᐊᕙᑎᖓᓂ ᑐᓚᒃᑕᕝᕕᒃ ᐊᒻᒪ ᓯᓚᓕᕆᕝᕕᒃ PDA, ᑭᓯᐊᓂᒃ ᑕᒻᒃᑯᓄᖓ ᐊᐸᖅᑯᑦ ᐃᓚᖓ ᑖᓐᓇ RAA, ᐃᓚᓕᒃ ᑖᓐᓇ 10-km ᐅᖓᑦᑯᔾᔪᑎᖓ ᐊᕙᑎᖓᓂ ᑖᓐᓇ PDA ᓂᒋᖓᓂ ᐃᒪᖅᑲᕐᓂᐅᔪᓄᑦ, ᐊᒻᒪ ᑕᒪᑭᖅᓗᒍ ᑖᓐᓇ ᐅᑭᐅᖅᑕᖅᑐᒥ ᐊᒻᒪ ᑭᓈᒃᑎᒃ ᐃᒪᖅᑲᕐᓂᐅᔪᑦ ᐅᖓᓚᖓᓂ ᐃᓱᖓᓂ ᑖᓐᓇ PDA.

## VS.7.1 ᐃᒪᖅᑲᕐᓂᐅᔪᑦ

ᐃᒪᖅᑲᕐᓂᐅᔪᑦ ᑎᒃᑯᐊᖅᑕᐅᔪᑦ ᐱᓐᓇᕆᔭᐅᓂᖏᑦ ᐃᓚᒋᔭᖓ (VC) ᐱᑉᐳᒍ ᑖᓐᓇ ᐊᑐᕋᔭᖅᑐᖅ ᐃᓗᐃᑯᑎᖓ ᐊᒃᑐᐊᓃᑦ ᐱᓕᕆᐊᖑᔪᒥᑦ ᐱᓕᕆᐊᑦ ᓄᓇ ᖃᖓᓂ ᐃᒪᖅ ᐊᑲᐅᓂᖓ ᐊᒻᒪ ᐃᒪᐅᖓᕐᓂᖓ, ᓄᓇᒥ ᐃᒪᖅ ᐊᑲᐅᓂᖓ, ᓄᓇᕙᓗᖅᑲᕐᓂᖓ ᐊᑲᐅᓂᖓ. ᑕᒪᒃᑯᐊ ᐊᑐᕋᔭᕐᓃᑦ ᐃᓗᐃᑯᑕᐅᓃᑦ ᐊᒃᑐᐊᓃᑦ ᓴᕿᕋᔭᖅᑐᑦ ᐊᑐᖅᑎᓪᓗᒍ ᓴᓇᔭᐅᓂᖓ ᑐᒡᓕᕆᓂᕐᓂ, ᑖᓐᓇ ᐊᐅᓚᑕᐅᓃᑦ ᐊᒻᒪ ᐋᖅᑭᐅᒪᓃᑦ ᑐᒡᓕᕆᓂᕐᓂ, ᐅᕝᕙᓘᓐᓃᑦ ᐊᓯᖏᑦ ᐱᓕᕆᐊᖑᔪᖅ−ᑐᕌᕐᓃᑦ ᐅᓚᐱᓭᐅᑎᑦ ᐊᓯᔾᔨᕆᑕᐅᓃᑦ ᐃᓕᖅᑯᓯᖓᓄᑦ ᐱᓕᕆᔾᔪᓰᑦ.

## VS.7.1.1 ᐱᒋᐊᕐᕕᖓ

ᐃᒥᒐᐅᔪᓐᓇᖅᑐᖅ ᐃᒪᖅᑲᕐᓂᐅᔪᑦ ᐃᓗᐊᓂ ᑖᒻᓇ LAA ᓱᓂᐅᒪᐃᑦᑐᑦ ᐃᓚᑦᑎᑯᓯᖓ ᓱᓂᐅᒪᐃᓐᓂᖅᓴᐅᐸᓗᑎᒃ. ᓄᓇ ᖃᖓᓂ ᐃᒪᖅ ᑰᕕᖏᑦ ᐊᐅᓚᑎᑕᐅᔪᑦ ᐊᐳᑦ ᐊᐅᒃᑕᕐᓂᖓᓂᑦ ᐊᒻᒪ ᓯᓚᓗᖏᒃ, ᐊᖏᓂᖅᓴᒥᒃ ᐅᑭᐅᑉ ᐃᓚᖓᓂ ᑰᖓᖏᑦ ᐃᒪᒃᓯᓂᖅᓴᐅᓂᖏᑦ ᐊᑦᐸᖅᑎᓪᓗᒍ ᐊᐅᔾᔭᖓᓂ ᐊᒻᒪ ᐅᑭᐅᒥ. ᑕᓲᑦ ᐊᒻᒪ ᑕᓯᕋᐃᑦ ᐊᑕᔾᔪᑎᔪᑦ ᐃᑲᓪᕈᖅᑲᕐᓂᖏᓐᓂ ᑰᕕᖏᑦ, ᐊᒻᒪ ᕿᕐᑯᒪᐃᓐᓇᕐᓃᑦ ᑭᒡᓚᖅᑲᕐᓂᖏᑦ ᒪᓂᖅᑲᒥ ᐃᒪᖅᑕᖏᑦ ᓯᒪᐅᓯᖅᑕᕐᓃᑦ. ᑕᒪᓗᒃᑖᖏᑦ, ᐃᓚᑦᑎᑯᓯᖏᑦ ᓱᓂᐅᒪᐃᓐᓃᑦ ᒪᓂᖅᑲᒥ ᐃᒪᖅ ᑰᒃᑐᑦ ᑭᒡᓚᖅᑲᖅᑐᑦ ᐊᑕᔾᔪᑎᖏᑦ ᐊᑯᖓᓂ ᐃᑎᓂᐅᔪᑦ ᐊᒻᒪ ᐃᑦᑲᓪᕈᑦ ᐱᓚᕐᓂᔾᔪᑎᖏᑦ ᐱᐸᓗᒍ ᐱᑕᖅᑲᕐᓂᖏᑦ ᕿᕐᑯᒪᐃᓐᓇᕐᓃᑦ ᐊᑐᕈᑎᖏᑦ ᑐᓗᖅᑕᐅᑎᑦ ᐊᒥᓲᓂᖅᓴᓄᑦ.

ᐃᒪᖅ ᐊᑲᐅᓂᖓ ᑕᓯᕐᓂ ᐊᒻᒪ ᐃᒪᖅᑲᕐᓂᐅᔪᓂ ᐊᑐᕐᓂᖅᓴᖅ ᖃᓄᓇᑦᑐᑎᓐᓂᖓ ᐳᒃᑭᓐᓂᖏᓐᓄᑦ ᓂᖅᑲᐅᔪᓐᓇᖅᑐᕋᓗᐃᑦ ᐳᖅᑐᓃᑦ, ᐃᓱᓗᐊᙱᓐᓃᑦ, ᐊᒻᒪ ᒥᑭᓂᖅᓴᐅᓃᑦ ᓴᓗᒪᐃᓪᕈᓂ ᐅᕝᕙᓘᓐᓃᑦ ᐊᕙᑎᑦ ᐊᓯᐊᖑᕐᓃᑦ ᐊᒃᑐᐊᓃᑦ. ᐃᓚᑦᑎᑯᑐᖅᑲᖓ ᐅᑭᐅᑉ ᐃᓚᖓᓂ ᐊᓪᓚᑦᑭᖅᓃᑦ ᐊᑐᖅᑐᑦ ᐱᐸᓗᒍ ᓯᑯᖅᑲᕐᓂᖓ, ᐊᐅᒃᑐᕐᓂᖓ ᐃᒪᖅ ᐱᖅᑲᕐᓃᑦ, ᐊᒻᒪ ᓯᓚ ᐱᑦᑎᓲᑦ. ᐃᖃᓗᒃᓯᐅᕐᓂᖅ ᐊᒻᒪ ᐊᐅᓚᕐᓃᑦ ᑕᓯᖅᑎᒍᑦ ᐊᒻᒪ ᑰᒐᕐᓂ ᑰᕖᑦ ᓇᓯᖅᑲᔾᔨᖏᑦ ᓇᓗᓇᙱᓐᓂᖅᓴᐅᓃᑦ ᐃᒪᐅᒐᕐᓂᑦ ᐊᒻᒪ ᐃᒪᕆᖓᓂᑦ, ᓴᓗᒪᔪᖅ ᐃᒪᖅ.

## VS.7.1.2 ᐱᓚᕆᐊᒥᑦ ᐊᒃᑐᐃᔾᔪᑏᑦ

ᑖᒻᓇ ᐱᓚᕆᐊᖅ ᖃᓄᕆᔾᔪᑕᐅᔪᓐᓇᖅᑐᖅ ᓄᓇᐸ ᖃᖓᓂ ᐃᒪᖅ ᐊᖏᓂᖓ, ᓄᓇᐸ ᖃᖓᓂ ᐃᒪᖅ ᐃᓱᕐᓂᖓ ᐊᑲᐅᓂᖓ, ᐊᒻᒪ ᒪᓂᖅᑲᒥ ᐃᒪᖅ ᐊᑲᐅᓂᖓ ᓴᓇᔭᐅᓂᑎᒍᑦ ᐊᑦᑎᑎᑦ, ᑰᒐᐅᔾᑦ ᐃᑲᖅᑕᕐᕖᑦ, ᐃᓗᑐᓃᑦ ᐱᖅᑲᕐᓂᖏᑦ, ᐊᒃᓴᕋᕐᓂᖏᑦ ᓄᓇ ᑐᓚᒃᑕᕐᕕᒃ ᐊᒻᒪ ᓯᓚᓚᕆᕕᒃ, ᐊᒻᒪ ᓯᓂᒃᑕᐅᒪᕕᑦ. ᐊᑐᕋᔭᖅᑐᑦ ᐊᒃᑐᐊᓃᑦ ᐊᑦᑎᑕᐅᔪᑦ ᐱᓗᐊᖅᑐᒥᒃ ᐊᑐᕐᓂᓚᖅᑦ ᐃᓂᖏᓐᓄᑦ ᑕᒪᒃᑯᐊ ᓄᓇᑦ ᐅᓚᐱᓴᒐᐅᓂᐊᑦ, ᐃᒥᖅᑕᕐᕕᐅᓂᐊᑦ ᐊᒻᒪ ᑯᕕᑎᑕᐅᓂᖏᑦ, ᐅᕝᕙᓘᓐᓃᑦ ᐱᓚᕆᔾᔪᑎᑦ ᐱᖃᑎᒋᖕᓃᑦ ᓄᓇᒥᖓᖅᑐᓄᑦ ᑰᕕᖏᑦ ᐊᑲᐅᓂᖏᑦ. ᐱᖓᓱᑦ ᐱᓚᕆᐊᑦ ᐊᒃᑐᐊᓃᑦ ᐊᑦᑎᑎᖏᑦ ᐊᒻᒪ ᖃᓄᕐᑑᓃᑦ ᓯᕕᑭᓇᖅᓯᒪᔪᑦ ᑕᒪᒃᑯᐊᕗᓃᑦ:

ᐊᓯᔾᔨᕐᓃᑦ ᓄᓇᐸ ᖃᖓᓂ ᐃᒪᖅ ᐊᖏᓃᑦ:

- ᐃᒥᖅᑕᕐᕕᐅᓃᑦ ᐊᒻᒪ ᑯᕕᑎᑕᐅᓃᑦ ᐳᑦᑎᐅᑎᓂᑦ ᒥᐅᓂᓇᓂᖏᑦ, ᐅᑭᐅᒥ ᐊᑦᑎᑎᑦ ᐋᕿᒃᓯᒪᓂᖏᑦ, ᐊᒻᒪ ᐃᒥᒐᐅᔫᒃᓴᑦ ᐃᒪᐃᑦ ᐊᑐᕐᓂᖏᑦ ᐊᓯᔾᔨᑐᐃᓇᓇᐊᓚᑦ ᐃᒪᖅ ᐊᖏᓂᖓ, ᐱᓗᐊᖅᑐᒥᒃ ᐊᑐᖅᑎᓪᓗᒍ ᑰᓗᐊᙴᖑᓐᓃᑦ ᐱᕕᒋᑦᑕᕐᓂᖏᑦ. ᑭᖑᐊᒍᑦ ᐊᑐᕐᓂᖓᓂ ᐃᓅᐊᖅᓯᕆᐊᕈᑎᑦ, ᐊᐅᓚᑕᐅᓃᑦ, ᐊᒻᒪ ᐱᕚᓪᓚᖅᑎᓐᓃᑦ ᐱᔭᐅᓂᖏᑦ, ᖃᓄᑐᐃᓇᖅ ᐊᒃᑐᐊᓃᑦ ᑭᒡᓚᖅᑲᖅᑐᑦ ᐊᑐᑲᐃᓇᕐᓂᖏᓐᓄᑦ ᐃᒥᖅᑕᕐᕕᐅᓃᑦ ᐊᒻᒪ ᑯᕕᑎᑕᐅᓃᑦ ᐃᓂᖏᑦ ᐱᖃᑕᐃᑦ ᓴᓇᔪᓄᑦ ᐊᒻᒪ ᐊᐅᓚᑕᐅᓃᑦ, ᐊᒻᒪ ᐃᒥᖅᑕᕐᕕᐅᖏᓐᓇᕐᓂᖏᑦ ᐱᖃᑕᐃ ᐃᒥᒐᐅᔪᓐᓇᖅᑐᑦ ᐃᒪᖅ ᐊᑐᖅᑎᓪᓗᒍ ᐊᐅᓚᓂᖓ. ᐱᐸᓗᒍ ᐱᓚᕆᐊᕗᔫᐸ ᒥᑭᔪᖅ ᑐᐸᓚᕋᕐᓂᖓ ᐃᓯᒪᕆᐸᓗᒍ ᐃᒪᖅᑲᕐᓂᐅᔪᖅ ᐊᖏᓂᖓ, ᑕᒪᒃᑯᐊ ᐊᓯᔾᔨᕈᑎᑦ ᐃᓯᒪᕆᔭᐅᔪᑦ ᐊᖏᕗᓗᐊᙴᖑᓂᖓ (ᐆᒃᑐᑎᕆᓗᒍ <10% ᐊᓯᔾᔨᕐᓂᖓ ᑰᖓᓂᖓᓄᑦ ᐅᕝᕙᓘᓐᓃᑦ ᑕᓯᖅ ᐃᒪᐅᒐᕐᓂᖓ), ᐱᑎᓪᓗᒋᑦ ᓚᐃᓴ ᐊᖏᕐᓂᖏᑦ ᐃᓯᒪᕆᔭᐅᓃᑦ ᓇᓗᓇᐃᐸᑎᑦ ᐊᒻᒪ ᐊᖏᓂᖏᑦ ᐃᒪᖅᑲᕐᓂᐅᔪᑦ ᓈᒻᒪᒃᑐᒥᒃ ᐊᑐᕋᓱᖓᓂᖏᑦ ᐱᔪᖓᕐᓃᑦ.
- ᓄᓇᖅᑲᕐᓂᐅᔪᑦ ᐊᓯᔾᔨᕐᓂᖏᑦ ᐱᖃᑎᖏᓐᓂᑦ ᒪᓂᕋᐅᓃᑦ, ᒪᓂᒃᓴᕐᓃᑦ, ᐊᑭᕕᖓᕐᓃᑦ ᓯᓈᖏᑦ, ᓱᓪᓗᑦ ᑰᕕᐅᓃᑦ, ᐃᓗᑦᑐᖅᑎᖅᓯᒪᓃᑦ, ᐊᒻᒪ ᓴᐳᑎᖏᑦ ᐃᓂᖏᑦ ᐋᕿᒐᐅᔪᓐᓇᕐᓃᑦ ᐃᓚᑦᑎᑯᓯᖏᑦ ᑰᕕᐅᓃᑦ ᐱᑦᑎᑯᓯᖏᑦ, ᐱᖑᖅᑎᓐᓂᖏᑦ ᓄᓇᖓᓂ ᐊᓯᔾᔨᑎᑦ ᓄᓇ ᖃᖓᓂ ᑰᖓᓃᑦ, ᑕᓯᕋᖑᖅᑕᕐᓃᑦ, ᐅᕝᕙᓘᓐᓃᑦ ᓇᒨᕐᓂᖓ ᑰᖓᓂᖓ. ᑭᖑᐊᒍᑦ ᐊᑐᓚᕐᓂᖓ ᐃᓅᐊᖅᓯᕆᐊᕈᑎᑦ, ᐊᐅᓚᓂᖏᑦ, ᐊᒻᒪ ᐱᕚᓚᕐᓃᑦ ᐱᓇᓱᖏᑦ, ᐊᒃᑐᐊᓗᕿᓐᓂᖏᑦ ᓄᓇᐸ ᖃᓇᔭᖓᓂᑦ ᐊᓯᔾᔨᕐᓃᑦ ᐊᒻᒪ ᐊᓯᐊᕗᕐᓃᑦ ᑰᕕᐅᓃᑦ ᓱᒋᐊᕐᓂᖏᑦ ᑖᓕᓂ ᐊᑦᑎᑎᖓᓂ PDA–ᖓ ᓂᕆᐅᒋᔭᐅᔪᑦ ᐳᒃᑭᑦᑐᒥᒃ ᐊᖏᓂᖓ (ᐆᒃᑐᑎᕆᓗᒍ ᑐᖔᓂ 10% ᐊᓯᐊᕗᕐᓂᖅ ᑰᖓᓂᖓᓄᑦ ᐊᒻᒪ ᑕᓯᖅ ᐃᒪᐅᒐᕐᓂᖓ ᓱᑦᑭᖅᓂᖓ ᐊᑐᖅᑐᓄᑦ ᖃᓄᓇᓐᓃᑦ), ᒥᓇᐅᒋᔭᐅᔪᑦ ᐃᓂᖅᑲᕐᓃᑦ ᖃᓂᖓᓂ ᐱᓚᕆᕕᐅᔪᑦ, ᓯᕕᑭᑦᑐᒥᑦ ᐊᑯᓂᖅᓯᐅᖅᑐᑐᑦ ᐊᑯᓂᐅᑎᒋᓂᖓ, ᐊᒻᒪ ᑭᖑᓘᒃᑎᓐᓂᖓ ᐅᓚᐱᓴᐅᑕᐅᔪᖅ ᐃᓂᖏᑦ ᓂᕆᐅᒋᔭᐅᔪᑦ ᓱᓂᐊᓚᙴᖑᓐᓂᖏᑦ ᐊᐅᓚᓕᖅᑎᓪᓗᒍ, ᐱᓗᐊᖅᑐᒥᒃ ᐊᑐᖅᐸᓚᐊᓂᖏᓐᓄᑦ ᐃᓅᐊᖅᓯᕆᐊᕐᓃᑦ.

ᐊᓯᐊᖑᕐᓃᑦ ᓄᓇ ᖃᖓᓂ ᐃᒪᖅ ᐊᒻᒪ ᓄᓇᕋᓗᖃᕐᓃᑦ ᐊᑲᐅᓂᖏᑦ:

- ᓯᐊᒪᒃᓯᒪᓂᖏᑦ ᐃᔾᔪᐃᑦ ᐊᒻᒪ ᑰᒐᐅᔭᑦ ᐃᓗᐊᓂ ᓴᓇᓃᑦ ᐱᑎᑦᑐᓇᖅᑕᖏᑦ ᐳᒃᑕᓚᕐᓃᑦ ᓄᓇᕗᓗᐃᑦ ᓴᓂᐊᓂ ᐃᒪᖃᕐᓂᐅᔪᑦ. ᑕᒪᒃᑯᐊ ᐃᓗᐊᓅᕐᓃᑦ ᐱᔾᔪᑕᐅᔪᓇᖅᑐᑦ ᓯᕕᕿᑦᑐᒧᑦ ᐃᓚᒋᐊᕐᓃᑦ ᐃᓱᖅᓯᔾᔪᑕᐅᓃᑦ ᐊᒻᒪ ᓄᓇᖓᓂ ᓄᓇᕗᓗᐃᑦ ᑰᒡᕕᖏᓐᓄᑦ ᓴᓇᕖᐅᔪᓂᑦ ᐃᓂᖏᓐᓂᑦ. ᑭᖑᐊᒍᑦ ᐊᑐᕆᖃᖅᑎᓪᓗᒋᑦ ᐃᓗᐊᖅᓯᒋᐊᕈᑎᑦ, ᐊᐅᓚᑕᐅᓃᑦ, ᐊᒻᒪ ᐱᕙᓪᓕᖅᑎᓐᓃᑦ ᐱᔭᐅᓃᑦ, ᐊᒃᑐᐊᓂᕋᓗᐃᑦ ᐱᓂᐊᕋᓱᒋᔭᐅᔪᑦ ᐳᒃᑭᓐᓂᖏᑦ ᐊᖏᓂᖏᑦ, ᐊᑯᑦᑐᔪᓂᑦ ᐊᑯᓚᐃᓐᓃᑦ ᐊᒻᒪ ᐅᑎᖅᑎᑕᕐᓃᑦ.
- ᓄᓇᑉ ᖃᖓᓂ ᐃᒪᖅ ᐊᒻᒪ ᓄᓇᕗᓗᐃᑦ ᐊᑲᐅᓂᖏᑦ ᐊᒃᑐᐊᔭᐅᓚᕐᒥᔪᑦ ᓴᓗᒪᐃᓪᕿᑎᑦ ᐃᖑᑎᑕᐅᔪᓂᑦ ᑰᒃᑐᓂᑦ ᐅᓚᐱᔅᖅᑕᐅᔪᓂᑦ ᖃᖓᓂ, ᓴᓇᕖᐅᔪᑦ ᐃᓂᖏᓐᓂᑦ, ᓴᐳᓯᖅᓯᒪᔪᑦ ᐃᓂᖏᓐᓂᑦ, ᐊᒻᒪ ᓄᖑᓪᓚᖅᐸᓕᐊᓂᕐᓂᑦ ᐊᒻᒪ ᓄᓇᕗᓗᐃᑦ ᒥᐅᓂᙵᓂᖏᓐᓂᑦ ᐱᔾᔪᑎᖏᑦ. ᓴᑦᕿᐅᒪᔪᑦ ᐅᔭᖃᑦ ᐊᒻᒪ ᐃᓗᑦᑐᖅᑎᒐᖅᓃᑦ ᓄᓇᑦ ᐱᔾᔪᑕᐅᔪᓇᕐᒥᔪᑦ ᐊᑯᔾᔪᑕᐅᓂᖅ ᓴᕕᑦ ᐅᕝᕗᓐᓂᓃᑦ ᓯᕈᐃᓚᕐᓃᑦ, ᐊᒻᒪ ᖃᖅᑕᕐᓃᑦ ᓴᑦᕿᖅᑎᑦᑎᔪᓇᖅᑐᑦ ᓇᐃᑦᑐᕈᑎᑦ ᐃᓚᖏᑦ. ᑭᖑᐊᒍᑦ ᐊᑐᕆᖃᖅᑎᓪᓗᒋᑦ ᐃᓗᐊᖅᓯᒋᐊᕈᑎᑦ, ᐊᐅᓚᑕᐅᓃᑦ, ᐊᒻᒪ ᐱᕙᓪᓕᖅᑎᓐᓃᑦ ᐱᔭᐅᓃᑦ, ᐊᒃᑐᐊᓂᕋᓗᐃᒃ ᐱᓂᐊᕋᓱᒋᔭᐅᔪᑦ ᐳᒃᑭᓐᓂᖏᑦ ᐊᖏᓂᖏᑦ, ᐊᑯᑦᑐᔪᓂᑦ ᐊᑯᓚᐃᓐᓃᑦ ᐊᒻᒪ ᐅᑎᖅᑎᑕᕐᓃᑦ.

ᐊᓯᔾᔨᕐᓂᖏᑦ ᒪᓂᖃᒥᑦ ᐃᒪᖅ ᐊᑲᐅᓂᖏᑦ:

- ᐃᑦᑲᑦᑐᑦ ᒪᓂᖃᒥ ᐃᒪᐃᑦ ᖃᓄᓇᓕᔪᓇᖅᑐᑦ ᐊᒥᓱᓄᑦ ᐊᔾᔨᖏᓐᓄᑦ ᐊᑉᕐᑯᑕᐅᓃᑦ ᐱᑉᐳᒍ ᓄᓇ ᖃᖓᓂ ᐃᒪᖅ, ᐊᑯᓐᓂᖏᑦ ᐊᒃᑐᐊᔭᐅᔪᓄᑦ ᓄᓇ ᖃᖓᓂ ᐃᒪᕐᒧᑦ ᐅᕝᕗᓐᓂᓃᑦ ᑰᖕᓂᖏᑦ ᐊᓯᐊᖑᕈᑕᐅᓂᖅ ᒪᓂᖃᒥ ᐃᒪᖅ ᐊᑲᐅᓂᖓ. ᐃᑎᔪᑦ ᒪᓂᖃᒥ ᐃᒪᖅ ᐊᖏᓂᖅᓴᒥᒃ ᓴᐳᓯᒪᔪᑦ ᐃᕝᔪᔪᒥᑦ ᕿᕐᑯᒪᐃᓐᓇᕐᓂᖅ ᑮᓪᓕᕈᑕᐅᔪᖅ ᐊᓐᓄᑦ ᐊᑯᑕᐅᓂᖓᓄᑦ. ᐊᑐᕋᔭᖅᑐᖅ ᐊᓯᐊᖑᕐᓃᑦ ᒪᓂᖃᒥ ᐃᒪᖅ ᐊᖏᓂᖓ ᖃᐅᔨᓴᖅᑕᐅᙱᑦᑐᑦ ᐱᑉᐳᒍ ᐱᑕᖃᙱᓐᓂᖓ ᒪᓂᖃᒥ ᐃᒪᖅ ᐊᒧᔭᐅᓂᖓ ᐸᕐᓇᒃᑕᐅᔪᖅ ᐆᒧᖓ ᐱᓕᕆᐊᖑᔪᖅ.

## VS.7.1.3 ᑲᑎᑉᐸᓪᓕᐊᔪᑦ ᐊᒃᑑᑎᔪᑦ

ᑖᒻᓇ ᐱᓕᕆᐊᖑᔫᑉ ᑲᑎᖅᓱᕐᓂᖏᑦ ᐊᒃᑐᐊᓂᑯᐃᑦ ᓄᓇ ᖃᖓᓂ ᐃᒪᖅ, ᒪᓂᖃᓂ ᐃᒪᖅ, ᐊᒻᒪ ᓄᓇᕗᓗᐃᑦ ᐊᑲᐅᓂᖏᑦ ᖃᓄᓇᔾᔪᑎᓕᖏᑦ ᐳᒃᑭᑦᑐᖅ ᐊᒃᑐᐊᔾᔪᑎᑦ, ᐅᑎᖅᑎᓐᓃᑦ, ᐊᒻᒪ ᓄᓇᓕᕐᑯᑎᓄᑦ ᑭᓪᓕᖃᕐᓃᑦ ᑖᑉᑯᐊ LAA. ᑲᑎᖅᓱᕐᓃᑦ ᐊᒃᑐᐊᓃᑦ ᓯᐊᒪᒍᑕᐅᓂᕐᓄᑦ ᕿᕐᑯᒪᐃᓐᓇᕐᓃᑦ ᑕᒪᒃᑯᓇᓂ ᐃᓗᑭᑦᑐᓂ ᒪᓂᖄᑉ ᐃᓗᖓᓂ ᐅᑎᖅᑎᑕᐅᔪᓇᖅᑐᑦ ᑭᓯᐊᓂᒃ ᓂᕆᐅᓇᙱᑦᑐᑦ ᐊᒃᑐᐊᓃᑦ ᐃᒪᖅ ᐊᑲᐅᓂᖓᓄᑦ. ᑕᓗᒃᑖᖏᓐᓄᑦ, ᐱᑉᐳᒍ ᒥᑭᔪᖅ ᐃᓚᓕᐅᑎᓂᖏᑦ ᐱᓕᕆᐊᖑᔪᖅ ᐊᒃᑐᐊᓃᑦ ᑲᑎᖅᓱᕐᓃᑦ ᐱᑕᖃᕋᓗᖏᑦ ᐊᒃᑐᐊᓃᑦ ᒪᓂᖃᒥ ᐃᒪᖅ ᐊᖏᓂᖓ ᐊᒻᒪ ᐊᑲᐅᓂᖓ, ᐊᒻᒪ ᓄᓇᕗᓗᐃᑦ ᐊᑲᐅᓂᖓ ᐃᓗᐊᓂ ᑕᒪᓇ RAA ᐊᒻᒪᓗᑦᑕᐅᖅ ᓂᕈᐅᕆᔭᐅᓂᖓᓄᑦ ᐃᓗᐊᖅᓯᒋᐊᕈᑎᑦ ᐱᔾᔪᑎᑦ ᑖᑉᑯᓄᖓ ᐱᓕᕆᐊᖑᔪᖅ ᐊᒻᒪ ᐃᓗᐊᖅᓯᒋᐊᕐᓂᖏᑦ ᐊᑐᓕᖅᑐᒃᓴᑦ ᐊᓯᖏᓐᓂᑦ ᐱᓕᕆᐊᖑᔪᑦ ᐊᒻᒪ ᐱᓕᕆᓂᖏᑦ ᑖᑉᑯᓇᓂ RAA, ᑲᑎᖅᓱᕐᓂᖏᑦ ᐊᒃᑐᐊᓃᑦ ᓂᕈᐅᕆᔭᐅᔪᑦ ᐊᖏᓗᐊᙳᖏᑦᑐᑦ.

## VS.7.1.4 ᐊᖏᓂᖓ

ᑭᖑᐊᒍᑦ ᐃᓗᐊᖅᓯᒋᐊᕈᑎᑦ, ᐊᒃᑐᐊᕋᓗᓐᓃᑦ ᐃᒪᖃᕐᓂᐅᔪᓄᑦ ᓇᓚᐅᑦᑕᐅᔪᑦ ᐊᖏᓗᐊᕋᔭᙱᓐᓂᖏᑦ. ᐊᓯᐊᖑᕐᓃᑦ ᒪᓂᖃᒥ ᐃᒪᖅ ᐊᖏᓂᖓ, ᒪᓂᖃᒥ ᐃᒪᖅ ᐊᒻᒪ ᓄᓇᕗᓗᐃᑦ ᐊᑲᐅᓂᖏᑦ, ᐊᒻᒪ ᓄᓇᒥ ᐃᒪᖅᑕᐃᑦ ᐊᑲᐅᓂᖏᑦ ᓂᕈᐅᕆᔭᐅᙱᑦᑐᑦ ᐊᓯᔾᔨᕈᑕᐅᓃᑦ ᐅᖓᑖᒍᑦ ᐃᓕᑦᑯᓯᖏᑦ ᐱᒻᒪᕆᐅᑉᔭᕐᒪᖁᖏᑦ ᓯᓚᑖᓂ PDA. ᑲᑎᖅᓱᖅᑯᕐᑦ ᐊᒃᑐᐊᓃᑦ ᓇᓚᐅᑕᐅᓇᓱᐊᕐᓂᖏᑦᓗ ᐊᖏᓗᐊᙱᓐᓇᓱᒋᓂᖏᑦ.

### VS.7.1.5 ᐊᒃᑐᐃᓗᐊᖅᑕᐃᓕᑎᑦᑎᓂᖅ, ᐊᐅᓚᑦᑎᓂᖅ, ᐊᒻᒪ ᐱᐅᓯᕆᐊᖅᑎᑦᑎᓂᖅ

ᑖᒻᓇ ᐱᓕᕆᐊᖅ ᐊᑐᕋᔭᕐᒥᔭᕆᑦ ᓴᓇᔾᔪᓯᒃᓴᓕᐅᕐᓂᑦ, ᐊᐅᓚᔾᔪᑎᕆᑦ ᒥᐅᓂᕆᔾᔪᑎᑦ, ᐊᒻᒪ ᒥᐊᓂᕆᓂᕆᑦ ᐱᓕᕆᔾᔪᑎᑦ ᐱᑦᑕᐃᓕᒫᓂᕆᑦ ᐅᕝᕙᓘᓐᓂᑦ ᒥᒃᓱᕆᐊᕐᓂᕆᑦ ᐊᒃᑐᐊᓇᔭᕐᓂᑦ ᐃᒥᒐᐅᔪᖕᓇᖅᑐᓄᑦ ᐃᒪᕐᑳᓂᐅᔪᑦ. ᐱᓕᕆᐊᕚᓪᓗᐊᑕᕐᓂᐊᖅᑐᑦ ᐅᑯᐊᖑᔪᑦ:

- ᓴᓇᔾᔪᓯᒃᓴᓕᐅᕐᓂᕆᑦ ᓱᐸᓗᑦ, ᐃᑳᕈᑎᑦ, ᐊᒻᒪ ᑰᒡᕕᕆᑦ ᖃᓄᓇᓐᓂᕆᓐᓄᑦ ᐃᓘᐊᖅᓯᓯᒪᓂᕆᓐᓄᑦ ᐃᓕᑦᑯᓲᑦ ᑰᒡᕕᕆᑦ ᐱᑦᑯᓲᑦ ᐊᒻᒪ ᒥᒃᓱᕆᐊᕐᓂᕆᑦ ᑰᒐᐅᔭᑦ ᖁᓕᖓᓂᑦ ᑕᓯᕋᓕᖅᑐᕐᓂᕆᑦ ᐅᕝᕙᓘᓐᓂᑦ ᐊᑎᖅᐸᓂ ᐃᓱᖅᓯᑕᕐᓂᑦ
- ᐊᑐᓕᖅᑎᓐᓂᖅ ᓄᖑᓚᖅᐸᓪᓕᐊᓂᑦ ᐊᒻᒪ ᓄᓇᕋᓗᒃᑕᖅᑲᓕᕐᓂᑦ ᒥᐊᓂᕆᓂᕆᑦ ᐱᔾᔪᑎᑦ ᐊᑐᖅᑎᓪᓗᕆᑦ ᑰᒐᐅᔭᕐᓂ ᓴᓇᓂᑦ ᐊᒻᒪ ᓯᕕᖓᓂᑦ
- ᐃᓕᐅᕐᑲᖏᓂ ᑐᐊᐸᓕᐊᑦ ᐊᑐᕐᑯᔭᑦ ᑰᒡᕕᒃᓴᖓ ᐊᒻᒪ ᓄᓇᕙᓗᐃᑦ ᐊᐅᓚᑕᐅᓂᖓ ᐸᕐᓇᐅᑎᑦ
- ᐃᓕᐅᕐᑲᕐᕕ ᓴᕖᑦ ᒪᕐᑭᓂᕆᑦ/ᓱᕈᖅᓯᓚᑦ ᐅᔭᕐᑲᓂᑦ ᑰᕕᑦ (ML/ARD) ᐊᐅᓚᑕᐅᓂᖅ ᐸᕐᓇᐅᑦ ᐃᓚᕐᑲᖅᑐᑦ ᐊᐅᓚᑕᐅᓂᖅ ML/ARD ᓱᓇᑦ ᓴᑦᕿᐅᒪᓂᖅ ᓴᓇᔭᐅᑎᓪᓗᒍ (ᐆᒃᑐᑎᒋᓗᒍ, ᐊᑉᕐᑯᑦ ᑭᕕᐅᑎᖓ, ᑐᙵᕖᑦ, ᐃᓗᑐᓂᕐᑲᕐᕖᑦ). ᑭᑐᓕᒻᒥᑦ ᐅᔭᕋᕐᑲᕐᓃᑦ ᐊᑐᕐᓂᕆᓐᓄᑦ ᕐᑯᓚᓄ ᐃᒪᐅᒃᑲᒃᑕᐅᕐᕖᑦ ᐱᔾᔪᑕᐅᔪᒪᔪᑦ ᓱᕈᐃᓚᑦ ᐅᔭᕐᑲᑦ ᑰᕕᑦ/ᓴᕖᑦ ᒪᕐᑮᓃᑦ ᐆᒃᑐᕋᕐᓃᑦ, ᑭᓯᒥᐅᑎᓪᓗᒍ ᓈᒻᒪᒋᓐᓂᑦ ᓱᓇᑦ ᐊᑐᕐᓂᕆᑦ ᓴᓇᓂᕐᒎᑦ.
- ᒥᐊᓂᕆᓂᕆᑦ ᓴᓇᔭᐅᑎᓪᓗᒍ ᓇᓗᓇᐃᖅᑐᕆᐊᕆᑦ ᐃᒪᖅ ᐊᑲᐅᓂᖓ, ᑰᕕᑦ ᖃᓄᓇᓐᓂᕆᑦ, ᐊᒻᒪ ᑰᕕᐅᔪᑦ ᐊᑐᑦᑎᐊᕐᓂᕆᑦ
- ᐊᑐᖅᓗᒋᑦ ᐊᑐᒐᓕᖅᐸᓪᓕᐊᓂᖅ ᐊᐅᓚᑕᐅᓃᑦ ᐃᓘᐊᖅᓴᕐᓂᕆᑦ ᐱᑦᑯᓲᑦ ᒥᐊᓂᖅᓯᔾᔪᑎᑦ ᓇᓗᓇᐃᕐᓂᕆᑦ ᓂᕆᐅᓇᙱᑦᑐᑦ ᐊᓯᔾᔨᕐᓃᑦ

ᐅᕐᑲᕐᑲᑎᒋᕙᓪᓕᕐᓂᕆᑦ ᕿᑎᕐᒥᐅᓄᑦ, ᐊᓯᕆᑦ ᓄᓇᕐᑲᖅᑳᖅᑐᑦ ᐃᓚᒋᑦ, ᐊᓯᕆᓪᓗ ᐊᒃᑐᐊᓇᔭᖅᑐᑦ ᓄᓇᓕᐅᔪᑦ ᓇᓗᓇᐃᑯᑕᐅᓂᐊᑦ ᐃᒪᕐᒧᑦ–ᑐᕋᖓᓂ ᐸᕐᓇᐃᔭᐃᓂᖅ, ᐱᕕᒃᓴᕆᑦ, ᒥᐅᓂᕆᓂᕆᑦ, ᐊᒻᒪ ᐊᐅᓚᑕᐅᓂᕆᑦ ᐊᑐᒍᑦ ᐱᓕᕆᐊᖑᔪᖅ ᐊᑐᖅᑕᐅᓂᖓᓂ.

## VS.7.2 ᐃᒪᑦᑎᐊᕙᒃᑐᑦ ᐃᕐᑲᓗᐃᑦ ᐊᒻᒪ ᐃᕐᑲᓗᕐᑲᕐᓂᐅᔪᑦ

ᐅᓇ ᐃᒪᑦᑎᐊᕙᒃᑐᑦ ᐃᕐᑲᓗᐃᑦ ᐊᒻᒪ ᐃᕐᑲᓗᕐᑲᕐᓂᐅᔪᑦ VC ᐃᓚᒋᑦ ᐃᕐᑲᓗᐃᑦ ᐊᒻᒪ ᐃᕐᑲᓗᕐᑲᕐᓂᐅᔪᑦ ᐅᓐᓂᖅᑐᕐᓂᕆᑎᒍᑦ ᑖᑉᑯᐊ *ᐃᕐᑲᓗᓕᕐᑯᑎᑦ ᐱᕐᑯᔭᑦ* ᐊᒻᒪᓗᑦᑕᐅᖅ ᐃᒪᕐᒥᐅᑕᑦ ᐱᕈᖅᓯᐊᑦ ᐊᒻᒪ ᐆᒪᔪᕋᓗᐃᑦ ᕿᒥᕐᓗᕐᑲᙳᕆᑦᑐᑦ, ᐊᑐᕐᓂᕆᓐᓄᑦ ᐃᒪᑦᑎᐊᕙᐃᑦ.

### VS.7.2.1 ᐱᒋᐊᕐᕕᖓ

ᐃᒪᑦᑎᐊᕙᒃᑐᑦ ᐃᕐᑲᓗᐃᑦ ᐊᒻᒪ ᐃᕐᑲᓗᕐᑲᕐᓂᐅᔪᑦ ᑕᒫᓂ LAA ᓱᓂᐅᒪᐃᑦᑐᑦ ᐊᕆᓂᖅᓴᒥᒃ ᐃᓕᑦᑯᓱᕆᓐᓄᑦ ᖃᓄᓇᓐᓃᑦ, ᐃᑲᔪᖅᑐᕐᓂᕆᑦ ᐊᓪᓚᑦᕿᑦ ᓄᓇᓕᐅᔪᑦ ᐃᕐᑲᓗᕐᑲᕐᓃᑦ ᐆᒪᔪᕋᓗᐃᑦ ᐊᓪᓚᑦᕿᒃᑐᑦ ᓱᒥᑐᐃᓇᖅ ᐃᒪᕐᑲᕐᓂᐅᔪᓂ, ᐃᓚᐅᑎᓪᓗᕆᑦ ᐃᓕᑦᑯᓯᓕᕐᑯᑎᑦ ᐊᑐᒻᒪᕆᖕᓂᕆᑦ ᑕᒪᒃᑯᐊᑐᑦ ᐃᕐᑲᓗᒃᐲᑦ, ᑕᓯᕐᓂ ᐃᓗᕋᕐᔪᐃᑦ, ᓱᓗᒃᐸᐅᒐᐃᑦ, ᑎᒃᑖᓕᑦ, ᐊᒻᒪ ᑲᐃᕝᔭᕆᒃᑐᑦ ᑲᕕᓯᑏᑦ. ᑕᒪᒃᑯᐊ ᐆᒪᔪᕋᓗᐃᑦ ᐊᑐᒻᒪᕆᒃᑐᑦ ᐆᒪᔾᔪᑕᐅᔪᑦ ᓂᕿᒋᓂᕆᑦ ᑕᒪᒃᑯᓄᖓ ᐃᓄᐃᑦ ᓄᓇᓕᐅᔪᑦ. ᓇᔪᒐᐅᕙᒃᑐᑦ ᖃᓄᓇᓐᓂᕆᑦ ᐊᓪᓚᑦᕿᒃᑐᑦ ᐊᕆᔪᒥᒃ ᕿᕐᑯᒪᐃᓇᕐᓂᐅᔪᓂᑦ ᑰᒐᐃᑦ ᐃᑲᑦᑐᓄᑦ ᓇᑎᕐᓇᕐᑲᕐᓃᑦ ᑰᒐᐅᔭᑦ, ᑕᓲᑦ, ᐊᒻᒪ ᐊᑕᔾᔪᑎᔪᑦ ᑕᓯᕋᐃᑦ. ᐃᕐᑲᓗᐃᑦ ᓇᔪᖅᐸᒃᑕᕆᑦ ᐊᑐᕐᓃᑦ ᐊᓪᓚᑦᕿᑦ ᓈᓱᓇᐸᓗᕆᑦ ᐅᑭᐅᐸ ᐃᓚᖓᓄᑦ ᑰᕕᐅᕙᕆᓂᕆᑦ, ᒪᓴᒃᐸᓪᓕᐊᓂᕆᑦ, ᓯᑯ ᐃᕝᔪᓂᕆᑦ, ᐊᒻᒪ ᐃᒪᖅ ᐃᑎᓂᕆᑦ. ᑰᕕᐅᕙᒃᑐᑦ ᐱᓂᖅᓴᐅᔪᑦ ᐅᑭᐅᐸ ᐃᓚᖓᓄᑦ ᐊᒻᒪ ᐱᑎᑕᐅᔪᑦ ᐊᐳᑦ ᐊᐅᒃᑐᕐᓂᖓᓄᑦ, ᓯᓚᓗᕆᓂᖓᓄᑦ, ᐊᒻᒪ ᐱᕕᒋᔭᕆᑦ ᐃᒪᒃᓯᓯᒪᓂᑦ ᐊᐅᔭᖅ ᐊᑉᐸᖅᑎᓪᓗᒍ ᐊᒻᒪ ᐅᑭᐅᖓ. ᓯᕕᑭᑦᑐᓂᖓ ᐊᒻᒪ ᐊᑯᑦᑐᔪᓄᑦ ᑰᕕᑦ ᐱᔾᔪᑕᐅᕆᒥᔪᑦ ᑰᕕᐅᓂᕐᓄᑦ, ᐅᑭᐅᐸ ᐃᓚᖓᓄᑦ ᐊᑕᔾᔪᑎᕆᑦ, ᐊᒻᒪ ᓂᕆᕙᒃᑕᕆᓐᓄᑦ ᐱᔾᔪᑕᐅᓂᑦ ᐊᑉᐸᓂ ᑰᕕᕆᓐᓄᑦ ᐃᕐᑲᓗᕐᑲᕐᓂᐅᔪᓄᑦ. ᑕᒪᓗᒃᑖᕆᑦ, ᓱᓂᐅᒪᐃᓐᓃᑦ ᓇᔪᒐᐅᕙᒃᑐᑦ ᑖᑉᑯᓇᓂ LAA ᐊᑐᖅᐸᒃᓯᒪᓃᑦ ᒥᒃᓱᕆᐊᕈᑎᕆᑦ ᓴᓗᒪᐃᖅᑕᕐᓂᕆᑦ ᐅᓚᐱᓴᐅᑎᕆᑦ ᐊᒻᒪ ᐱᑕᕐᑲᖅᑎᓐᓂᑦ ᐅᕿᕙᕐᓃᑦ, ᐊᐅᓚᕐᓃᑦ, ᓱᕝᕕᐅᕐᓃᑦ, ᐊᒻᒪ ᐱᕈᖅᓴᕐᓃᑦ ᐱᔾᔪᑎᕆᑦ ᐃᑲᔪᖅᑐᕐᓃᑦ ᐊᑐᐃᓐᓇᕐᓂᖅ ᐊᖑᓇᓱᒃᓃᑦ ᕿᑎᕐᒥᐅᓂᑦ ᐊᒻᒪ ᐊᓯᕆᑦ ᓄᓇᕐᑲᖅᑳᖅᑐᑦ ᐃᓚᖁᑦ.

## VS.7.2.2 ᐱᓕᕆᐊᒥᑦ ᐊᒃᑐᐃᔾᔪᑏᑦ

ᑖᓐᓇ ᖃᐅᔨᓴᕐᓂᖏᑦ ᐱᑎᓐᓂᖏᑦ ᒪᕐᕉᖕᓂᑦ ᐊᑐᕋᔭᕐᓃᑦ ᐱᓕᕆᐊᖑᔪᖅ–ᑐᕌᖕᒐᓃᑦ ᐊᒃᑐᐊᔭᖏᑦ ᐃᒪᕐᑎᐊᕝᕙᒃᑐᑦ ᐃᖃᓗᐃᑦ ᐊᒻᒪ ᐃᖃᓗᐃᑦ ᓇᔪᖅᐸᒃᓴᖏᓐᓂ:

ᐊᓯᐊᖑᕐᓃᑦ ᐃᖃᓗᐃᑦ ᓇᔪᖅᐸᒃᑕᖏᑦ:

- ᐱᓕᕆᐊᖑᔪᖅ ᓱᓕᓃᑦ ᐊᓯᔾᔨᕈᑕᐅᔪᓐᓇᖅᑐᑦ, ᐅᓚᐱᓴᕐᓃᑦ, ᐅᕝᕙᓘᓐᓃᑦ ᐲᕐᓂᖏᑦ ᐃᖃᓗᐃᑦ ᓇᔪᖅᐸᒃᑕᖏᑦ ᐱᑉᓗᒋᑦ ᑕᐅᑦᑐᖏᑦ ᐅᓚᐱᓴᕐᓃᑦ ᐃᒪᐃᑦ ᑰᒡᕙᖏᑦ, ᐊᓯᐊᖑᕐᓃᑦ ᑰᖕᓃᑦ ᐱᑦᑯᓰᑦ, ᐊᒻᒪ ᓴᓇᓂᖏᑦ ᐃᓕᓯᒪᐃᓇᖅᑐᒃᓴᑦ ᓴᓇᔭᐅᓃᑦ.
- ᐊᓯᐊᖑᕚᑎᑦ ᐃᒪᐅᑉ ᐊᖏᓂᖓᓄᑦ ᐃᑲᖅᑐᕐᕕᖕᓂ ᐅᕝᕙᓘᓐᓃᑦ ᐃᓗᐊᓂ ᒥᑭᔪᑦ ᑰᒡᕙᐅᓂᖏᑦ ᐱᓕᕆᔾᔪᑎᑦ ᖃᓄᓇᔾᔪᑕᐅᔪᓐᓇᕐᒥᔪᑦ ᐊᑐᕈᓐᓇᖅᑐᓂ ᐃᓚᐃᓐᓂᖅ ᐃᓅᓯᖅ ᐊᑐᖅᑕᖅᓂᖏᓐᓄᑦ.
- ᑭᖑᐊᒍᑦ ᐊᑐᖅᑕᐅᓂᖏᑦ ᐃᓗᐊᖅᓴᐅᑎᑦ, ᐊᐅᓚᔾᔪᑎᑦ, ᐊᒻᒪ ᐱᕗᓪᓕᕈᑎᑦ ᐱᔾᔪᑕᐅᓃᑦ, ᑖᒃᑯᐊ ᐊᒃᑐᐊᓂᕋᓗᐃᑦ ᐊᓯᐊᖑᕈᑎᓂᑦ ᐃᖃᓗᖃᕐᓂᐅᔪᓂᑦ ᐱᒃᑭᑦᑐᒥᒃ ᐊᓯᔾᔨᖅᑕᐅᓂᐅᔪᑦ ᐊᖏᓂᖏᓐᓄᑦ. ᑕᒪᒃᑯᐊ ᓯᕗᑐᓂᖓ ᑖᒃᑯᐊ ᐊᒃᑐᐊᓃᑦ ᐊᓪᓚᑦᑭᖅᓃᑦ ᓯᕗᑭᓐᓂᖏᓐᓄᑦ ᓯᕗᑐᔪᒧᑦ, ᐊᑯᖅᑐᑦ ᐊᒥᓯᑦᑕᕐᓂᖏᑦ ᐊᑐᖃᑦᑕᐃᓇᙱᓐᓂᖏᓐᓄᑦ ᓱᓕᓃᑦ, ᐊᒻᒪ ᑭᓪᓕᖃᕐᓂᖏᑦ ᑖᒃᑯᓄᖓ LAA. ᑖᓐᓇ ᐊᑐᕋᔭᕐᑯᙱᓐᓂᖓ ᐱᓕᕆᐊᖑᔪᖅ–ᑐᕌᖕᒐᓃᑦ ᐊᒃᑐᐊᓃᑦ ᐊᑐᖅᑐᑦ ᐊᑐᖅᑎᓪᓗᒍ ᐃᒃᐱᖕᓇᕐᓃᑦ ᐃᓅᓯᕐᒧᑦ ᑐᓪᓕᓇᖕᓂᑦ (ᐆᒃᑐᑎᒋᓗᒍ ᓱᕝᕙᐅᕐᕙᒋᓃᑦ) ᐊᓪᓚᑦᑭᒃᑐᑦ ᐃᒃᐱᖕᓇᕐᓃᑦᑐᑦ ᐃᒃᐱᖕᓇᓗᐊᖅᑐᓄᑦ. ᑕᒪᒃᑯᐊ ᐊᒃᑐᐊᓂᕋᓗᐃᑦ ᓂᕆᐅᓇᖅᑐᑦ ᐅᑎᖅᑎᓕᕐᓂᖏᑦ ᐃᓂᖏᓐᓄᑦ ᓴᓗᒪᖅᓴᒐᐅᔪᑦ (ᐆᒃᑐᑎᒋᓗᒍ ᐊᑐᑲᓇᖅᑐᑦ ᓴᓇᕙᐅᔪᑦ ᐅᕝᕙᓘᓐᓃᑦ ᐱᓚᕐᓂᖏᑦ ᑎᑭᑦᑕᕐᕙᑦ ᐊᑉᕐᑯᑎᑦ) ᑭᓯᐊᓂᒃ ᐅᑎᖅᑎᑕᐅᓚᑦ ᐊᑐᐃᓐᓇᓇᐊᒃᓴᖏᑦ ᐱᓕᕆᐊᖑᔪᖅ ᐃᓚᖏᓐᓄᑦ (ᐆᒃᑐᑎᒋᓗᒍ ᒥᑦᑕᕐᕕᑦ, ᐊᑉᕐᑯᑦ, ᑐᓚᒃᑕᕐᕕᒃ ᓴᓇᓂᖏᑦ).

ᐊᓯᐊᖑᕐᓂᖏᑦ ᐃᖃᓗᐃᑦ ᐋᓐᓂᐊᖅᑕᐃᓕᓂᖏᑦ, ᐊᓪᓕᕗᓪᓕᐊᓂᖅ ᐅᕝᕙᓘᓐᓃᑦ ᐋᓐᓂᐅᒪᓂᖅ:

- ᐊᓯᐊᖑᕐᓃᑦ ᐃᖃᓗᐃᑦ ᐋᓐᓂᐊᖅᑕᐃᓕᓂᖅ, ᐊᓪᓕᕗᓪᓕᐊᓂᖏᑦ, ᐅᕝᕙᓘᓐᓃᑦ ᐋᓐᓂᐅᒪᓂᖅ ᓂᕆᐅᒋᔭᐅᔪᑦ ᐱᑎᑦᑕᐅᓃᑦ ᐊᒃᑐᐊᓇᔭᖅᑐᓂᑦ ᐊᓯᐊᖑᕐᓃᑦ ᐃᒪᖅ ᐊᑲᐅᓂᖓᓄᑦ ᐱᑉᓗᒍ ᓄᓇᕙᓗᖃᕐᓃᑦ ᐃᓗᓕᐅᑎᓂᖏᑦ ᐊᒻᒪ ᐃᒪᖅ ᐊᑲᐅᓂᖓ ᐊᑯᔾᔪᑎᖏᑦ, ᑐᖅᑯᓃᑦ ᐃᖃᓗᐃᑦ ᐋᓐᓂᕐᓂᕐᒧᑦ ᐅᕝᕙᓘᓐᓃᑦ ᐊᔪᖅᓯᓐᓂᖏᑦ, ᓴᓇᓂᖏᑦ ᐃᒪᐅᑉ ᐃᓗᐊᓂ ᓂᐱᑐᓃᑦ, ᐊᒻᒪ ᐃᓚᕗᓪᓕᕐᓃᑦ ᐃᖃᓗᐃᑦ ᐊᒃᓯᕈᕐᓃᑦ.
- ᑭᖑᐊᒍᑦ ᐊᑐᓕᖃᖅᓗᒋᑦ ᐃᓗᐊᖅᓯᒋᐊᕈᑎᑦ, ᐊᐅᓚᔾᔪᑎᑦ, ᐊᒻᒪ ᐱᕗᓪᓕᕐᓃᑦ ᐱᔭᐅᓃᑦ, ᑖᒃᑯᐊ ᐊᒃᑐᐊᓂᕋᓗᐃᑦ ᐃᓱᒪᒋᔭᐅᔪᑦ ᓯᓪᓗᐊᙱᓐᓃᑦ, ᑭᓪᓕᖃᖅᓗᑎᒃ ᑖᒃᑯᓄᖓ LAA, ᐊᒻᒪ ᐊᑐᕐᓂᖏᑦ ᐊᒥᓯᐃᖅᑕᖅᓗᑎᒃ ᐊᑐᖃᑦᑕᕐᓂᖏᑦ ᓱᓕᓃᑦ. ᑖᒃᑯᐊ ᐱᕕᒋᔭᖏᑦ ᑕᒪᒃᑯᐊ ᐊᒃᑐᐊᕋᓗᖕᓃᑦ ᐊᓪᓚᑦᑭᖅᓂᐊᑦ ᓯᕗᑭᑦᑐᒥᑦ (ᐆᒃᑐᑎᒋᓗᒍ, ᓴᓇᔭᐅᓂᖓ ᐱᓕᕆᐊᑦ ᑭᓯᒥᒃ) ᓯᕗᑐᔪᒧᑦ (ᓇᓗᓇᐃᑉᑯᑕᓇᑉᓗᒍ, ᐅᐃᒍᓂᖏᑦ ᐊᑐᕐᓂᖏᓐᓄᑦ ᐊᐅᓚᑕᐅᓃᑦ ᐊᒻᒪ ᐋᖅᑭᒃᓯᒪᓂᖏᑦ ᐱᓕᕆᔾᔪᑎᑦ). ᑖᒃᑯᐊ ᐊᑐᕋᔭᕐᓂᖏᑦ ᐊᒃᑐᐊᓃᑦ ᐊᑐᖅᑕᐅᓃᑦ ᐊᑐᕐᓂᖏᓐᓄᑦ ᐃᒃᐱᒋᔪᓐᓇᕐᓃᑦ ᐆᒪᓂᖏᑦ (ᐆᒃᑐᑎᒋᓗᒍ ᓱᕝᕙᐅᕐᓂᖏᓐᓄᑦ) ᐊᓪᓚᑦᑭᖅᓃᑦ ᐃᒃᐱᒋᙱᓐᓂᖏᑦ ᐃᒃᐱᒋᓗᐊᕐᓂᖏᓐᓄᑦ. ᑕᒪᒃᑯᐊ ᐊᒃᑐᐊᓂᕋᓗᐃᑦ ᓂᕆᐅᒋᔭᐅᔪᑦ ᐅᑎᖅᑎᑕᐅᓚᕐᓃᑦ, ᐱᑉᓗᒍ ᐊᑐᙱᓐᓂᖏᑦ ᑐᖅᑯᓃᑦ ᐃᖃᓗᐃᑦ ᓱᓚᖏᑦ, ᑕᒪᒃᑯᐊ ᐊᑐᐃᓐᓇᖅᑐᑦ ᐊᑐᓂᖅᓗᑎᒃ ᐱᑉᓗᒋᑦ ᑭᓯᐊᓂᒃ ᐅᑎᖅᑎᔪᓐᓇᕐᓃᑦ ᐊᒥᓲᑎᒋᓂᖏᓐᓄᑦ.

## VS.7.2.3 ᑲᑎᑉᐸᓪᓕᐊᔪᑦ ᐊᒃᑑᑎᔪᑦ

ᑲᑎᖅᓱᕐᓃᑦ ᐊᒃᑐᐊᓃᑦ ᐃᒪᕐᑎᐊᕝᕙᒃᑐᑦ ᐃᖃᓗᐃᑦ ᐊᒻᒪ ᐃᖃᓗᖃᕐᓂᐅᔪᑦ ᓂᕆᐅᒋᔭᐅᔪᑦ ᐊᑯᖓᓂ ᐱᓕᕆᐊᖑᔪᖅ ᐊᒻᒪ ᓇᓗᓇᐃᕐᓂᖏᑦ ᑕᑯᒃᓴᐅᓃᑦ ᐱᓕᕆᓃᑦ ᑕᕝᕙᓂ RAA. ᑕᒪᓗᒃᑖᖏᓐᓄᑦ, ᑲᑎᓪᓗᒋᑦ ᐊᒃᑐᐊᓃᑦ ᓂᕆᐅᒋᔭᐅᔪᑦ ᐳᒃᑭᓐᓂᖏᑦ ᐊᖏᓃᑦ ᐊᓯᔾᔨᕐᓂᖏᓐᓄᑦ ᐃᖃᓗᐃᑦ ᐋᓐᓂᐊᖅᑕᐃᓕᓃᑦ, ᐊᓪᓕᕗᓪᓕᐊᓃᑦ, ᐅᕝᕙᓘᓐᓃᑦ ᐋᓐᓂᐅᒪᓃᑦ ᐃᓚᒋᐊᕐᓂᖏᓐᓄᑦ ᐃᖃᓗᖃᕐᓃᑦ ᐊᒻᒪ ᐊᓯᔾᔨᕐᓃᑦ ᐃᒪᖅ ᐊᑲᐅᓂᖓᓄᑦ ᐊᒻᒪ ᓯᓗᐊᙱᓐᓂᖅ ᐊᖏᓃᑦ ᐊᓯᔾᔨᕐᓃᑦ ᐃᖃᓗᖃᕐᓂᐅᔪᓄᑦ ᑕᒻᒪᐃᓂᖏᓐᓂᑦ ᓇᔪᖅᑕᐅᕙᒃᑐᑦ ᐅᓕᑦᑕᕐᕕᖏᓐᓄᑦ ᐊᒻᒪ ᐱᑕᖃᕐᓃᑦ ᐱᑎᖃᕈᐃᕐᓂᖏᑦ. ᑕᒪᒃᑯᐊ ᓄᓇᓕᕐᑯᑎᑦ ᐱᖃᕐᓃᑦ ᐊᒃᑐᐊᓂᖏᓐᓄᑦ ᐱᓯᒪᓂᐊᑦ RAA ᑭᓯᐊᓂᒃ ᐃᓂᖃᕐᓂᖏᑦ ᑕᑯᒃᓴᐅᓂᖏᓐᓄᑦ ᐱᓕᕆᓃᑦ ᓄᓇᓕᖕᓂ ᐃᓂᖏᓐᓄᑦ. ᑖᒃᑯᐊ ᐊᑐᕋᔭᕐᓃᑦ ᑲᑎᖅᓱᕐᕙᓗᐃᑦ ᐊᒃᑐᐊᓃᑦ ᓯᕗᑐᔪᒧᕐᓂᐊᑦ ᐊᑐᖅᑎᓪᓗᒍ ᐱᑉᓗᒍ ᓯᕗᑐᔪᒧᑦ ᐊᐅᓚᓃᑦ ᑕᑯᒃᓴᐅᓃᑦ ᐱᓕᕆᐊᑦ, ᐊᒻᒪ ᐊᑐᕐᓂᐊᑦ ᐱᓕᕆᖅᑦᑕᑐᐊᙱᓐᓂᖏᑦ ᓱᓕᓃᑦ, ᐊᒻᒪ ᐊᓪᓚᑦᑭᖅᓃᑦ ᐅᑎᖅᑕᐅᓂᖏᓐᓂᑦ (ᐆᒃᑐᑎᒋᓗᒍ ᐊᑐᑲᐃᓇᕐᓂᖅ

ᓴᓇᕕᐅᓂᑦ, ᐃᒪᖅ ᐊᑉᖁᑕᐅᓂᑦ ᐃᑲᖅᑐᕐᕕᑦ ᐃᖃᓗᖃᖏᓂᐅᔪᓂᑦ) ᐅᑎᖅᑎᑕᐅᓂᖏᓐᓄᑦ (ᓇᓗᓇᐃᑉᑯᑕᕆᓗᒍ, ᓴᓇᓯᐊᑕᐅᖏᓐᓇᖅᓂᖏᑦ ᐅᖓᕝᑯᑕᖅᓂᖏᑦ ᐃᖃᓗᖃᖏᓂᐅᔪᑦ).

## VS.7.2.4 ᐊᖏᓂᖓ

ᑖᒃᓇ ᐱᓕᕆᐊᖑᔪᖅ ᐊᑐᖅᐸᓪᓕᐊᓂᐊᖅᑕᖓ ᐱᑦᑕᐃᓕᓂᖅ ᐃᓗᐊᖅᓯᓂᖏᓪᓗ ᐱᔭᐅᓃᑦ, ᐃᓚᐅᑎᓪᓗᒋᑦ ᐱᔭᐅᓃᑦ ᐃᓗᐊᖅᓯᒋᐊᕈᑎᑦ ᓇᔪᖅᑕᐅᕙᒃᑐᑦ ᑕᒻᒪᐃᓂᖏᑦ, ᐱᔭᖃᖅᐸᑦ ᐃᓗᐊᖅᓯᔾᔪᑎᑦ ᐊᒃᑐᐊᖅᑕᐃᓕᓚᐃᓐᓂᖏᓐᓄᑦ. ᑖᑉᑯᐊ ᐊᒃᑐᐊᓂᕋᓗᐃᑦ ᐃᖃᓗᐃᑦ ᐊᒻᒪ ᐃᖃᓗᖃᖏᓂᐅᔪᑦ ᑕᐃᒪᓇᐃᑦᑐᒥᒃ ᓂᕆᐅᒋᔭᐅᙱᑦᑐᑦ ᐱᔾᔪᑎᖏᑦ ᐆᒃᑐᕋᖅᑕᐅᔪᖕᓇᖅᑐᑦ ᐊᓯᔾᔨᕈᑎᑦ ᓴᓇᔭᐅᓂᖏᓐᓄᑦ ᑐᕌᖓᔪᑦ ᐃᖃᓗᐃᑦ ᐊᒥᓪᕋᖅᓂᖏᓐᓄᑦ, ᐃᓚᐅᑎᓪᓗᒋᑦ ᑕᒪᒃᑯᐊ ᐃᓕᑦᑯᓯᓕᖅᑯᑎᑦ ᐅᑯᐋᓐᓂᑦ ᐱᑦᑯᓰᑦ ᐊᑐᒻᒪᕆᖕᓂᖏᑦ ᖃᑎᖅᒥᐅᓄᑦ, ᐊᓯᖏᑦ ᓄᓇᖃᖅᑳᖅᑐᑦ ᐃᓚᒋᑦ, ᐅᑯᐋᓐᓂᑦ ᐊᓯᖏᑦ ᐊᒃᑐᐊᓇᔭᖅᑐᑦ ᓄᓇᓖᑦ, ᑕᐃᒪᐃᑦᑐᒥᒃ ᓂᕆᐅᓇᖅᑐᑦ ᓱᓗᐊᕐᕆᓐᓂᑦ. ᑲᑎᖅᓱᖅᓱᒋᑦ ᐊᒃᑐᐊᓂᑦ ᓇᓚᐅᑕᒐᐅᓇᓯᐊᖅᓂᖏᓪᓗ ᐊᖏᓗᐊᕐᕆᓐᓇᓯᒋᓂᖏᑦ.

## VS.7.2.5 ᐊᒃᑐᐃᓗᐊᖅᑕᐃᓕᑎᑦᑎᓂᖅ, ᐊᐅᓚᑦᑎᓂᖅ, ᐊᒻᒪ ᐱᐅᓯᒋᐊᖅᑎᑦᑎᓂᖅ

ᑖᒃᓇ ᐱᓕᕆᐊᖑᔪᖅ ᐊᑐᖅᓂᐊᖅᑕᖏᑦ ᓴᓇᓯᔪᓯᒃᓴᑦ ᐱᑦᖁᔾᔨᑦ, ᐊᐅᓚᓯᔪᑎᑦ ᒥᐊᓂᕆᓯᔪᑎᑦ, ᐊᒻᒪ ᒥᐊᓂᕆᓂᖏᑦ ᐱᓕᕆᓯᔪᑎᑦ ᐱᑦᑕᐃᓕᓂᖏᓐᓄᑦ ᐊᒃᑐᐊᓂᑦ ᐃᒪᑦᑎᐊᕙᒃᑐᖅ ᐃᖃᓗᐃᑦ ᐊᒻᒪ ᐃᖃᓗᖃᖏᓂᐅᔪᑦ. ᐱᓕᕆᐊᖑᓪᓗᐊᑕᖅᓂᐊᖅᑐᑦ ᐅᑯᐊᖑᕗᑦ:

- ᓴᓇᓯᔪᓯᒃᓴᖏᑦ ᐃᒪᐃᑦ ᐊᑉᖁᑎᖏᑦ ᐃᑲᖅᑐᕐᕕᑦ (ᓱᐸᓗᐃᑦ ᖁᓪᕕᑦ, ᐃᑳᕈᑎᑦ, ᐊᓯᖏᓪᓗ ᓴᓇᓯᒪᔪᑦ) ᐃᓗᐊᖅᓯᓯᒪᓂᖏᑦ ᐃᓕᑦᑯᓯᑦ ᖁᖏᓂᖏᑦ ᐱᑦᑯᓰᑦ, ᐃᖃᓗᐃᑦ ᐊᐅᓚᓂᖏᑦ, ᐊᒻᒪ ᓇᔪᖅᑕᐅᕙᒃᑐᑦ ᐊᑕᔾᔪᑎᖏᑦ.
- ᐊᑐᖅᓗᒍ ᓯᕗᐊᓂ ᐅᓚᐱᓴᖅᓂᖅ ᐃᓂᖏᑦ ᐱᓕᕆᔾᔪᑎᓄᑦ ᐊᒻᒪ ᓴᓇᕖᑦ ᐃᓕᓂᖏᑦ ᐊᑐᕈᒥᓇᕐᖓᑕ, ᐊᒻᒪ ᐋᖅᑭᐅᒪᓂᖏᑦ ᓇᐅᓯᒪᔪᕐᓗᐃᑦ, ᐊᔪᓇᙱᑦᑕᕐᖓᑦ.
- ᐊᑐᖅᓂᖏᑦ ᓄᖑᓪᓚᖅᐸᓪᓕᐊᓃᑦ ᐊᒻᒪ ᓄᓇᕙᓗᐃᑦ ᒥᐊᓂᕆᓂᖏᑦ ᐱᔭᐅᓃᑦ ᐊᑐᖅᑎᓪᓗᒍ ᖁᓚᐅᔭᓂ ᓴᓇᓃᑦ, ᓯᕕᖓᓃᑦ, ᐊᒻᒪ ᓴᓇᓃᑦ ᒥᒃᓵᒋᐊᖅᓂᖏᓐᓄᑦ ᓄᓇᕙᓗᐃᑦ ᐃᓗᐊᓄᒃᑕᖅᓂᑦ ᐃᖃᓗᖃᖏᓂᐅᔪᓄᑦ ᐃᒪᐃᑦ.
- ᓴᓇᓂᖏᑦ ᐃᒪᖅᓂ ᓱᓕᓃᑦ ᓯᓚᑎᖓᓂ ᐱᑦᑕᐃᓕᕕᐅᔪᑦ ᐱᓕᕆᓃᑦ ᐱᕕᒃᓴᖏᓐᓄᑦ, ᐃᓕᒃᖁᖅᑎᓐᓂᖏᑦ ᓴᓇᕕᖏᑦ ᐱᔭᖃᓕᕋᖓᑦ, ᐊᒻᒪ ᐋᖅᑭᒃᓯᒪᓂᖏᑦ ᖁᖕᓂᑦ ᐊᑉᐸᓂᖅ ᐊᑐᖅᑎᓪᓗᒍ ᐃᒪᐃᔭᐃᓂᑦ.
- ᐊᑐᖅᐸᓪᓕᐊᓂᖅ ᐃᖃᓗᐃᑦ ᐱᑕᖅᑕᐅᓂᖏᑦ ᐱᓕᕆᓯᔪᑎᑦ ᓯᕗᐊᓂ ᖁᓚᐅᔭᖅᓂ ᓴᓇᑦ, ᐱᓕᕆᓂᖏᑦ ᐊᔪᙱᓯᔪᑎᓕᖓᓂᑦ ᓴᓇᓃᑦ.
- ᐊᑐᖅᑎᓐᓂᖏᑦ ᐃᒻᒥᖅᑐᐃᕕᑦ ᐊᐅᓚᑕᐅᓂᑦ ᐱᑦᑯᓰᑦ, ᐃᓚᐅᑎᓪᓗᒍ ᓴᓗᒪᐃᕆᑉᑯᑎᓕᑦ ᐃᒥᖅᑐᐃᕕᑦ, ᒥᐊᓂᕆᓂᖏᑦ ᐃᒥᖅᑕᖅᓂᑦ ᐊᖏᓂᖏᑦ, ᐊᒻᒪ ᖁᓪᕕᑦ ᐊᒻᒪ ᓯᓚᓗᖕᓂᕐᒥᑦ ᐃᒪᖅ ᐊᐅᓚᑕᐅᓂᑦ.
- ᐊᑐᖅᐸᓪᓕᐊᓂᖏᑦ ᖃᖅᑕᐅᑎᑦ, ᑯᕕᒐᔭᖅᑐᑦ ᐊᑐᒐᒃᓴᓕᐅᖅᓂᑦ, ᐊᒻᒪ ᐳᑦᑎᐅᑎᑦᑕᐃᓕᑎᑦ ᐸᖅᓇᐅᑎᑦ ᒥᒃᓵᓯᒪᓂᖏᑦ ᓇᐃᑦᑐᐳᐃᓐᑕᖅᓂᑦ, ᓱᐳᐃᔪᖕᓇᖅᑐᑦ ᓱᓇᑦ, ᐊᒻᒪ ᓄᓇᕋᓗᓕᖅᑕᖅᓂᑦ.
- ᐅᒥᖕᓂᖓ ᐊᒻᒪ ᓴᓗᒪᖅᑎᒐᐅᓂᖓ ᐊᑐᑲᐃᓇᖅᑐᑦ ᑎᑭᑦᑕᖅᓂᑦ ᐊᑉᖁᑎᑦ, ᑐᐊᐸᒃᑕᖅᕕᑦ, ᐊᒻᒪ ᓴᓇᕕᐅᔪᑦ ᐃᓂᖏᑦ ᐊᑐᕆᐊᖃᕈᐃᕋᖓᑕ.
- ᖃᐅᔨᓴᖅᓂᖏᑦ ᐃᒪᐃᑦ ᖁᓪᕕᑦ ᐃᑲᖅᑐᕐᕕᑦ ᐊᒻᒪ ᓄᖑᓕᖅᓂᑦ ᐊᒻᒪ ᓄᓇᕙᓗᐃᑦ ᒥᐊᓂᕆᓂᖏᑦ ᐱᔾᔪᑎᑦ ᐊᑐᖅᑲᑦᑕᖅᓂᖏᑦ ᐊᒻᒪ ᐊᑐᖅᓂᖏᑦ ᐃᓗᐊᖅᓯᒋᐊᖅᓂᑦ ᓱᓕᓂᑦ, ᐱᔭᖃᕋᖓᑦ.
- ᐊᑐᖅᓱᒋᑦ ᐊᑐᓕᖅᓂᖏᑦ ᐊᐅᓚᑕᐅᓂᑦ, ᓄᑖᖑᖅᓂᑦ ᐱᑦᑯᓰᑦ ᒥᐊᓂᕆᔭᖅᐸᑕ ᓇᓗᓇᐃᖅᓂᖏᑦ ᓂᕆᐅᓇᕐᖏᑦᑐᑦ ᐊᒃᑐᐊᓂᑦ.

ᐱᒃᐸᑦ ᑲᓇᑕᒥ ᐃᒪᕐᒥᐅᑕᓕᕆᔩᑦ (DFO) ᑕᒪᒃᑯᐊ ᐱᓕᕆᐊᑦ ᐃᓚᒋᔭᖏᑦ ᖃᓄᕆᓐᓂᑦ ᓱᐳᐃᔪᖕᓇᖅᓂᖏᓐᓄᑦ ᐅᓚᐱᓴᖅᓂᑦ ᐅᑯᐋᓐᓂᑦ ᐊᓯᐳᖅᓂᖏᑦ (HADD) ᐃᖃᓗᖃᖏᓂᐅᔪᑦ ᐱᔭᖃᖅᓂᖏᑦ ᐱᔪᓇᐅᑎᑦ ᒪᓕᒃᓗᒋᑦ ᐃᖃᓗᓕᖅᑯᑎᑦ ᐱᖁᔭᑦ, ᑖᒃᓇ ᐱᓕᕆᐊᖑᔪᖅ ᐱᕙᓪᓕᐊᓂᐊᖅᑕᖓ ᐃᖃᓗᖃᖏᓂᐅᔪᖅ ᐃᓗᐊᖅᓯᒋᐊᕈᑎᖏᑦ ᐸᖅᓇᐅᑦ ᐊᑐᖅᓗᒍ ᐱᖃᑎᒋᖏᓂᑦ DFO, ᖃᑎᖅᒥᐅᑦ, ᐊᒻᒪ ᐊᓯᖏᑦ ᐊᒃᑐᐊᕐᔭᖅᓂᑦ ᓄᓇᓕᐅᔪᑦ.

## VS.7.3 ᐃᒪᕐᑎᐊᕙᐃᑦ ᐊᕙᑎᖏᑦ ᐊᑦᑐᐃᓂᖃᕐᓂᕐᒧᑦ ᑎᑎᕋᖅᓯᒪᔪᖅ

ᓇᓗᓇᐃᖅᑐᑎᑦ ᐊᑐᓚᖅᑐᓄᑦ ᖃᓄᖕᔪᐊᓕᐅᕆᓂᐊᖅᑐᑦ ᑖᓐᓇ ᖁᕐᓗᖅᑐᐊᕐᔫᑉ ᐊᑉᖁᑎᖓᓄᑦ ᐊᒻᒪ ᑐᓚᒃᑕᕐᕕᖓᓄᑦ ᐱᓕᕆᐊᖅ ᐃᒪᖃᕐᓂᐅᔪᓄᑦ, ᐊᒻᒪ ᐃᒪᕐᑎᐊᕙᒃᑐᑦ ᐃᖃᓗᐃᑦ ᐊᒻᒪ ᐃᖃᓗᖃᕐᓂᐅᔫᑦ ᓂᕆᐅᒥᕗᔫᑦ ᐊᑦᑐᐊᕋᓗᖕᓂᖏᑦ ᐊᒻᒪ ᑲᑎᖅᓱᕐᓂᖏᑦ ᐊᖏᕙᓪᓚᙱᓐᓂᑦ.

# VS.7 Résumé du volume – Portée de l’évaluation du milieu d’eau douce

Pour les Inuits, le milieu d’eau douce est une ressource essentielle sur laquelle ils comptent pour la chasse, les déplacements et la connexion à la terre. Les poissons d’eau douce font partie intégrante du régime saisonnier des Inuits et sont essentiels en période de pénurie alimentaire (Banci et Spicker 2024).

> *Les ekalok (les poissons) faisaient partie intégrante du régime saisonnier des Inuits, et étaient essentiels en période de pénurie alimentaire, surtout lorsque les caribous n’arrivaient pas en raison d’un changement de voie migratoire ou de zone de vêlage. Les gens pêchaient partout où ils installaient leurs campements et où ils se déplaçaient, principalement au printemps et à l’automne, ce qui correspondait à la migration de frai.* (Banci et Spicker 2024).

Au fil du temps, les Inuits et les détenteurs du savoir ont observé d’importants changements significatifs en matière de qualité et de disponibilité de l’eau. Cela comprend l’assèchement des sources, la baisse du niveau d’eau dans les lacs et les rivières, ainsi que des changements du goût de l’eau et de sa clarté de l’eau. Les Inuits attribuent ces modifications à un ensemble de changements climatiques, notamment la réduction des précipitations, la fonte du pergélisol et une contamination accrue causée par des activités industrielles telles que l’exploitation minière (KIA 2003). Le milieu d’eau douce revêt une importance écologique et socio-économique, soutenant les écosystèmes aquatiques et terrestres, la santé humaine, ainsi que l’utilisation traditionnelle des terres, des zones marines et des ressources.

West Kitikmeot Resources (WKR) a recueilli des renseignements de référence sur la situation en combinant la collecte de connaissances menée par les Inuits et collaborative (y compris le rapport sur les connaissances des Inuits propres au projet, établi à partir des renseignements de la base de données du Naonaiyaotit Traditional Knowledge Project [NTKP] et des ateliers du Groupe consultatif autochtone [IAG]), des renseignements publics provenant de groupes autochtones pris en compte dans le cadre du projet, ainsi que de la rétroaction sur la mobilisation communiquée par les Kitikmiuts, d’autres groupes autochtones et d’autres communautés potentiellement touchées, avec des études techniques recueillies par des méthodes scientifiques occidentales.

WKR a utilisé ce savoir intégré pour éclairer l’établissement des limites d’évaluation des projets et soutenir l’évaluation des effets du projet et des effets cumulatifs sur toutes les composantes valorisées. Le savoir inuit combiné ainsi que les renseignements scientifiques occidentaux ont également directement influencé la détermination de l’importance et la conception de mesures d’atténuation, de gestion et d’amélioration. Cette base de connaissances est essentielle pour garantir que l’évaluation du projet reflète les points de vue des Kitikmiuts, les expériences vécues et les conditions environnementales observées. Le partage continu du savoir, la collaboration et l’intégration de nouveaux renseignements tout au long de la durée du projet seront essentiels pour affiner les prévisions, améliorer la gestion adaptée et améliorer les résultats du projet pour les Inuits et autres communautés potentiellement concernées.

Le projet de la route et du port de Grays Bay (le « projet ») est un port en eaux profondes et un aménagement routier praticable en toute saison de 230 km proposé par West Kitikmeot Resources Corp. (WKR), situé dans la région de Kitikmeot au Nunavut. Le port sera situé dans le golfe Coronation, à environ 50 km au sud de la voie du passage du Nord-Ouest par l'Arctique, et reliera par route en toute saison le site fermé de la mine Jericho à la station Jericho, sur la rive nord-ouest du lac Contwoyto (NU). Chaque année, la route praticable en toute saison sera reliée toute la saison à la route hivernale qui va du lac Tibbitt au lac Contwoyt, officiellement appelée Tibbitt to Contwoyto Winter Road (TCWR). WKR a préparé un énoncé des répercussions pour cerner et évaluer les effets environnementaux et socio-économiques potentiels résultant du projet, qui répond aux exigences énoncées dans l'Accord du Nunavut et les lignes directrices préliminaires normalisées pour l'élaboration d'un Énoncé des répercussions environnementales (ERE) de la Commission du Nunavut chargée de l'examen des répercussions pour le projet de la route et du port de Grays Bay proposé par WKR (dossier CNER nº 24XN038; CNER 2026). Le présent volume de l'ERE présente l'évaluation des répercussions environnementales potentielles sur les ressources en eau, y compris la quantité d'eau de surface, la qualité des eaux de surface et des sédiments, ainsi que la qualité des eaux souterraines, les poissons d'eau douce et l'habitat des poissons.

Des limites spatiales et temporelles ont été établies pour soutenir la réalisation des évaluations des composantes valorisées (CV), éclairées par la compréhension actuelle des effets potentiels du projet et d'autres facteurs pertinents. Le secteur d'aménagement du projet (SAP) comprend l'emprise au sol de toutes les composantes du projet, y compris les perturbations permanentes et temporaires (par exemple, l'étendue de l'infrastructure du projet, le défrichement prévu et les zones de déblaiement). La zone d'évaluation locale (ZEL) est la zone maximale où les impacts environnementaux propres au projet peuvent être estimés de manière qualitative avec un degré raisonnable de précision et de confiance. Pour la CV des ressources en eau et la CV des poissons d'eau douce et de l'habitat des poissons, la ZEL a été définie comme une zone tampon de 1 km centrée sur le SAP. La ZEL comprend également une zone tampon de 100 m autour des SAP du port, de l'aérodrome de la station Jericho Station, ainsi qu'une extension au nord-ouest de la rivière Kennarctic à l'ouest du SAP de l'aérodrome et englobe le SAP de la route, y compris une zone s'étendant sur 100 m en amont et en aval de l'axe de la route.

La zone d'évaluation régionale (ZER) englobe le SAP et la ZEL et fournit un contexte régional expliquant comment les effets liés au projet peuvent influencer les CV respectives, ainsi que la manière dont ces effets peuvent interagir cumulativement avec ceux d'autres projets passés, présents ou raisonnablement prévisibles. Pour la CV des ressources en eau, la ZER comprend une zone tampon terrestre de 10 km autour du SAP et s'étend jusqu'au bassin versant de la rivière Kennarctic ainsi qu'au bassin versant sans nom qui se déverse dans l'océan Arctique. La ZER de la CV des poissons d'eau douce et de l'habitat des poissons comprend également une zone tampon terrestre de 10 km autour du SAP du port et de l'aérodrome, mais pour la portion routière de la ZER, elle inclut une zone tampon de 10 km autour du SAP pour les bassins versants du sud, ainsi que l'ensemble des bassins versants vers l'océan Arctique et de la rivière Kennarctic à l'extrémité nord du SAP.

# VS.7.1 Ressources en eau

Les ressources en eau ont été sélectionnées comme composante valorisée (CV) en raison du potentiel de répercussions négatives des activités du projet sur la qualité et la quantité d'eau de surface, la qualité des eaux souterraines et la qualité des sédiments. Ces répercussions négatives potentielles peuvent survenir pendant la phase de construction, d'exploitation et de maintenance, ou d'autres perturbations liées au projet qui modifient les processus hydrologiques naturels.

## VS.7.1.1 Base de référence

Les ressources en eau douce au sein de la ZEL demeurent en grande partie à l'état naturel. Les cours d'eau de surface sont alimentés par la fonte des neiges et les précipitations, avec des débits très saisonniers et des périodes de faible niveau d'eau à la fin de l'été et en hiver. Les lacs et étangs sont reliés par des canaux peu profonds, et le pergélisol limite l'échange d'eaux souterraines. Dans l'ensemble, le débit d'eau souterraine de référence présente une connectivité limitée entre les systèmes profonds et peu profonds en raison de la présence de pergélisol, qui agit comme une barrière dans la plupart des cas.

La qualité de l'eau dans les lacs et les plans d'eau se caractérise généralement par de faibles niveaux de nutriments et de turbidité ainsi qu'une influence anthropique minimale. Les variations saisonnières naturelles surviennent en raison de la couverture glacée, d'impulsions de fonte et de conditions météorologiques. La pêche et les déplacements le long des lacs et des chenaux de rivière reposent sur des niveaux d'eau prévisibles et une eau claire et propre.

## VS.7.1.2 Répercussions du projet

Le projet est susceptible d'avoir une incidence sur la quantité des eaux de surface, la qualité des eaux de surface et des sédiments, ainsi que sur la qualité des eaux souterraines du fait de la construction de routes, de franchissements de cours d'eau, de sources d'emprunt, de ports et d'aérodromes côté ville, ainsi que de campements. Les aspects des répercussions potentielles sont particulièrement applicables aux zones où les terres seront perturbées, où l'eau est prélevée et rejetée, ou où les infrastructures interagissent avec les systèmes de drainage naturel. Voici le résumé des trois aspects des répercussions du projet et de leurs résultats :

Modification dans la quantité des eaux de surface

- Les prélèvements et les rejets d’eau pour le contrôle de la poussière, l’entretien hivernal des routes et l’utilisation de l’eau potable peuvent temporairement modifier la quantité d’eau, particulièrement lors des périodes de faible débit. Après application de mesures d’atténuation, de gestion et d’amélioration, les effets résiduels se limitent aux emplacements de prélèvement et de rejet temporaires associés à la construction et à l’exploitation, ainsi qu’au prélèvement permanent associé à l’approvisionnement en eau potable pendant l’exploitation. Étant donné la faible empreinte du projet par rapport à la taille du bassin versant, ces changements sont considérés comme de faible ampleur (c’est-à-dire un changement inférieur à 10 % du débit des cours d’eau ou du volume du lac), alors que les approbations de permis tiennent compte des lignes directrices et des taux provenant des plans d’eau disposant d’une capacité d’assimilation suffisante.
- Les changements de couverture terrestre associés au défrichement, au nivellement, aux remblais, aux ponceaux, aux sources d’emprunt et aux zones remblayées peuvent modifier les schémas naturels de drainage, créant des changements localisés dans le ruissellement de surface, l’engorgement ou la direction du débit. Après l’application de mesures d’atténuation, de gestion et d’amélioration, les effets résiduels des changements de couverture terrestre et de la modification de la réaction au ruissellement le long du SAP de la route devraient également être de faible ampleur (c’est-à-dire moins de 10 % de la variation du débit des cours d’eau et du volume du lac par rapport aux conditions actuelles), localisés près des infrastructures, de courte à moyenne durée et réversibles à mesure que les zones perturbées devraient se stabiliser pendant la phase d’exploitation, notamment avec la mise en œuvre de mesures d’atténuation.

Changement dans la qualité des eaux de surface et des sédiments :

- La perturbation des sols et des travaux dans les cours d’eau est susceptible d’introduire des sédiments en suspension dans les plans d’eau voisins. Ces intrants peuvent entraîner des augmentations à court terme de la turbidité et une sédimentation localisée en aval des zones de travail. Après application de mesures d’atténuation, de gestion et d’amélioration, les effets résiduels devraient être de faible ampleur, de fréquence irrégulière et réversibles.
- La qualité de l’eau de surface et des sédiments peut aussi être affectée par des contaminants mobilisés dans le ruissellement provenant de surfaces perturbées, de zones de construction, de zones remblayées, ainsi que des installations de prévention de l’érosion et de contrôle des sédiments. Les roches exposées et les matériaux d’emprunt peuvent contribuer à la dissolution des métaux ou à l’accroissement de l’acidité, et le dynamitage peut libérer des composés azotés. Après application de mesures d’atténuation, de gestion et d’amélioration, les effets résiduels devraient être de faible ampleur, de fréquence irrégulière et réversibles.

Changement dans la qualité des eaux souterraines.

- Les eaux souterraines peu profondes sont sensibles à plusieurs des mêmes aspects que l'eau de surface, car le mélange avec l'eau de surface affectée ou le ruissellement de celle-ci est susceptible de modifier la qualité des eaux souterraines. Les eaux souterraines profondes sont en grande partie protégées par un épais pergélisol qui limite le mélange vertical. Les changements potentiels dans la quantité d'eau souterraine ne sont pas évalués car aucune extraction d'eau souterraine n'est prévue dans le cadre de ce projet.

### VS.7.1.3 Effets cumulatifs

Les effets résiduels cumulatifs du projet sur les eaux de surface, les eaux souterraines et la qualité des sédiments sont considérés comme de faible ampleur, réversibles et géographiquement limités à la ZEL. Les effets cumulatifs sur la répartition du pergélisol dans la subsurface peu profonde peuvent ne pas être réversibles, mais ne devraient pas avoir d'incidence sur la qualité de l'eau. Dans l'ensemble, étant donné la faible contribution des répercussions du projet aux effets résiduels cumulatifs sur la quantité et la qualité des eaux de surface, ainsi que la qualité des sédiments au sein de la ZER, ainsi que les mesures d'atténuation prévues pour le projet et l'adoption de mesures d'atténuation par d'autres projets et activités de la ZER, les effets cumulatifs ne devraient pas être importants.

### VS.7.1.4 Importance

Après leur atténuation, les effets résiduels sur les ressources en eau ne devraient pas être importants. Les changements dans la quantité et la qualité des eaux de surface ainsi que sur la qualité des sédiments et des eaux souterraines ne devraient pas changer au-delà de la variabilité naturelle à l'extérieur du SAP. On prévoit que les effets cumulatifs des bruits ne seront pas importants.

### VS.7.1.5 Mesures d'atténuation, de gestion et d'amélioration

Le projet appliquera des pratiques de conception, des contrôles opérationnels et des programmes de surveillance afin d'éviter ou de réduire les effets potentiels sur les ressources en eau douce. Les principales mesures comprennent :

- Concevoir des ponceaux, des ponts et des structures de drainage pour s'adapter à l'écoulement naturel des eaux et réduire l'accumulation d'eau en amont ou l'affouillement en aval.
- Appliquer des mesures de prévention de l'érosion et de contrôle des sédiments lors des travaux dans l'eau et du nivellement.
- Appliquer de plans de drainage et de gestion des sédiments propres à la carrière.
- Appliquer un plan de gestion de la lixiviation des métaux ou du drainage rocheux acide qui comprendra la gestion des matériaux de la lixiviation des métaux ou du drainage rocheux acide exposés pendant la construction (par exemple, remblai routier, plateformes, sources d'emprunt). Tout matériau rocheux devant être utilisé au-dessus de la ligne des hautes eaux sera soumis à des essais de drainage rocheux acide ou de lixiviation des métaux, seuls les matériaux acceptables seront utilisés pour la construction.

- Établir une surveillance pendant la construction pour évaluer la qualité de l'eau, les conditions de débit et le rendement du drainage.
- Utiliser la gestion adaptée pour rajuster les pratiques si la surveillance détecte des changements inattendus.

Le dialogue continu avec les Kitikmiuts, d'autres groupes autochtones et d'autres communautés potentiellement touchées orientera la planification, le calendrier, le suivi et la gestion liés à l'eau tout au long du cycle de vie du projet.

# VS.7.2 Poisson d'eau douce et habitat du poisson

La présente CV des poissons d'eau douce et de leur habitat comprend les poissons et l'habitat des poissons selon la définition de la *Loi sur les pêches*, ainsi que la végétation aquatique et les invertébrés benthiques, qui se trouvent en eau douce.

## VS.7.2.1 Base de référence

Les poissons d'eau douce et leurs habitats à l'intérieur de la ZEL demeurent en grande partie dans leur état naturel, soutenant une communauté diversifiée d'espèces de poissons qui varient selon les bassins versants, y compris des espèces importantes sur le plan culturel comme l'omble chevalier, la truite grise, l'ombre arctique, la lotte et le ménomini blanc. Ces espèces constituent une source importante de subsistance alimentaire pour les communautés inuites. Les conditions d'habitat vont de grandes rivières permanentes à des ruisseaux peu profonds de toundra, des lacs et des étangs interconnectés. L'utilisation de l'habitat des poissons varie selon les régimes de débit saisonniers, les périodes de crues nivales, l'épaisseur de la glace et la profondeur de l'eau. Les débits sont très saisonniers et causés par la fonte des neiges, les précipitations et les périodes de basses eaux à la fin de l'été et en hiver. Les canaux éphémères et intermittents contribuent aussi au drainage, à la connectivité saisonnière et aux apports nutritifs pour les systèmes où vivent des poissons en aval. Dans l'ensemble, les habitats de référence dans la ZEL subissent une perturbation anthropique minimale et offrent des fonctions d'hivernage, de migration, de frai et d'élevage qui favorisent la poursuite de la récolte par les Kitikmiuts et d'autres groupes autochtones.

## VS.7.2.2 Répercussions du projet

L'évaluation a mis l'accent sur deux répercussions potentielles liées au projet sur les poissons d'eau douce et leur habitat :

Changement dans l'habitat du poisson :

- Les activités du projet peuvent modifier, perturber ou supprimer l'habitat des poissons du fait de la perturbation physique des cours d'eau, la modification des débits et la construction d'infrastructures permanentes.
- L'altération de la quantité d'eau aux franchissements ou dans de petits réseaux de drainage peut aussi influencer la disponibilité de l'habitat à certains stades de vie.

- Après l'application de mesures d'atténuation, de gestion et d'amélioration, les effets résiduels du changement dans l'habitat du poisson seront d'une ampleur faible à modérée. La durée de ces effets variera de court à long terme, surviendra sous forme d'événements irréguliers multiples et sera limitée à la ZEL. La probabilité que des répercussions liées au projet surviennent lors des étapes de vie sensibles (par exemple, période de frai) varie de l'absence de sensibilité à une sensibilité élevée. Les effets résiduels devraient être réversibles dans les zones récupérées (par exemple, espaces de travail temporaires ou routes d'accès), mais irréversibles pour les composantes permanentes du projet (par exemple, piste d'atterrissage, routes, infrastructures portuaires).

Changement dans la santé, la croissance ou la survie des poissons :

- Les changements dans la santé, la croissance ou la survie des poissons devraient être motivés par les effets potentiels des changements dans la qualité de l'eau dus aux apports sédimentaires et à la chimie de la qualité de l'eau, à la mort des poissons par blessure ou étouffement, à la production de bruit sous-marin et à l'augmentation de la pression de pêche.
- Après application de mesures d'atténuation, de gestion et d'amélioration, les effets résiduels sont considérés comme de faible ampleur, limités à la ZEL, et surviennent sous forme d'événements irréguliers multiples. La durée de ces effets résiduels variera de court terme (c'est-à-dire seulement en phase de construction) à long terme (c'est-à-dire s'étendant sur les phases d'exploitation et de maintenance). La probabilité que des répercussions surviennent lors des étapes de vie sensibles (par exemple, période de frai) varie de l'absence de sensibilité à une sensibilité élevée. On prévoit que les effets résiduels seront réversibles, à l'exception de ceux entraînant la mort des poissons ou des œufs de poisson, qui seront permanentes au niveau individuel, mais réversibles à l'échelle de la population.

## VS.7.2.3 Effets cumulatifs

Des effets cumulatifs sur les poissons d'eau douce et leur habitat sont prévus du fait du projet et de certaines activités physiques repérées dans la ZER. Dans l'ensemble, on prévoit que les effets cumulatifs seront de faible ampleur pour les changements dans la santé, la croissance ou la survie des poissons en raison de l'augmentation de la pression de pêche et des changements dans la qualité de l'eau, et d'ampleur modérée pour le changement dans l'habitat des poissons en raison de la perte d'habitat sous la ligne des hautes eaux et lors du défrichage riverain. L'étendue géographique des effets directs sera la ZER, mais localisée aux zones locales des activités physiques. Les effets cumulatifs résiduels potentiels seront de longue durée en raison de la longue durée d'exploitation des activités physiques, et surviendront sous forme d'événements irréguliers, allant d'événements réversibles (par exemple, espaces de travail temporaires, franchissements de cours d'eau sur l'habitat des poissons) à irréversible (par exemple, une infrastructure permanente qui chevauche l'habitat des poissons).

## VS.7.2.4 Importance

Le projet mettra en œuvre des mesures d'évitement et d'atténuation, y compris des mesures visant à compenser la perte d'habitat, si nécessaire, afin de contrebalancer les effets inévitables. On ne prévoit donc pas que les effets résiduels sur les poissons et leurs habitats provoquent un changement mesurable de la productivité des populations de poissons pertinentes, y compris celles d'importance culturelle ou traditionnelle pour les Kitikmiuts, d'autres groupes autochtones ou d'autres communautés potentiellement affectées, et ils ne devraient pas être importants. On prévoit que les effets cumulatifs des bruits ne seront pas importants.

## VS.7.2.5 Mesures d'atténuation, de gestion et d'amélioration

Le projet appliquera des pratiques de conception, des contrôles opérationnels et des programmes de surveillance afin d'éviter ou de réduire les répercussions potentielles sur les poissons d'eau douce et leurs habitats. Les principales mesures comprennent :

- Concevoir de traversées de cours d'eau (ponceaux, ponts et autres structures) pour maintenir l'écoulement naturel des eaux, le passage des poissons et la connectivité des habitats.
- Utiliser les zones auparavant perturbées comme infrastructures et espaces de travail lorsque cela est possible, et entretenir la végétation riveraine lorsque cela est faisable.
- Application de mesures de prévention de l'érosion et de contrôle des sédiments lors des travaux dans l'eau, du nivellement et de la construction afin de réduire les apports de sédiments dans les eaux où vivent les poissons.
- Effectuer des activités dans l'eau en dehors des périodes restreintes, isoler les zones de travail au besoin et maintenir le débit en aval lors de l'assèchement.
- Mettre en œuvre un programme de sauvetage de poissons avant les travaux en rivière, mené par du personnel qualifié.
- Appliquer des pratiques de gestion de l'eau, y compris les prises d'eau protégées par des grilles, le contrôle des taux de prélèvement d'eau, ainsi que la gestion du ruissellement et des eaux pluviales.
- Mettre en œuvre des plans de contrôle des explosifs et de la poussière et de plans d'urgence en cas de déversement pour limiter les apports d'azote, les substances nocives et la sédimentation.
- Fermer et récupérer les routes d'accès temporaires, les carrières et les espaces de travail une fois qu'ils ne sont plus nécessaires.
- Inspecter régulièrement les franchissements de cours d'eau ainsi que les mesures de prévention de l'érosion et de contrôle des sédiments, et appliquer des mesures correctives, au besoin.
- Utiliser la gestion adaptée, mettre à jour les pratiques si la surveillance détecte des effets inattendus.

Si Pêches et Océans Canada (MPO) détermine que les composantes du projet entraînent une détérioration, destruction ou perturbation (DDP) de l'habitat des poissons nécessitant une autorisation en vertu de la *Loi sur les pêches*, le projet établira un plan de compensation pour l'habitat du poisson en collaborant avec le MPO, les Kitikmiuts et d'autres communautés potentiellement touchées.

## VS.7.3 Énoncé des répercussions sur le milieu d'eau douce

Une évaluation de l'influence potentielle du projet de la route et du port de Grays Bay sur les ressources d'eau, les poissons d'eau douce et leur habitat prévoit que les effets résiduels et cumulatifs ne seront pas importants.

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# Abbreviations

ABA ... acid base accounting

ANFO ... ammonium nitrate and diesel fuel

AP ... acid potential

ARD ... acid rock drainage

BMP ... best management practice

BPQMP ... Borrow Pits and Quarry Management Plan

$CaCO_3$ ... calcium carbonate

CCME ... Canadian Council of Ministers of the Environment

DFO ... Fisheries and Oceans Canada

DO ... dissolved oxygen

DOC ... dissolved organic carbon

DWG ... drinking water guidelines

ECCC ... Environment and Climate Change Canada

EFN ... environmental flow needs

EMP ... Explosives Management Plan

ESCP ... Erosion and Sediment Control Plan

FEQG ... Federal Environmental Quality Guidelines

FMP ... Fuel Management Plan

GN ... Government of Nunavut

IAG ... Inuit Advisory Group

ICP ... Izok Corridor Project

IDF ... Intensity Duration Frequency

IS ... Impact Statement

ISQG ... interim freshwater sediment quality guidelines

KP .......... kilometre post

LAA .......... Local Assessment Area

Ma .......... million years ago

ML .......... metal leaching

MMG .......... Minerals and Metals Group

$NH_3$ .......... un-ionized ammonia

$NH_4^+$ .......... ammonium ion

NIRB .......... Nunavut Impact Review Board

$NO_3^-$ + $NO_2$ .......... total nitrate and nitrite

NP .......... neutralization potential

NPR .......... neutralization potential ratio

NT .......... Northwest Territories

NTKP .......... Naonaiyaotit Traditional Knowledge Project

NTU .......... Nephelometric Turbidity Unit

NWB .......... Nunavut Water Board

PAG .......... potentially acid generating

PAHs .......... polycyclic aromatic hydrocarbons

PCIC .......... Pacific Climate Impacts Consortium

PDA .......... Project Development Area

PEL .......... probably effect level

PIL .......... project inclusion list

PWI .......... Potential Water Intake

QA/QC .......... quality assurance and quality control

RAA .......... Regional Assessment Area

SCP .......... Spill Contingency Plan

TCWR .......... Tibbitt to Contwoyto Winter Road

TDS ............ total dissolved solids

TKN ............ total Kjeldahl nitrogen

TLMRU ............ and traditional land, marine, and resource use

TOC ............ total organic carbon

TSS ............ total dissolved solids

VC ............ Valued Component

WKR ............ West Kitikmeot Resources Corp.

WMP ............ Water Management Plan

WSC ............ Water Survey of Canada

## Symbols and Units of Measure

°C ............ degrees Celsius

µS ............ microsiemens

µS/cm ............ microsiemens per centimetre

cm ............ centimetre

g/L ............ grams per litre

kg ............ kilograms

km ............ kilometre

km/h ............ kilometres per hour

$km^2$ ............ square kilometre

L ............ litre

L/s ............ litres per second

$L/s/km^2$ ............ litres per second per square kilometre

m ............ metre

$m^3$/day ............ cubic metres per day

$m^3$/sec ............ cubic metres per second m$^3$/year ........ cubic metres per year

m/s ........ metres per second

mg ........ milligrams

mg/L ........ milligrams per litre

mm ........ millimetre

mV ........ millivolts

wt. % ........ weight percent

# Glossary

| Term | Definition |
|---|---|
| 1:100-year event | A weather event that has a 1% chance of occurring in any given year. |
| Acid potential | The total acid a material is capable to generate and includes acid that was dissolved, neutralized, and/or formed acid salts. |
| Alkalinity | A measurement of the capacity of a solution to neutralize a strong acid. |
| Annual runoff | The total volume of water that flows out of a watershed over a one-year period. It can be influenced by factors such as precipitation, evaporation or natural storage. |
| Catchment (watershed) | The area of land where all flowing surface water converges to a common outlet, such as a stream, river, lake, or ocean. Catchments are bounded by natural topographic features (e.g., ridges or divides) and can range in size from small creeks to large river basins. |
| Drainage area | Refers to the land area contributing runoff to a particular stream, river, or lake. |
| Ephemeral stream | A stream or drainage channel that only flows intermittently, usually immediately after rainfall or snowmelt events. |
| Flow diversion | Engineered interventions that redirect the natural flow of water from its original path to another location typically through channels, pipes or barriers. |
| Freshet | Refers to the rapid increase in streamflow from snowmelt, heavy rain, or a combination of the two. |
| *In Situ* | Refers to physical or chemical properties measured directly at the location of interest without removal or alteration. |
| Hardness | Hardness refers to the amount of dissolved minerals in water, typically characterized by high levels of calcium in the water – usually expressed as mg/L of $CaCO_3$. |
| High flows | Refers to the rapid discharge of water from a river or stream, often associated with significant rainfall and/or snowmelt events. These flows are characterized by their magnitude, shape, and duration. |

| Term | Definition |
|---|---|
| Hydraulic conductivity | A ratio of velocity to hydraulic gradient, indicating the permeability of porous media. |
| Hydrologic response | The way a watershed or catchment reacts to precipitation inputs including timing, magnitude and duration of runoff infiltration and streamflow changes. |
| Hydrometric station | A monitoring site where streamflow, water level, or related hydrological data are collected. |
| Infiltration capacity | The maximum rate at which soil can absorb water from the surface under specific conditions. It varies based on soil texture, compaction, moisture content, vegetation cover and land use. |
| Instantaneous peak discharge | Highest flow rate of water observed during a specific event such as a flood or sudden rainfall. |
| Low flow | The minimum flow in a river stream or channel during periods of limited precipitation and groundwater contribution. |
| Mean annual flow | The average volume of water passing a specific point in a river or stream over the course of a year. Provides long-term indication of a watersheds water availability and flow. |
| Neutralization potential | The total acid a material is capable of neutralizing. |
| Neutralization potential ratio | The ratio of neutralization potential (NP) to acid potential (AP). |
| Nival flow regime | A streamflow pattern dominated by snowmelt, with low winter flows and high spring to early summer flows driven by melting snowpack. |
| Non-Contact Runoff | The flow of water that occurs without direct contact with disturbed ground areas. |
| Peak Discharge (Peak Flow) | Highest volume of water per unit of time that flows through a channel or river. Often relating to flood severity and is influenced by precipitation intensity, watershed characteristics and channel geometry. |
| Permafrost | Ground (soil or rock and included ice or organic material) that remains at or below 0 degrees Celsius (°C) for at least two consecutive years. |
| Precipitation Interception | Precipitation is temporarily retained by vegetation before reaching the ground. |

| Term | Definition |
|---|---|
| Return Period | Average time between events such as floods or heavy rainfall. It is used to estimate the likelihood of a specific event happening within a given timeframe. |
| Runoff Response | The flow of water from land to a water body caused by rainfall that exceeds the soil's ability to absorb it. |
| Seasonal Distribution | Predictable patterns of water availability that occur over the annual cycle. Provides insight into the potential for water availability. |
| Seven Day Low Flow | The lowest 7-day average flow during a specified period (e.g., during the entire year or during summer) |
| Subsurface Hydrogeologic Investigations | Used to understand the distribution, movement and quality of groundwater in the earth subsurface. |
| Surface Runoff | Unconfined flow of water over the ground surface. Occurs when excess rainwater, stormwater, meltwater or other sources can no longer infiltrate in the soil. |
| Talik | A layer or body of unfrozen ground within permafrost that occurs due to anomalies in thermal, hydrologic, or hydrochemical conditions |
| Temporal Distribution | Refers to the pattern or trend of occurrence of a specific phenomenon over a period of time. This concept is used in hydrologic modeling simulations. |
| Topsoil | Leaf litter or organic layer and A and/or AB horizon of mineral soils. |
| Transpiration | Process by which plants extract water from the soil through their roots and release it to the atmosphere as vapour through their leaves. |

# 19 Assessment of Potential Effects on Water Resources

Kitikmiut, other Indigenous groups, and other potentially affected communities have expressed deep and multifaceted concerns about water sources and quality, based on both Inuit, Indigenous, and Community Knowledge and monitoring observations. Water is regarded as essential for all life, and its careful use is emphasized to ensure sustainability for future generations (Banci and Spicker 2024). Over time, Inuit and Knowledge holders have observed significant changes in water quality and availability. These include the drying up of springs, reduced water levels in lakes and rivers, and changes in the taste and clarity of water. Inuit attribute these changes to a combination of climate change, reduced precipitation, melting permafrost, and increased contamination from industrial activities such as mining (KIA 2003).

Water Resources was selected as a valued component (VC) due to the potential for adverse effects from project activities on surface water quality and quantity, groundwater quality, and sediment quality. These potential adverse effects may arise during the Construction phase, the Operations and Maintenance phase, or other Project-related disturbances that alter natural hydrological processes.

Water Resources hold ecological and socio-economic importance, supporting aquatic and terrestrial ecosystems, human health, and traditional land, marine, and resource use (TLMRU). In the context of the Project, they are especially important to Inuit of the Kitikmeot Region (hereafter referred to as Kitikmiut), other Indigenous groups, and other potentially affected communities. As noted by Banci and Spicker (2024):

> *Everyone needs water and it should be used carefully so it can be used by all people in the future All the lakes and rivers are very important in our area because the lakes and rivers flow into our river (Coppermine River). Water is very important for all life forms.*

Potential effects on water resources may interact with the following VCs:

- Terrain, Soils, and Permafrost (Volume 6, Section 14)
- Vegetation (Volume 6, Section 15)
- Caribou (Volume 6, Section 16)
- Birds (Volume 6, Section 17)
- Other Wildlife (Volume 6, Section 18)
- Freshwater Fish and Fish Habitat (Volume 7, Section 20)
- Traditional Land, Marine, and Resource Use (Volume 9, Section 24)
- Food Security (Volume 9, Section 25)
- Community Health and Wellbeing (Volume 9, Section 26)
- Non-traditional Land, Marine, and Resource Use (Volume 9, Section 29)

## 19.1 Scope of Assessment

This section defines and describes the scope of the assessment of potential effects on the Water Resources VC, including surface water quantity, surface water quality and sediment quality, and groundwater quality.

### 19.1.1 Influence of Engagement and Inuit, Indigenous, and Community Knowledge on the Assessment

West Kitikmeot Resources Corp. (WKR) continues to engage with Kitikmiut, other Indigenous groups, and other potentially affected communities about the Project. A summary of engagement activities conducted from 2016 to 2025 is presented in Volume 3, Section 6 (Public Engagement). In addition to these activities, WKR conducted community-based primary research with residents and organizations of the Kitikmeot communities of Cambridge Bay, Gjoa Haven, Kugaaruk, Kugluktuk, and Taloyoak, along with organizations in Yellowknife. An Inuit Advisory Group (IAG) was established to advise WKR on potential environmental and socio-economic effects or concerns related to the Project, planned mitigation approaches, and aspects of the environmental assessment, including, but not limited to, baseline conditions, significance determination, and consideration and integration of Inuit and Community Knowledge. Members were selected by the Kitikmeot Inuit Association and WKR based on their knowledge of many aspects of the natural and human environment, including but not limited to wildlife, fish, climate, land use and access, archaeology, and water in the project area.

To further inform the project design, a Project-specific Inuit Knowledge report titled *Kitikmeot Knowledge of the Proposed Kogloktoakyok (Grays Bay) Port and Road Project Final Report* (Banci and Spicker 2024) was commissioned by WKR. This report, based on Inuit Knowledge contained in the Naonaiyaotit Traditional Knowledge Project (NTKP), was made available to WKR through a licensing agreement with the Kitikmeot Inuit Association.

In addition, publicly available sources of Inuit and Indigenous Knowledge were reviewed to provide further context about baseline conditions and how conditions are changing, as well as potential mitigation measures recommended on previous projects that could be considered for the Project. Results from monitoring studies and other community-based research were also reviewed.

Through the Project-specific engagement program, Inuit, Indigenous groups, and other potentially affected communities shared comments, perspectives, concerns, and recommendations related to water resources. Through reviewing the information, Inuit, Indigenous, and Community Knowledge has influenced key components of the water resources assessment. WKR commits to continued engagement with Kitikmiut, other Indigenous groups, and other potentially affected communities during the advancement of project design, planning, and monitoring, throughout the life of the Project.

#### *19.1.1.1 Influence of Inuit, Indigenous, and Community Knowledge on Assessment Boundaries*

Inuit, Indigenous, and Community Knowledge reviewed with consideration to the proposed spatial boundaries served to confirm the assessment boundaries. Through the Project-specific Inuit Knowledge report, compiled from the NTKP database, Kitikmiut shared knowledge about gathering places (including hunting, and fishing camps, cabins, and ancient camps), travelways, harvesting areas, and resource habitats in the vicinity of the Project, including cold water springs (*aniloakhinik*) and permanent ice (*neelak*) (Banci and Spicker 2024).

The Local Assessment Area (LAA) is representative of the area that will be directly disturbed by construction and operation of the project components and includes a spatial buffer that accounts for upstream and downstream effects on watercourses or effects on other water systems around infrastructure. This includes water systems of cultural importance to Kitikmiut, other Indigenous groups, and other potentially affected communities. The Regional Assessment Area (RAA) is larger, and considers the area where effects from the Project in combination with other projects may be experienced, including additional locations of importance identified by Kitikmiut, other Indigenous groups, and other potentially affected communities (see Section 19.1.4.1).

#### *19.1.1.2 Influence of Inuit, Indigenous, and Community Knowledge on Baseline Conditions*

WKR collected baseline condition information by combining Inuit-led and collaborative knowledge gathering (including the Project-specific NTKP and IAG workshops), publicly available information from Indigenous groups considered in the context of the Project, and engagement feedback shared by Kitikmiut, other Indigenous groups, and other potentially affected communities with technical studies based on western scientific methods. Pertinent baseline information from Inuit, Indigenous, and Community Knowledge sources has been considered and summarized in Section 19.2.2.1 Table 19.9. This includes information about water quality and quantity and drinking water sources (see Section 19.2.2.1).

#### *19.1.1.3 Influence of Inuit, Indigenous, and Community Knowledge on the Assessment of Project Effects*

WKR discussed with Kitikmiut, other Indigenous groups, and other potentially affected communities how project activities (e.g., clearing, blasting, etc.) and project infrastructure could affect socio-economic conditions or culturally important interests, including water quality and drinking water sources within the water resources LAA. Through community meetings, IAG workshops, and public engagement opportunities, Kitikmiut, other Indigenous groups, and other potentially affected communities provided perspectives and values, which were considered and integrated into the potential effects to be considered. For example, bedrock fractures supplied by cold groundwater and *Aniloakhinik* (cold groundwater springs) were identified as important sources of drinking water through these engagements, which helped to focus efforts on the identification and protection of deep groundwater resources through permafrost thickness assessment (see Section 19.3.4). They also helped guide planning for the Project's adaptive measures and long-term resilience. Feedback has been integrated in the assessment of Project effects on water resources, where applicable (see Section 19.3).

#### *19.1.1.4 Influence of Inuit, Indigenous, and Community Knowledge on the Assessment of Cumulative Effects*

Through workshops and regional discussions, Kitikmiut Knowledge Holders, other Indigenous groups, and other potentially affected communities assisted WKR in identifying culturally important areas, species, and practices that may experience combined effects from the Project and other projects and activities in the Project's RAAs.

WKR integrated Inuit, Indigenous, and Community perspectives with western science to develop a holistic view of how multiple changes could affect land-based livelihoods, cultural continuity, and environmental integrity over time. For example, the detrimental impacts that past mining operations and changing climate conditions have had on surface water and groundwater quality was noted in several engagements. In response, mitigation measures and best management practices have been identified to reduce residual project effects that could be cumulative with future mining operations and further climate impacts (see Sections 19.3.3.3 and 19.3.4.3). The analysis recognizes the importance of long-term monitoring, where Inuit co-developed monitoring will track combined effects to inform adaptive management plans (see Section 19.4).

#### *19.1.1.5 Influence of Inuit, Indigenous, and Community Knowledge on Assessing Significance of Effects*

Significance criteria were informed with input from Inuit, Indigenous, and Community Knowledge. Inuit, Indigenous, and Community values and perspectives (see Volume 3). The concept of significance in the assessment was guided by Inuit, Indigenous, and Community values and detailed ecological observations about resource health, along with understanding of socio-economic conditions and TLMRU. This supported WKR's consideration of whether the Project results in persistent and measurable changes in surface water quantity, water or sediment parameters, or groundwater quality. This also included consideration of water sources and water requirements valued by Kitikmiut, other Indigenous groups, or other potentially affected communities. Members of the IAG also provided additional criteria to consider when identifying whether a project is likely to have significant, or unacceptable, effects (see Sections 19.1.6 and 19.5).

To be considered "non-significant" or acceptable, IAG members advised WKR to implement comprehensive measures and commitments that align with Inuit, Indigenous, and Community priorities and values.

- Proactive Protection Measures: WKR's commitment to avoiding or strictly mitigating known high-risk activities is crucial. This includes sizing culverts and bridges considered major structures or high risk to handle up to high water events, accounting for ice conditions and the effects of climate change.

- Incorporation of Inuit, Indigenous, and Community Knowledge into Management: The commitment to incorporate Inuit, Indigenous, and Community Knowledge and Western Science in all assessment sections, as appropriate, from baseline to monitoring, fostered dialogue and an inclusive Project. The request for Inuit monitors to enforce mitigation measures in real-time shows that inclusion requires active Inuit participation in the Project's management (IAG 2025a, 2025b).
- Adaptive Management: The use of adaptive management plans that can be revised based on ongoing monitoring and the ongoing sharing of Inuit, Indigenous, and Community Knowledge is seen as essential for success and acceptability, given the unpredictable nature of climate (IAG 2025a, 2025b).
- Holistic Approach to Benefits: The Project's success is tied to its broader social and economic benefits, such as contributing to more resilient supply chains and providing job/training opportunities for Inuit and other Indigenous groups. The protection of all wildlife and water resources, beyond just caribou, was also a key part of the holistic equation for acceptability (IAG 2025b).

#### *19.1.1.6 Influence of Inuit, Indigenous, and Community Knowledge on the Development of Mitigation, Management, and Enhancement Measures*

Through engagement activities, community-based primary research, IAG workshops, and review of publicly available literature, measures to reduce negative effects from the Project and enhance benefits from the Project were identified. For example, during IAG workshops, participants stated that WKR should implement mitigation measures that have proven successful on other projects in Nunavut rather than inventing new measures (IAG 2025b). Feedback also helped focus the Project’s design on sensitive timing and locations for monitoring and mitigation. For instance, rather than drilling water wells for groundwater monitoring, groundwater springs identified through these discussions could be sampled as an analog.

Proposed mitigation, management, and enhancement measures were discussed and reviewed with Inuit community representatives during IAG workshops and community meetings to confirm they align with community priorities. Adjustments were made as appropriate based on advice from IAG members and the Kitikmeot Inuit Association, in addition to Indigenous groups and other potentially affected communities. Inuit co-developed and co-implemented monitoring and reporting were incorporated to support ongoing involvement and accountability. Information obtained through Inuit, Indigenous, and Community Knowledge emphasized the importance of some of the mitigation measures relevant to water resources listed in Sections 19.3.2.3, 19.3.3.3, and 19.3.4.3. The Project will apply adaptive management strategies such as the continuous monitoring during construction activities (Section 19.7) and the follow-up sampling of groundwater if surface water impacts are observed (Section 19.3.4.3).

Inuit, Indigenous, and Community Knowledge informed the development of practical, culturally responsive mitigation and monitoring measures. IAG members emphasized the importance of protecting water (IAG 2025a, 2025b) and the following monitoring measures are planned:

- Water quality parameters sampling (e.g., turbidity, metals, nutrients) at representative locations, as required
- Periodic inspection of erosion and sediment control structures during high-flow periods
- Verification of metal leaching (ML)/acid rock drainage (ARD) management effectiveness through water quality monitoring, where required
- Dustfall monitoring near sensitive waterbodies during construction and operations, where required

#### *19.1.1.7 Influence of Inuit, Indigenous, and Community Knowledge on Transboundary Effects*

WKR engaged with and received feedback from Indigenous groups and other potentially affected communities, governments, and organizations in regions outside of the Kitikmeot Region to understand if project activities could affect socio-economic conditions, resources, wildlife, or culturally important areas shared between regions. This feedback has been integrated into the transboundary effects assessment (Volume 10, Section 33) and is not discussed further in this section.

### 19.1.2 Regulatory and Policy Setting

The assessment of potential effects on water resources is guided by the Impact Statement (IS) Guidelines for the Project (NIRB 2026, NIRB File No. 24XN038; Sections 8.1.5 – 8.1.8), federal regulations and guidelines, water quality and sediment guidelines, and applicable groundwater legislation.

The management of water resources is subject to several statutes, policies, and frameworks. These are identified in Table 19.1, which provides a description of key legislation applicable to the assessment of water resources.

**Table 19.1 Summary of Key Legislation and Policies for Water Resources**

| Regulation or Policy | Description |
|---|---|
| **Federal** | |
| *Fisheries Act* | • Sections 34 through 42, regulates fisheries and water pollution.<br>• Section 36 prohibits the deposit of deleterious substances into waters frequented by fish, unless authorized under regulations.<br>• As defined in Section 34(1)(a) of the Fisheries Act, a deleterious substance is "any substance that, if added to any water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water." |
| *Canadian Environmental Protection Act* (CEPA) | • Provides the legislative framework for preventing pollution and managing toxic substances that may pose risks to the environment or human health.<br>• CEPA supports water resource protection by regulating the release of harmful substances into aquatic environments and guiding environmental quality standards relevant to freshwater and sediment quality assessments. |
| *Canada Water Act* | • Provides the framework for cooperation between the federal government and provinces / territories in the conservation, development, and use of Canada's water resources.<br>• The Canada Water Act enables joint programs and studies, in this case, with the Nunavut Water Board (NWB) to support water quality monitoring and research, agreements on water management, and planning for water resource development and pollution control. |
| **Territorial** | |
| *Nunavut Waters and Nunavut Surface Rights Tribunal Act* | • Protects water resources and considers development impacts on users and the environment.<br>• Provides provisions for water use and waste disposal through the issuance of water licenses (administered by the NWB). |

#### *19.1.2.1 Surface Water, Groundwater, and Sediment Quality Guidelines*

There are no regulations under the *Nunavut Waters and Nunavut Surface Water Rights Tribunal Act* or the *Canada Water Act* prescribing water quality standards or guidelines. Therefore, the following federal water quality guidelines (standards) are applied to surface water and groundwater quality:

- Canadian Council of Ministers of the Environment (CCME) Guidelines for the protection of Freshwater Aquatic Life (CCME 2025a)
- Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CCME 2025b)
- Canadian Groundwater Quality Guidelines for the Protection of Environmental and Human Health (CCME 2025c)
- Canadian Water Quality Guidelines for the Protection of Agriculture, Irrigation, Livestock (CCME 2025d)

- Federal Environmental Quality Guidelines (FEQGs) for the protection of aquatic life in fresh water (GOC 2024)
- Health Canada's Drinking Water Quality Guidelines and Recreational Water Quality Guidelines apply to potable water and recreational waters (Health Canada 2025)

These guidelines and standards are intended to support the protection of freshwater aquatic life and human health by identifying concentrations of substances (e.g., metals, nutrients, major anions) below which adverse effects are generally not anticipated. Given that human health and aquatic life guidelines are more conservative than those developed for wildlife, they are also considered protective of wildlife receptors. However, these guidelines and standards are generic and may not fully reflect site-specific conditions that influence the bioavailability or toxicity of substances to ecological or human receptors (e.g., water chemistry or species-specific sensitivities).

The federal guidelines described above encompass a broad suite of water chemistry parameters; however, only a subset is expected to respond to Project activities. Monitoring will focus on indicator parameters that are relevant to potential Project stressors through a defined Project pathway. Definitions of significant effects for chemistry are described in Section 19.3.4.

### 19.1.3 Potential Effects, Pathways, and Measurable Parameters

Potential effects of the Project on water resources, pathways through which the effects may occur as a result of project components or activities, and measurable parameters of the effects are provided in Table 19.2.

Note that potential changes to groundwater quantity are not discussed any further in this report as:

- no groundwater extraction is planned for this Project,
- the shallow groundwater system that occurs above the permafrost is intimately connected to the surficial water system and assessments on the changes to surface water quantity will also apply to shallow groundwater.

Given the limited interaction between the Project and groundwater resources, the assessment of the change to surface water quantity should provide an adequate assessment of water availability for both surficial water and groundwater.

Concerns and/or potential effects pathways identified by Inuit through engagement and are discussed in Section 19.1.1.

Potential project effect pathways relevant to water resources are further discussed in the following sections:

- Changes to Surface Water Quantity: Section 19.3.2.2
- Changes to Surface Water and Sediment Quality: Section 19.3.3.2
- Change in Groundwater Quality: Section 19.3.4.2

**Table 19.2 Potential Effects, Effects Pathways and Measurable Parameters for Water Resources**

| Potential Effect | Effect Pathway | Measurable Parameter(s) and Units of Measurement |
|---|---|---|
| Change in surface water quantity | • Changes to surface drainage patterns and runoff from surficial disturbance such as vegetation clearing, earthworks, bermed areas and ditches<br>• Change in surface water flow as a result water withdrawals and discharge at lakes and streams | • Mean monthly and annual streamflow (cubic metres per second [$m^3/s$])<br>• Annual peak and low flows ($m^3/s$)<br>• Volume of lakes ($m^3$)<br>• Lake level (m) |
| Change in surface water and sediment quality | • Introduction of sediments resulting from water discharge associated with temporary withdrawals during construction and operations, in-channel works, runoff, altered drainage patterns, dust settlement and mobilization to receiving waters<br>• Increased contaminant loading due to ML/ARD from exposed rock and borrow materials<br>• Nitrogen compound mobilization to the aquatic environment through the use of explosives | • General water quality parameters [e.g., pH, suspended sediments (mg/L), turbidity (NTU), etc.], anions and nutrients (mg/L), total and dissolved metals (mg/L). Total metals in sediment are measured in mg/kg. |
| Change in groundwater quality | • Seepage into the active zone from surficial runoff, snowmelt, and surficial water bodies<br>• Excavation and installation of subsurface infrastructure<br>• Transport of contaminants along preferential flow pathways along subsurface infrastructure<br>• Mixing with contaminated surficial water or shallow groundwater with deep groundwater<br>• Changes in permafrost distribution allowing for mixing of surface water and groundwater with different compositions | • Total and dissolved metals (mg/L)<br>• Total nitrogen, nitrate, nitrite, and ammonia (mg/L)<br>• Total petroleum hydrocarbons (mg/L)<br>• Ground temperature (°C) |

The release of petroleum hydrocarbons due to accidental spills is covered in Chapter 10, Volume 32 and is not included in this assessment.

## 19.1.4 Boundaries

### *19.1.4.1 Spatial Boundaries*

The assessment boundaries for Water Resources and Freshwater Fish and Fish Habitat (Section 20) are the same to facilitate consistency among these related and interdependent VCs. The spatial boundaries encompass the areas where the Project is expected to interact with water resources, including those that are relevant to culturally and ecologically important regions where Inuit harvest (described in Section 19.1.1.1). Each spatial boundary represents the anticipated extent of different interactions with the Project. The assessment includes the Project Development Area (PDA), LAA, and RAA. Note that the marine environment is assessed in Volume 8, Section 21 and is not included in this assessment.

### Project Development Area

The PDA encompasses the physical footprint of all Project components, including both permanent and temporary disturbances (e.g., extent of Project infrastructure, planned clearing, and laydown areas). The PDA includes six sub-areas based on the types of components to be developed: the Port (which is further divided into marine and landside infrastructure), Road, Aerodrome, Jericho Station, and Winter Road PDAs. The boundaries of the PDAs were created by applying buffers around where the project components will be sited, and varies by each of the sub-areas depending on necessary flexibility for final siting of certain Project components based on conditions on the ground. For the Road PDA and Winter Road PDA, a 75-metre (m) buffer was applied to the roads centreline, for the Port PDA and the Aerodrome PDA, the areas were subdivided based on the conceptual Project component locations and then buffered approximately 1,000 m for the landside Port PDA, approximately 300 m for the marine Port PDA, and 500 m for the Aerodrome PDA. The Jericho Station PDA was buffered based on the existing development from the old Jericho Mine site that will be used for the Project and the need for additional space to accommodate the project components that will be developed as part of the Project for this location. The Winter Road PDA will only exist annually between the beginning of February and end of March, will be built on land where the existing Jericho Station road ends, at the southeastern portion of Jericho Station, to the shoreline of Contwoyto Lake where it will connect to the Tibbitt to Contwoyto Winter Road. For the purposes of the impact assessment, the PDA is the same as the Site Study Area identified in the IS Guidelines. The PDA is shown in Figure 19.1

### Local Assessment Area

The LAA includes the area in which project-related effects can be predicted or measured with a level of confidence that allows for the assessment wherein there is a reasonable expectation that those effects could be of concern. The LAA developed for the assessment of effects on surface water quantity, surface water and sediment quality, and groundwater quality includes:

- The port portion of the LAA encompasses the area that will be directly disturbed by construction and operations activities, including all Port Landside infrastructure and Aerodrome (e.g., airstrip, laydown and storage areas, landfill, administration offices and accommodations) and includes a 100 m buffer around the Port and Aerodrome PDA, plus an extension to the northwest side of the Kennarctic River west of the Aerodrome.
- The Road portion of the LAA includes the Road PDA and an area extending 100 m upstream and downstream of the centerline (i.e., the Road PDA plus 25 m).
- The LAA around Jericho Station includes a 100 m buffer around the PDA.

The LAA is shown in Figure 19.1 and Figure 19.2.



Local Assessment Area (LAA)
Regional Assessment Area (RAA)
**Project Development Area (PDA)**
Aerodrome
Port (Landside Infrastructure)
Port (Marine-based Infrastructure)
Grays Bay Road

0 2 4 Kilometres
(At original document size of 8.5x11) 1:175,000

N

**Notes**
**1.** Coordinate System: WGS 1984 UTM Zone 12N
**2.** Data Sources: Government of Canada, Stantec, Earthstar Geographics

NUNAMI STANTEC LIMITED
WEST KITIKMEOT RESOURCES CORP

*Project Location*
West Kitikmeot Region
Nunavut

Prepared by DS on 2026-02-02
TR by JK on 2026-02-02

*Client/Project*
123514868_106
West Kitikmeot Resources Corp
Grays Bay Road and Port

*Figure No.*
**19.1**

*Title*
**Water Resources Assessment Areas - Grays Bay Port**

\\Ca0002-ppfss05\geomatics\Clients\Nunami_Stantec\GBRP\Figures\123514868_106_SurfaceWaterQuantity_Port_LSA_RSA.pagxRevised: 2026-02-12 By: slemay



Local Assessment Area (LAA)
Regional Assessment Area (RAA)
Grays Bay Port
Closed Mine Site
Tibbitt to Contwoyto Winter Road
Watercourse

0 10 20 Kilometres
(At original document size of 8.5x11)
1:1,280,000

N

***Notes***
**1.** Coordinate System: WGS 1984 UTM Zone 12N
**2.** Data Sources: Government of Canada, Stantec, Earthstar Geographics

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*Project Location*
West Kitikmeot Region
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Prepared by DS on 2026-02-02
TR by JK on 2026-02-02

*Client/Project*
123514868_107
West Kitikmeot Resources Corp
Grays Bay Road and Port

*Figure No.*
**19.2**

*Title*
**Water Resources Assessment Areas - Grays Bay Road**

\\Ca0002-ppfss05\geomatics\Clients\Nunami_Stantec\GBRP\Figures\123514868_107_SurfaceWaterQuantity_Road_LSA_RSA.pagxRevised: 2026-02-12 By: slemay

### Regional Assessment Area

The RAA includes the area that establishes the context for the determination of significance of Project-related effects and encompasses the area within which Project-specific effects may overlap with effects of other past, present, and reasonably foreseeable future projects (i.e., cumulative effects). The RAA includes a 10-kilometre (km) land-based buffer around the PDA and extends to include the Kennarctic River watershed and the unnamed watershed that drains to the Arctic Ocean. The RAA is shown in Figure 19.1 and Figure 19.2.

#### *19.1.4.2 Temporal Boundaries*

The temporal boundaries for the Project consist of the Construction phase, and the Operations and Maintenance phase.

Onsite works for the Project are scheduled to begin in 2029, with major construction commencing in 2030. The major construction activities are anticipated to span approximately five years. Operations and Maintenance is anticipated to commence in 2035 and continue indefinitely, as the Project components are considered permanent infrastructure.

As this is permanent infrastructure, a closure and reclamation plan is not applicable. However, areas used temporarily during construction will be reclaimed in accordance with permit conditions.

## 19.1.5 Residual Effects Characterization

A list of measures used to characterize residual effects of the Project on water resources is provided in Table 19.3.

**Table 19.3 Characterization of Residual Effects on Water Resources**

| Characterization | Description | Quantitative Measure or Definition of Qualitative Categories |
|---|---|---|
| Direction | The long-term trend of the residual effect | **Positive –** a residual effect that moves measurable parameters in a direction beneficial to water resources relative to baseline.<br>**Adverse –** a residual effect that moves measurable parameters in a direction detrimental to water resources relative to baseline.<br>**Neutral –** no net change in measurable parameters for water resources relative to baseline. |
| Magnitude | The extent of a change in measurable parameters or the VC from baseline conditions. | <u>**Surface Water Quantity**</u><br>No Measurable Change – Changes in streamflow compared to existing conditions (i.e., streamflow without project effects) are less than 5% (i.e., changes are within the range of uncertainty in hydrologic data measurement and analysis). For lake volumes, water withdrawals within the limit of existing licences are considered to have no measurable change. |

| Characterization | Description | Quantitative Measure or Definition of Qualitative Categories |
|---|---|---|
| Magnitude (cont'd) | | Low (<10%) – Changes in streamflow or lake volume are greater than the "no measurable change" threshold, but less than 10% compared to existing conditions (within the natural variability of existing conditions).<br>Moderate (10-20%) – Changes in streamflow or lake volume compared to existing conditions are between 10% and up to 20%.<br>High (>20%) – Changes in streamflow or lake volume compared to existing conditions are greater than 20%.<br>**Surface Water and Sediment Quality**<br>For the purposes of this assessment, a measurable change is defined as a change in water chemistry that can be quantified relative to the established range of baseline variability and evaluated using the criteria in Section 19.1.6.<br>**No Measurable Change**: No measurable change from pre-construction conditions and/or upstream reference sites<br>**Low**: A measurable change that is anticipated to be within the variability of pre-construction conditions and/or upstream reference sites<br>**Moderate**: A measurable change that is anticipated to be outside the variability of pre-construction conditions and in exceedance of applicable surface water or sediment quality guidelines (see Section 19.1.2.1), legislated requirements, and/or management, but is unlikely to have an adverse effect on ecological or human receptors in the LAA or RAA.<br>**High**: A measurable change that is anticipated to be outside the variability of pre-construction conditions and in exceedance of applicable guidelines, legislated requirements, and/or management, and is likely to have an adverse effect on ecological or human receptors in the LAA or RAA<br>**Groundwater Quality**<br>For the purposes of this assessment, a measurable change is defined as a change in water chemistry that can be quantified relative to the established range of baseline variability and evaluated using the criteria in Section 19.1.6.<br>**No Measurable Change**: No measurable change in the composition or taste of groundwater from pre-construction conditions<br>**Low**: A measurable change in in the composition of groundwater that is within the variability of pre-construction conditions and below the applicable guidelines (see Section 19.1.6.3).<br>**Moderate**: A measurable change in groundwater quality that is outside the variability of pre-construction conditions and exceeds the applicable guidelines but is unlikely to have an adverse effect on ecological or human receptors within the LAA.<br>**High**: A measurable change in groundwater quality that is outside the variability of pre-construction conditions, exceeds the applicable guidelines, and is likely to have an adverse effect on ecological or human receptors within the LAA. |

| Characterization | Description | Quantitative Measure or Definition of Qualitative Categories |
|---|---|---|
| Geographic Extent | The spatial area(s) in which an effect is predicted to be detectable. | PDA – residual effects are restricted to the PDA<br>LAA – residual effects extend into the LAA<br>RAA – residual effects interact with those of other projects in the RAA |
| Timing | Considers when an effect is predicted to occur, where relevant to the VC. | No sensitivity – seasonal aspects are unlikely to affect water resources<br>Low Sensitivity – effect does not occur during a sensitive time for surface or groundwater<br>High sensitivity - Effect occurs during a highly sensitive period. For surface water, the highly sensitive period is during winter (from freeze-up to spring-thaw) when streamflow is low. For groundwater, the highly sensitive period is from spring thaw to autumn freeze-up, when terrain, soils, and permafrost are the most susceptible to ground disturbance). |
| Duration | The time required until the measurable parameter or the VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived. | Short-term: The effect is restricted to a portion of construction.<br>Medium-term: The effect occurs throughout construction (up to 5 years).<br>Long-term: The effect occurs beyond construction or throughout Operations and Maintenance (more than 5 years). |
| Frequency | How often an effect is predicted to occur. | Single event – the effect occurs only once<br>Multiple irregular event – the effect occurs at no set schedule<br>Multiple regular event – the effect occurs at regular intervals<br>Continuous – the effect occurs continuously |
| Reversibility | The degree to which a VC can be returned to baseline conditions or other established reference point after relevant activities have ceased. | Reversible – the residual effect is likely to be reversed<br>Irreversible – the residual effect is unlikely to be reversed |

### 19.1.6 Significance Definition

During the September 2025 IAG workshop, participants discussed significance, with the goal of identifying effects that are considered acceptable or unacceptable to members. Through the discussion, a holistic suite of considerations that must be integrated into the Project’s social, environmental, and economic plans emerged. With respect to water resources, feedback received from IAG members (IAG 2025b) identified the following priorities, when considering unacceptable changes as a result of the Project:

- That Inuit perspectives are considered and addressed in Project design,
- That the Project does not negatively affect peoples’ ability to put food on the table, and
- That water and wildlife are protected

These priorities are applied across the potential effects described below as additional triggers for significance, alongside the technical definitions provided below.

#### *19.1.6.1 Change in Surface Water Quantity*

A significant residual effect on surface water quantity is defined as a persistent, measurable change in surface water quantity attributable to the Project that remains after the application of avoidance and mitigation measures have been applied. The change must exceed natural variability to the extent that it could adversely affect the aquatic ecosystem or existing water users. Significance is evaluated using the characterization of residual effects (Table 19.3) and professional judgement, according to the following criteria:

- If the magnitude of the effect is low (<10%), the effect is not significant.
- For moderate (10-20%) magnitude effects, if the geographic extent of the effect is confined to the PDA or LAA, the effect is likely to be not significant.
- For high (>20%) magnitude effects, significance evaluation will be based on geographic extent, duration, frequency, and reversibility.

#### *19.1.6.2 Change in Surface Water and Sediment Quality*

A significant residual effect on surface water or sediment quality is defined as a persistent, measurable change in water or sediment parameters attributable to the Project that remains after the application of avoidance and mitigation measures have been applied. The change must exceed natural variability to the extent that could negatively impact ecological or human receptors defined in the assessment. The determination of significance is informed by pre-construction conditions and applicable surface water and sediment quality guidelines, as outlined in Section 19.1.2.1. These guidelines provide reference concentrations for key parameters such as metals, nutrients, and suspended solids, which are used to assess the likelihood of adverse effects on aquatic life, human health, and sediment integrity.

Potential for Project-related changes to surface water or sediment quality that may negatively affect ecological health, human well-being, TLMRU, or community values determined through other VC analyses, as well as professional judgement, is also considered in the determination of the significance of adverse effects on surface water or sediment quality.

#### *19.1.6.3 Change in Groundwater Quality*

A significant residual effect on groundwater quality is defined as a persistent, measurable change in groundwater quality attributable to the Project that remains after the application of avoidance and mitigation measures have been applied. The change must exceed natural variability and could adversely impact existing or future groundwater users and/or the environment. For potable groundwater sources, Health Canada’s drinking water quality guidelines (Health Canada 2024) are used as the threshold for the onset of adverse impacts. CCME guidelines for groundwater (CCME 2025c), aquatic life (CCME 2025a), and agriculture (CCME 2025d) are also applicable to groundwater where pathways to these receptors are present.

# 19.2 Baseline Conditions

## 19.2.1 Methods

A review of Project-specific engagement feedback, publicly available literature, the project-specific Inuit Knowledge report compiled from the NTKP database IAG workshops, and community-based primary research to identify Inuit, Indigenous, and Community perspectives and values was also conducted. As discussed in Section 19.1.1, this information identified interests, concerns, and potential recommendations from Kitikmiut, other Indigenous groups, and other potentially affected communities related to water resources to inform the water resources assessment.

The assessment is guided by Inuit *Qaujimaningit*, which encompasses “Inuit traditional knowledge (and variations thereof or Inuit *Qaujimajatuqangit*), local and community-based knowledge, as well as Inuit knowledge systems as it relates to Inuit Societal Values and Inuit Knowledge (both traditional and contemporary)” (NIRB 2018). Inuit Societal Values, including traditional values, beliefs, and principles are referred to as Inuit *Qaujimajatuqangit* principles (NIRB 2018). For more detail see Volume 3. The Kitikmeot Inuit Association recommended use of the term Inuit Knowledge in the IS. WKR has adopted this terminology and understands Inuit Knowledge encompasses Inuit *Qaujimajatuqangit* principles, which have been incorporated into the assessment of effects on water resources.

Additional data and information used to characterize baseline conditions are sourced from data compiled from publicly available data, literature, and site-specific surface water and sediment quality data, water quantity, and groundwater data collected between:

- 1969 -2024 – Water Survey of Canada (WSC) hydrometric data (Canada 2019)
- 2004-2023 – Hope Bay Mine hydrometric data (ERM 2024a)
- 1995-2023 – Ekati Mine hydrometric data (ERM 2024b)
- 2002-2012 – Hydrologic studies from the Izok Corridor Project Draft Baseline Hydrology Report (MMG Ltd. 2013)
- 2002 -2023 – Ice data (De Beers Group 2023)
- 2005, 2011, and 2012 – geochemistry data from the Izok Corridor ML/ARD Assessment (Lorax 2013)
- 2008-2022 – Snap Lake project ice-off and ice-on dates (De Beers Group 2023)
- 2011-2024 – surface water and sediment quality data from the Izok Corridor Project (Golder 2013; RC BioSolutions 2011), High Lake Project (RC BioSolutions Ltd. 2021), a Potential Water Intake Memorandum (Nunami Stantec Limited 2024), and communities across Nunavut (Elliott et al. 2021)
- 1993-2013 – permafrost and ground temperature data from the High Lake Mine Geotechnical Investigations (BGC 2006, 2007, 2013), the Izok Corridor Project (AECOM 2011, 2012), and data compiled by the Geological Survey of Canada (Morse et al. 2023).
- 2012 – hydraulic conductivity measurements from the Izok Corridor Project (AECOM 2012)
- 2006-2013 – groundwater chemistry data from the Izok Corridor Project (AECOM 2013)

#### *19.2.1.1 Surface Water Quantity*

Baseline conditions for surface water quantity within the LAA and RAA were characterized to inform the effects assessment. This section considers regional monitoring programs, hydrometric data, climate data, project-specific studies, and Inuit, Indigenous, and Community Knowledge. Surface water quantity information has been organized into Regional Climate and Hydrology subsections below.

### Regional Climate

The Project is located within the tundra region of the continuous permafrost zone in the Canadian Arctic. This region is characterized by long, cold winters, and short, cool summers. During the summer, the active layer is thin and allows for minor infiltration of precipitation (Appendix 19A Grays Bay Road and Port Project Hydrology Baseline Report). The topography is typically undulating to moderately rugged, with sparse vegetation consisting of shrubs, lichens, and herbs (Sabina 2015; Wolfden 2006).

Environment and Climate Change Canada (ECCC) provides the largest database of observational historical weather and climate data in Canada. A review of available historical weather and climate data within the study domain were analysed based on data availability and proximity to the project area. ECCC station names, coordinates, and period of records for stations in proximity to the Project are shown in Table 19.4.

**Table 19.4 ECCC Climate Stations in proximity to the Project**

| Station ID | Station Name | Latitude | Longitude | Period of Record |
|---|---|---|---|---|
| 2302685 | Lupin AUT | 65°46'00.000" N | 111°14'00.000" W | 1993-1995 |
| 23026HN | Lupin A | 65°45'33.000" N | 111°15'00.000" W | 1982-2006 |
| 230N002 | Lupin CS | 65°45'19.050" N | 111°14'45.030" W | 1997-2025 |
| 2300550 | Bathurst Inlet | 66°50'00.000" N | 108°01'00.000" W | 1958-1962 |
| 2300551 | Bathurst Inlet | 66°50'15.050" N | 108°00'53.030" W | 2012-2025 |
| 2300850 | Contwoyto Lake | 65°29'00.000" N | 110°22'00.000" W | 1956-1981 |
| 2401087 | Edinburgh Island | 68°29'10.000" N | 110°52'54.000" W | 1992-1993 |
| 2303616 | Ross Point | 68°35'00.000" N | 111°06'00.000" W | 1959-1963 |
| 2300902 | Kugluktuk A | 67°49'00.000" N | 115°08'38.000" W | 1977-2014 |
| 2300903 | Kugluktuk A | 67°49'00.000" N | 115°08'38.000" W | 2014-2025 |
| 2300904 | Kugluktuk Climate | 67°49'02.004" N | 115°08'07.000" W | 2005-2025 |

Regional climate conditions within the LAA and RAA are described in detail in the Grays Bay Road and Port Project Climate Profile Technical Data Report (herein “Climate Profile TDR”; Volume 5, Appendix 12A). The analysis integrates both measured historical meteorological data and modelled gridded datasets to characterize baseline climate conditions relevant to the Project. Key sources and methods include:

- Inuit, Indigenous, and Community Knowledge: Observations and concerns from Kitikmiut, other Indigenous groups, and other potentially affected communities have been integrated to complement measured data, particularly in understanding long-term changes in snow conditions and wind patterns.
- Historical Observations: Data from ECCC meteorological stations were analysed based on data availability and proximity to project area.
  - The Lupin station, located 30 km southeast of Jericho Station, was identified as the most representative station for the RAA based on daily air temperature similarity (BGC 2013).
  - Data from Kugluktuk station, located on the Nunavut coast 180 km west of the proposed Grays Bay Port, are included for coastal comparison. Kugluktuk data is provided in the Climate Profile TDR.
- Gridded Datasets: In areas with limited station coverage, gridded datasets such as the Pacific Climate Impacts Consortium-Blend (1950–2012) were used to supplement observational data.
- Representative Locations: Climate conditions were characterized for Grays Bay, Ulu, and Jericho Station to represent the northern, central, and southern portions of the project area, respectively. Kugluktuk data were included to provide coastal context.

The following parameters were assessed to characterize baseline climate conditions for water resources:

- Temperature: Annual and seasonal minimum, mean, and maximum temperatures; number of extreme heat and cold days per year; and annual freeze-thaw cycles and frost-free days.
- Precipitation: Annual and seasonal total precipitation; Intensity-Duration-Frequency rainfall data for durations from 5 minutes to 24 hours and return periods from 2 to 100 years; maximum 1-, 3-, and 5-day precipitation accumulations; and snowfall trends incorporating Indigenous observations.
- Wind: Wind speed and prevailing wind directions; frequency of wind events exceeding 52, 63, and 90 kilometres per hour (km/h); extreme wind events; and future wind trends based on literature review.

### Hydrology

Hydrology information used to characterize surface water quantity within the LAA and RAA was compiled from previous studies and existing data sets. Baseline conditions are described and evaluated in the Grays Bay Road and Port Project Hydrology Baseline Report (Appendix 19A).

The Project intersects five main watersheds, all of which drain to the Arctic Ocean. From south to north, these watersheds are (Figure 19.3):

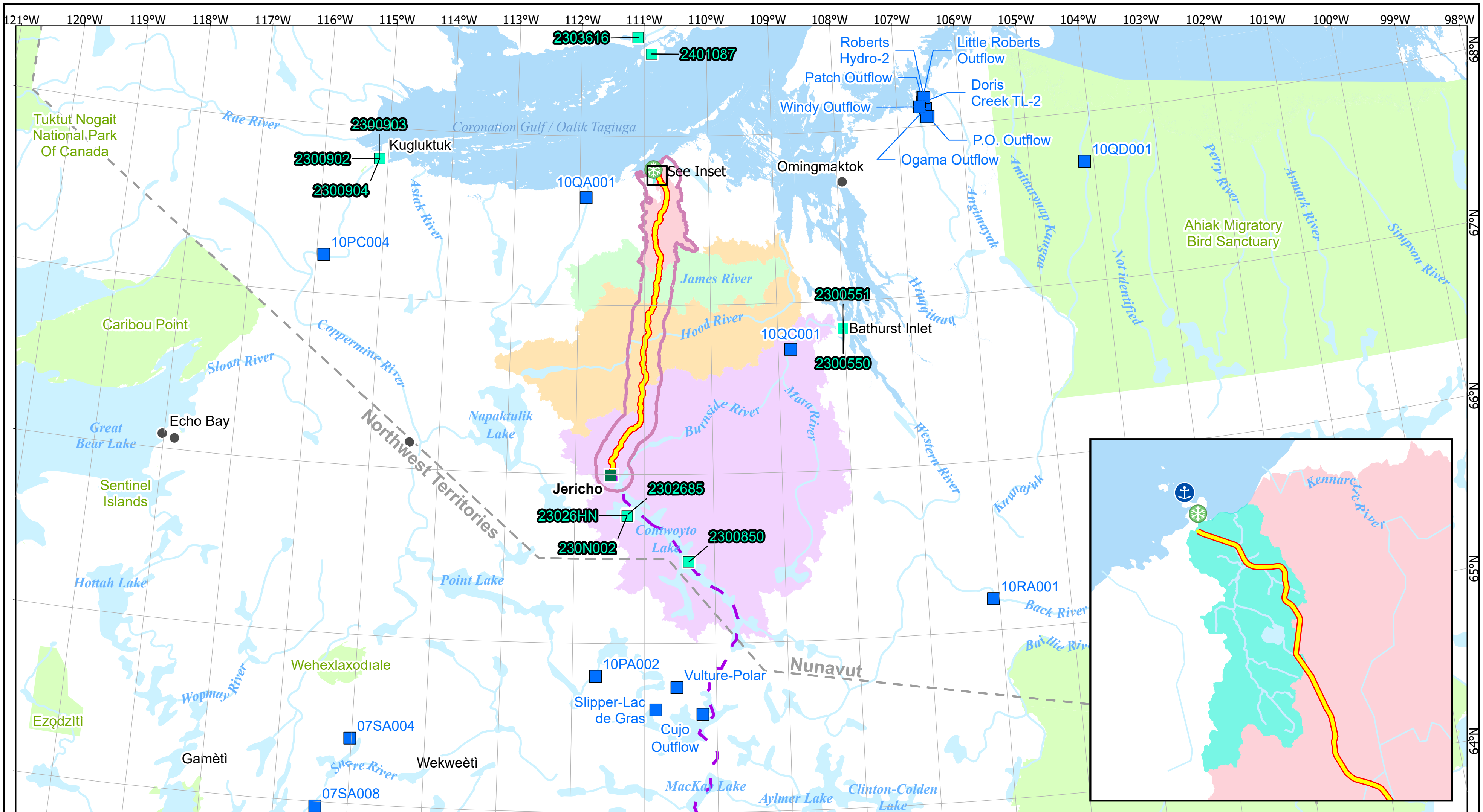
- Burnside River
- Hood River
- James River
- Kennarctic River, and
- an unnamed watershed that discharges to the Arctic Ocean near Grays Bay

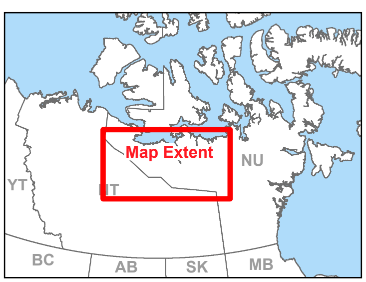
Existing data sources include active and historical hydrometric stations operated by the WSC, as well as project-specific stations from the Ekati and Hope Bay mine sites. Station proximity to the PDA, record length, and data gaps were considered in the selection of representative stations. The station name, drainage area, coordinates, and period of record are summarised in Table 19.5.

The regional hydrometric and climate stations are shown in Figure 19.3.

Surface water quantity conditions were characterized using hydrologic indices, as described in the Grays Bay Road and Port Project Hydrology Baseline Report (Appendix 19A). These indices were used to characterize annual runoff, seasonal distribution of runoff, peak flows, and low flow conditions. Surface water quantity conditions were estimated as follows:

- Annual runoff (millimetres (mm)) was calculated for each station using the mean annual flow and corresponding drainage area.
- Seasonal distribution of runoff was determined by calculating the monthly distribution of the annual runoff (as a percentage) to determine the timing of flows at each of the selected stations. A range of watershed sizes was included in this analysis to account for seasonal variability and to reduce sensitivity to short-term hydrologic fluctuations.
- Peak flows were estimated for return periods ranging from a 1:2-year event (which has a 50% likelihood of the estimated flow being exceeded in a given year) to a 1:100-year event (which has a 1% likelihood of the estimated flow being exceeded in a given year). The flood frequency analysis used annual instantaneous peak flows and included statistical tests for stationarity, homogeneity, and independence to assess the reliability of the datasets.
- Low flow conditions were evaluated using the minimum 7-day average flow during the open water season (June–September) for each year of record. Only years with fewer than five days of missing daily flow data within the open water season were included.




**Notes**
1. Coordinate System: WGS 1984 UTM Zone 12N
2. Data Sources: Governments of Canada and Northwest Territories, Stantec Consulting Ltd

- Climate Station
- Existing Meteorological Station (inactive)
- Hydrometric Station

**Watersheds (Stantec)**
- Unnamed Watercourse Draining to the Arctic Ocean
- Burnside River
- Hood River
- James River
- Kennarctic River
- Other Drainage Area Not Intersected by the PDA

- Grays Bay Port
- Grays Bay Road
- Regional Assessment Area
- Closed Mine Site
- Community
- Territorial Boundary
- Tibbitt to Contwoyto Winter Road
- Ocean
- Protected Conserved Area
- Waterbody

0 25 50 Kilometres

(At original document size of 8.5x11) 1:3,750,000

N

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WEST KITIKMEOT RESOURCES CORP

| | |
|---|---|
| Project Location<br>Kitikmeot Region, Nunavut | Prepared by DSPRY on 2026-02-02<br>TR by SLEMAY on 2026-02-02 |
| Client/Project | 123514868_102 |
| West Kitikmeot Resources Corp<br>Grays Bay Road and Port | |

Figure No.
**19.3**

Title
**Surface Water Quantity Baseline**

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**Table 19.5 Regional Water Survey of Canada Stations and Relevant Regional Mines**

| Station ID | Station Name | Drainage Area ($km^2$) | Latitude | Longitude | Period of Record |
|---|---|---|---|---|---|
| WSC 07SA004 | Indin River above Chalco Lake | 1,520 | 64°23'15" N | 115°01'18" W | 1977-2023 |
| WSC 07SA008 | Snare River above Indin Lake | 7,886 | 63°58'26" N | 115°25'59" W | 1999-2023 |
| WSC 10RA001 | Back River below Beachy Lake | 19,600 | 65°11'14" N | 106°05'09" W | 1978-2023 |
| WSC 10PC004 | Coppermine River Above Copper Creek | 46,200 | 67° 13' 42" N | 115° 53' 20" | 1987-2021 |
| WSC 10QA001 | Tree River near the Mouth | 5,810 | 67°38'06" N | 111°54'08" W | 1969-2024 |
| WSC 10PA002 | Yamba River below Daring Lake | 2,010 | 64°48'24" N | 111°40'41" W | 2000-2022 |
| WSC 10QC001 | Burnside River near the mouth | 16,800 | 66°43'34" N | 108°48'47" W | 1976-2022 |
| WSC 10QD001 | Ellice River near the mouth | 16,900 | 67°42'30" N | 104°08'21" W | 1993-2011 |
| Ekati Mine | Slipper-Lac de Gras Stream | 185 | 64°36'33"N | 110°50'27"W | 1995-2023<br>excluding 2022 |
| Ekati Mine | Vulture Polar | 7 | 64°44'24"N | 110°32'56"W | 1997-2014<br>excluding 2012, 2014 |
| Ekati Mine | Cujo Outflow | 3 | 64°34'52"N | 110°11'38"W | 1999-2023 |
| Hope Bay Mine | Windy Outflow | 14 | 68° 06'61"N | 106°38'36"W | 2004-2015; 2019-2023 |
| Hope Bay Mine | Patch Outflow | 32 | 68°02'78"N | 106°31'77"W | 2004-2015; 2019-2023 |
| Hope Bay Mine | P.O. Outflow | 35 | 68° 3'27.11"N | 106°31'0.85"W | 2004-2015; 2019-2023 |
| Hope Bay Mine | Ogama Outflow | 75 | 68° 6'14.25"N | 106°32'51.70"W | 2004-2015; 2019-2023 |
| Hope Bay Mine | Doris Creek TL-2 | 90 | 68° 8'29.91"N | 106°35'13.95"W | 2004-2015; 2019-2023 |
| Hope Bay Mine | Roberts Hydro-2 | 98 | 68°10'13.19"N | 106°33'39.38"W | 2004-2015; 2019-2023 |
| Hope Bay Mine | Little Roberts Outflow | 194 | 68°10'11.92"N | 106°34'38.56"W | 2004-2015; 2019-2023 |

Note:

Table references Grays Bay Road and Port Project Hydrology Baseline Report (Appendix 19A)

Available data from regional mine operations and the Izor Corridor Project study (MMG Ltd. 2013) were reviewed to characterize ice cover conditions. Ice thickness measurements from 14 lake sites were collected in 2012: eight locations near the north end, and six locations to the south of the proposed road alignment. In 2023, ice thickness measurements were reported for eight lakes in the Hope Bay annual report (ERM 2024a). Ice thickness was measured in April and May when ice typically is the thickest. No riverine ice thickness measurements were available in the RAA.

Numerous watercourses were identified that intersect with the PDA. Drainage areas for the watercourses range from 5 square kilometres ($km^2$) to 4,513 $km^2$ and have been classified as either 'small' (less than 50 $km^2$) or 'large' (greater than 50 $km^2$) (Table 19.6). A summary of the drainage areas for the watercourses intersecting the Project is shown in Table 19.6.

**Table 19.6 Summary of Stream Drainage Areas Along Road Alignment**

| Watershed | Road Kilometer Points (kilometres + metres) | | Small Drainage Area | Large Drainage Area | Undefined[1] |
|---|---|---|---|---|---|
| | Start | End | (< 50 $km^2$) | (> 50 $km^2$) | |
| Burnside River | 1095+108 | 1160+652 | 15 | 5 | 6 |
| Hood River | 1152+950 | 1232+580 | 28 | 3 | 5 |
| James River | 1232+580 | 1259+652 | 7 | 1 | - |
| Kennarctic River | 1257+365 | 1326+398 | 39 | 4 | 10 |
| Unnamed watershed draining to Arctic Ocean | 1324+385 | 1331+711 | 3 | - | 1 |
| **Total** | - | | **92** | **13** | **22** |

Notes:
[1] Undefined indicates where the drainage area could not be determined in the analysis.
Table references Grays Bay Road and Port Project Hydrology Baseline Report (Appendix 19A)

#### *19.2.1.2 Surface Water and Sediment Quality*

Baseline conditions for surface water and sediment quality within the LAA and RAA were characterized to provide context prior to the Construction phase and Operations and Maintenance phase of the Project. This section considers the following related elements of baseline conditions:

- Water Chemistry and Sediment: chemistry of the aquatic environment, including metals, nutrients, and suspended solids.
- Geochemical conditions: characteristics of bedrock and soils that may influence water and sediment quality through ML or ARD processes.
- Observations from Inuit about changes in drinking water quality, including changes in taste and visible appearance.

### Water Chemistry and Sediment

Water chemistry and sediment information used to characterize surface water and sediment quality within the LAA and RAA was compiled from previous studies and existing data sets. Baseline conditions are described in detail in the Grays Bay Road and Port Project Freshwater and Sediment Quality Data Summary Report in Appendix 19C. The characterization of baseline conditions draws on a combination of:

- Inuit, Indigenous, and Community Knowledge collected through Project-specific engagement activities, community-based primary research, the Project-specific Inuit Knowledge report compiled from the NTKP database, and through a review of publicly available information (see Sections 19.1.2, 19.2.2.1)
- Previous sampling conducted in 2012 and 2024 within the LAA and RAA, as documented in:
  - Potential Water Intake Location (PWI-1) Memorandum (Nunami Stantec Limited 2024)
  - Izok Corridor Project: Water and Sediment Quality – Izok Lake and Road – 2012 Field Data Report (Golder 2013). This 2013 study alignment overlaps entirely with the Water Resources LAA, and continues beyond the LAA (to the southwest towards the proposed Izok Mine).
  - High Lake Water Quality Field Report 2012 (RC BioSolutions 2011).

Additional context was provided through publicly available literature, including:

- Community water quality data across Nunavut: an introduction to available data for community water supplies (Elliott et al. 2021)
- Geochemistry of Small Canadian Arctic Rivers with Diverse Geological and Hydrological Settings (Brown et al. 2020)

No new field sampling was conducted specifically for this assessment, except for Potential Water Intake Location (Nunami Stantec Limited 2024) study. In addition to this data, data collected as part of previous studies and monitoring programs were referenced.

Only data from sites within or hydrologically connected to the RAA were included in the baseline characterization. Data from the Izok Mine and High Lake Mine sites located in the Coppermine River watershed were excluded, as this watershed does not overlap with the RAA. Similarly, stream site S35/S35a from High Lake was excluded due to its low-flow, bog-like conditions, which were not representative of typical stream water quality.

Sampling sites were selected to document spatial and temporal variability in water and sediment quality along the proposed roadway and adjacent areas. Many streams in the region are ephemeral and were sampled during the open water season (May to August) when flow was present. A summary of sampling effort is provided in Table 19.7.

Surface water quality results were compared to:

- FEQG (GOC 2024)
- CCME Water Quality Guidelines for Freshwater Aquatic Life (CCME 2025a)
- Health Canada Drinking Water Guidelines (Health Canada 2025)

Sediment quality results were compared to:

- Interim Sediment Quality Guidelines (ISQG) and Probable Effect Levels (PEL) for aquatic life protection (CCME 2025b)

Details on water and sediment quality parameters, detection limits, and applicable guidelines are provided in Appendix 19C.

**Table 19.7 Number of Water Quality and Sediment Quality Sites Sampled**

| Sampling Area | Station Type | Number of Water Quality Sites | | Number of Sediment Quality Sites | |
|---|---|---|---|---|---|
| | | August 2012 | August 2024 | August 2012 | August 2024 |
| Izok Corridor Project – Road[1] | Streams | 10 | - | 3 | - |
| High Lake Mine[2] | Kennarctic River | 6 | - | - | - |
| | Lakes | 15 | - | - | - |
| | Reference Lake Site | 2 | - | - | - |
| Potential Water Intake (PWI-1)[3] | Lakes | - | 6 | - | 3 |
| **Total Number of Samples** | | **39** | | **6** | |

Notes:
"-" indicates no samples collected
[1] Golder (2013)
[2] RC BioSolutions Ltd. (2021)
[3] Nunami Stantec Limited (2024)

## Geochemistry

Geochemistry information used to characterize geochemical conditions within the LAA and RAA was compiled from a previous study and existing data sets. An ML/ARD risk assessment study on the Izok Corridor project was conducted in 2013 on the previously proposed roadway from Grays Bay to the Proposed Izok Mine. This 2013 study alignment overlaps entirely with the Water Resources LAA and continues beyond the LAA (to the southwest towards the proposed Izok Mine). The geochemical samples situated outside of the Water Resources RAA were considered in this assessment of existing conditions, as the samples were collected from lithologies that are also present in the RAA (except for granitoid unit *Ag* and volcanic unit *Avx*). The ML/ARD assessment characterizes distinct lithologies; therefore, these samples provide inputs for median values of each distinct lithology. The geochemical sample collection, analytical methods, and quality assurance and quality control (QA/QC) are described in the Izok Corridor ML/ARD Risk Assessment (see Appendix 19A). A brief overview is provided here.

In 2005, 2011, and 2012, 206 static test samples were collected between Grays Bay and the Proposed Izok Mine, including areas outside of the RAA, from Jericho Mine to Izok Mine (see Figures 1.1 and 3.1 in Appendix 19A). Of the 206 samples, 185 were bedrock samples, and 21 were surficial soil samples. Bedrock samples were collected from outcrops via chip sampling. Soil samples were collected from 10 to 50 centimetres (cm) depth below surface. A total of 13 lithologies were analyzed for:

- acid-base accounting (ABA)
- solid-phase metal concentration by aqua regia digestion followed by inductively coupled plasma mass spectrometry

The acid-generating potential of materials was evaluated using acid base accounting results, which include measurements of neutralization potential (NP), acid potential (AP), and total sulphur concentration. The neutralization potential ratio (NPR) is determined by dividing NP by AP. For this assessment, the carbonate NPR (NP/AP based on carbonate content) was used to define the NPR.

Metal leaching refers to the process where metals that are present in rock or surficial material (e.g., talus, soil) are released from the solid form (i.e., mineral) into a dissolved form (i.e., into water) due to interactions with the environment (i.e., weathering). Acid rock drainage is a similar process; however, it refers to the acidic content released from rock or surficial material.

The ML/ARD risk rating was developed through four key steps, based on available numerical data and professional experience. These steps are described in detail in Section 2 of Appendix 19A and are summarized here:

1. Assigning a quantitative risk rating for ML and ARD potential based on geology and disturbance (e.g., cut volume).
2. Rating the dilution capacity within the pathway.
3. Rating the sensitivity of the receiving aquatic environment (e.g., fish presence, habitat resilience).
4. To guide further recommendations, integrate these ratings to determine an overall risk score for each quarry and rock cut along the Project.

Criteria for classifying a sample as potentially acid generating (PAG) or non-PAG, along with the associated ML/ARD risk levels, are outlined below:

- PAG and moderate risk for ML/ARD: samples with carbonate NPR < 2 and total sulphur >0.3 weight % (wt.%)
- PAG and moderate-low risk for ML/ARD: samples with carbonate NPR <2 and total sulphur between 0.1 wt.% and 0.3 wt.%
- PAG and low risk for ML/ARD: samples with carbonate NPR <2 and total sulphur between 0.05 wt.% and 0.1 wt.%.
- Non-PAG: samples with carbonate NPR <2 and total sulphur <0.05 wt.%
- Non-PAG: samples with carbonate NPR >2

The Project was divided into 46 sections based on the intersection with the major watershed boundary and geological unit. Sections 1 through 12, inclusive, are outside of the RAA; there are 34 sections applicable to this Project. The risk rating was derived for each section of the Project, based on the following formula:

$$Overall\ Risk\ =\ Stressor\ Risk\ (3\ to\ 20)\ \times\ Pathway\ (1\ to\ 5)\ \times\ Receptor\ Sensitivity\ (2\ to\ 6)$$

The numerical results with the corresponding risk are listed in Table 19.8.

**Table 19.8 Risk Rating and Corresponding Risk Category for Sections**

| Overall Risk Rating (per Section) | Risk Category (per Section) |
|---|---|
| < 49 | Very Low Risk |
| 50 to 99 | Low Risk |
| 100 to 149 | Moderate-Low Risk |
| 150 to 199 | Moderate Risk |
| > 200 | Moderate-High Risk |
| * | Variable/Uncertain Risk* |

Note:

* Due to low sample density and intricate geology, some sections were identified as variable or uncertain risk. These sections mostly contain both low and moderate risk zones that need further consideration and/or sampling to determine specific locations for quarries and/or rock cuts.

The above risk rating and risk category were assigned to each of the 34 sections, with results described in Section 19.2.2.3.

#### *19.2.1.3 Groundwater Quality*

Information on the groundwater conditions within the LAA and RAA were gathered from previous studies in the region. Due to the abundance of surficial water resources, there have been few subsurface hydrogeologic investigations in the region. Much of the information gathered on groundwater resources comes from mining operations both within and outside of the RAA. The information from these studies is used to help characterize the distribution of groundwater resources, aquifers properties, groundwater chemistry, and the subsurface permafrost conditions. Information sources include the following:

- Inuit, Indigenous, and Community Knowledge were collected through Project-specific engagement activities, community-based primary research, the Project-specific Inuit Knowledge report compiled from the NTKP database, and through a review of publicly available information, which helped establish baseline conditions and describe the local effects of climate change (see Sections 19.1.2, 19.2.2.1)
- Data on the subsurface thermal regime of the Grays Bay Port Area (BGC 2006)

- Data from the Izok corridor project and associated mines. This 2013 study alignment overlaps entirely with the Water Resources LAA and continues beyond the LAA (to the southwest towards the proposed Izok Mine). Data relevant to groundwater quality assessment includes:
  - Parameters from the High Lake area including permafrost conditions, aquifer properties, and groundwater composition (AECOM 2012; BGC 2006, 2007)
  - Parameters from the Izok Lake Mine area including permafrost conditions, aquifer properties, and groundwater composition (AECOM 2011, 2012, 2013)
- Data from the Ulu property on permafrost conditions (BGC 2006)
- Data from the Jericho Mine project on permafrost conditions (BGC 2013)
- Data from the Lupin Mine project (BGC 2006)

The groundwater quality data obtained from mines in the region may not be representative of the groundwater within the PDA. These locations are near mineral deposits which are known to contain higher than average concentrations of metals and sulphide minerals which can impact groundwater quality. Given this complication, and the limited amount of groundwater quality data available in the region, it is difficult to quantify background groundwater conditions.

### 19.2.2 Overview

The following subsections summarize the findings of the baseline program for water resources based on available historical data and reports, monitoring programs, and historical field investigations conducted for other studies that overlap the LAA of the project. More details on baseline conditions can be found in the following:

- Inuit Knowledge report compiled from the NTKP database, although this document cannot be made public fully.
- Appendix 19A: Grays Bay Road and Port Project Hydrology Baseline Report
- Appendix 19B: Izok Corridor ML/ARD Risk Assessment
- Appendix 19C: Grays Bay Road and Port Project Freshwater and Sediment Quality Data Summary Report

To inform understanding of the water resources setting, multiple sources of information were considered, including Inuit, Indigenous, and Community Knowledge perspectives and engagement feedback.

#### *19.2.2.1 Inuit, Indigenous, and Community Knowledge and Engagement Feedback*

Through the Project-specific engagement program delivered from 2016 to 2025, including community meetings, workshops, community-based primary research, the Project-specific Inuit Knowledge report compiled from the NTKP database, and through a review of publicly available information, Inuit, Indigenous groups, and other potentially affected communities shared information, expressed concerns, and provided recommendations related to water resources.

This feedback has been considered and summarized in Table 19.9 and has been integrated into the assessment of potential effects on water resources that follows.

**Table 19.9 Summary of Inuit, Indigenous, and Community Knowledge and Engagement Feedback Related to Water Resources**

| Comment | Source | WKR's Response | Where Addressed |
|---|---|---|---|
| NTKP consultants stated that limited but widespread potable water sources are found on land, and they should be preserved for future use. Large lakes and flowing rivers are the preferred drinking water sources. | Banci and Spicker 2024 | WKR has assessed the potential for the Project to impact both water quantity and quality and has proposed mitigation measures to reduce the Project's effects and help preserve these water resources. Special attention is paid to large lakes due to their importance as a water source and potential to interact with deep groundwater through open taliks. Permits for water withdrawal are required from the Nunavut Water Board (NWB). | See Change to Surface Water Quantity (Section 19.3.2), Change to Surface Water and Sediment Quality (Section 19.3.3) and Change in Groundwater Quality (Section 19.3.4).<br>See also Volume 9, Section 24 (TLMRU). |
| NTKP consultants reported that water quality has declined over the years, affecting taste and suitability for tea. These changes have been attributed to climate change, decreased precipitation, melting permafrost, mining, airborne pollutants, and tourism. The inland areas are less affected than the coast areas, but both still show signs of decline.<br>NTKP consultants stated that water quality varies by location and season, with some areas having sulfur or saline contamination. | Banci and Spicker 2024 | WKR acknowledges that water quality has changed over time. Plans have been made to reduce changes to water quality. WKR has assessed the potential for the Project to affect both water quantity and quality, including cumulative effects, and has proposed mitigation measures to reduce the Project's effects and help preserve these water resources. Permits for water withdrawal and discharge are required from the NWB. | Impacts from other projects are addressed in the Cumulative Effects Section (Section 19.4).<br>Future impacts of changing climate are addressed in Section 19.3.7<br>See also Change to Surface Water and Sediment Quality (Section 19.3.3) and Change in Groundwater Quality (Section 19.3.4). |
| During engagement on previous projects, Kitikmeot Inuit Association shared concerns related to water quality as a result of mining, including:<br>• Concerns about contamination from mining (e.g., Lupin Gold Mine, Tahera project)<br>• Potential for eutrophication, nitrate toxicity, and sedimentation affecting aquatic life and human health<br>• Inadequate assessment and mitigation plans by developers. | KIA 2003; NIRB 2024 | WKR recognizes the importance of water resources throughout the area and has developed mitigation measures to limit the Project's effects on water availability. | See Change to Surface Water Quantity (Section 19.3.2), Change to Surface Water and Sediment Quality (Section 19.3.3), and Change in Groundwater Quality (Section 19.3.4).<br>Measures to prevent changes to water quality are discussed in Sections 19.3.3.3 and 19.3.4.3.<br>Impacts from other projects are addressed in the Cumulative Effects Section (Section 19.4). |

| Comment | Source | WKR's Response | Where Addressed |
|---|---|---|---|
| During engagement on previous projects, Kitikmeot Inuit Association shared concerns related to water quality as a result of mining, including:<br>• Concerns about contamination from mining (e.g., Lupin Gold Mine, Tahera project)<br>• Potential for eutrophication, nitrate toxicity, and sedimentation affecting aquatic life and human health<br>• Inadequate assessment and mitigation plans by developers. | KIA 2003; NIRB 2024 | WKR recognizes the importance of water resources throughout the area and has developed mitigation measures to limit the Project's effects on water availability. | See Change to Surface Water Quantity Change In Surface Water Quantity (Section 19.3.2), Change to Surface Water and Sediment Quality (Section 19.3.3), and Change in Groundwater Quality (Section 19.3.4).<br>Measures to prevent changes to water quality are discussed in Sections 19.3.3.3 and 19.3.4.3.<br>Impacts from other projects are addressed in the Cumulative Effects Section (Section 19.4). |
| During engagement on previous projects, Kitikmeot Inuit Association shared concerns related to water quality as a result of mining, including:<br>• Concerns about contamination from mining (e.g., Lupin Gold Mine, Tahera project)<br>• Potential for eutrophication, nitrate toxicity, and sedimentation affecting aquatic life and human health<br>Inadequate assessment and mitigation plans by developers. | KIA 2003; NIRB 2024 | WKR recognizes the importance of water resources throughout the area and has developed mitigation measures to limit the Project's effects on water availability. | See Change to Surface Water Quantity (Section 19.3.2), Change to Surface Water and Sediment Quality (Section 19.3.3), and Change in Groundwater Quality (Section 19.3.4).<br>Measures to prevent changes to water quality are discussed in Sections 19.3.2.3 and 19.3.3.3.<br>Impacts from other projects are addressed in the Cumulative Effects Section (Section 19.4). |
| NTKP consultants reported that water quality varies across the project area. The best water sources in the summer are among deep rock crevices. Cold water springs (a*niloakhinik*) and permanent ice *(neelak*) are inland sources of water. *Aniloakhinik* are found in sandy areas, near eskers. These resources should be preserved. *Neelak* are known to exist near Anialik, Kennarctic River *(Kogloktoakyok*) and the west side of Grays Bay.<br>Additional waters sources used by Kitikmiut include lakes, rivers, rock basins, snow, and ice. | Banci and Spicker 2024 | Variations in water quality have been documented and used to inform decisions in this Project. Considerations for the identified hydrological features have been made. | Included in the overview of both Groundwater Quality (Section 19.2.2.4) and Surface Water Quality and Sediment Quality (Section 19.2.2.3. Applicability of cold water springs for monitoring effects is discussed in Section 19.4.3. |

| Comment | Source | WKR's Response | Where Addressed |
|---|---|---|---|
| NTKP consultants and community members of the Kitikmeot Region reported that drinking water quality has declined over time in the following locations:<br>• Near Kugluktuk<br>• Bernard Harbour<br>• Coppermine River<br>This could be due to changes in weather/precipitation, increased contamination from the mining industry, improper waste disposal or melting of permafrost. These changes are less dramatic in inland areas. Local residents want to ensure that existing water resources are not contaminated by project activities and operation. | Banci and Spicker 2024; NIRB 2004; GBRP 2017 | WKR acknowledges that water quality has changed over time. Plans have been made to mitigate for changes to water quality. | Measures to prevent changes to water quality are discussed in Sections 19.3.3.3 and 19.3.4.3.<br>Future impacts of changing climate are addressed in Prediction Confidence and Uncertainty (Section 19.6). |
| NTKP consultants stated that tailings ponds need to be properly managed to prevent contamination of water resources. | Banci and Spicker 2024 | Mineral exploration is not part of the proposed Project itself, but construction of the Grays Bay Road and Port will likely lead to the increased development of mining operations in the area. These mines will be subject to their own environmental impacts assessment and will be subject to the laws and regulations of the Nunavut Government. | Impacts from other projects are addressed in the Cumulative Effects Section (Section 19.4). |
| NTKP consultants shared that water resources are less abundant as average water levels are decreasing, and permafrost is receding quickly. The ocean is frozen for shorter periods of the year. | Banci and Spicker 2024 | WKR recognizes the importance of water resources throughout the area and has developed mitigation measures to limit the Project's effects on water availability. | Impacts of the Project on water quantity are discussed in Section 19.3.2.<br>Future impacts of climate change are addressed in Section 19.6.<br>See Sections 19.2.2.3 and 19.2.2.4 for climatic and hydrologic variability. |
| NTKP consultants explained that water levels have decreased over time, and many rivers are now dry in the fall. Areas where decreased water levels have been observed include Fairy Lake River (*Ahiak*), the Bathurst Inlet area, and Gordon Bay River (*Kokiviayok*). | Banci and Spicker 2024 | WKR recognizes the importance of water resources throughout the area and has developed mitigation measures to limit the Project's effects on water availability. | See Sections 19.2.2.3 and 19.2.2.4 for climatic and hydrologic variability. |

| Comment | Source | WKR's Response | Where Addressed |
|---|---|---|---|
| NTKP consultants reported that increased temperatures have led to thinner ice forming on lake and rivers, making travel in the winter more difficult and dangerous. | Banci and Spicker 2024 | WKR acknowledges this and other potential effects of climate change. | Future impacts of changing climate are addressed in Prediction Confidence and Uncertainty (Section 19.6).<br>See Section 19.2.2.3 for climatic variability. |
| NTKP consultants shared that surface runoff and snowmelt have been occurring more rapidly as the climate has changed, leading to high water conditions and floods in the spring while summers contain drought-like conditions. | Banci and Spicker 2024 | Although the nival flow regime (snow and ice-melt driven spring flows and lower flows in summer) is typical of the region, WKR recognizes that climate change may cause earlier melting and an earlier onset to the seasonal lower flow period. WKR has developed mitigation measures to limit the Project's effects on water. | See Sections 19.2.2.3 and 19.2.2.4 for climatic and hydrologic variability and Appendix 12A for further details on climate change projections. |
| During engagement on a previous project, Kitikmeot Inuit Association stated that past water management systems and monitoring plans, like the one at the Jericho mine, did not adequately protect water quality and had the potential for the internal loading of nutrients and eutrophication of lakes. This could harm fish eggs and fry. | KIA 2003 | WKR recognizes the importance of water resources throughout the Kitikmeot Region and has developed mitigation measures to limit the Project's impacts on water quality.<br>Water management and monitoring for quarries and mobile camps will be addressed in the Borrow Pits and Quarry Management Plan and the Water Management Plan, respectively. | See Sections 19.3.2 and 19.3.3.<br>Measures to prevent changes to water quality are discussed in Sections 19.3.3.3 and 19.3.4.3. |
| IAG members expressed that quarries and mobile camps will require water management plans and effluent quality criteria for both the construction and operation phase. Members are concerned about the acidification of water from blasted materials. | IAG 2025a | WKR acknowledges that water quality may be affected by quarries and mobile camps (potential metal leaching and acid rock drainage).<br>Water management and monitoring for quarries and mobile camps are addressed in the Borrow Pits and Quarry Management Plan and the Water Management Plan, respectively. | See Sections 19.3.2 and 19.3.3.<br>Measures to prevent changes to water quality are discussed in Sections 19.3.3.3 and 19.3.4.3. |
| IAG members recommended that snow management mitigate the impacts of melting dust-entrained snow on water quality. This could include silt fencing to monitor sediment and erosion. | IAG 2025a | WKR acknowledges that water quality may be affected by dust-entrained snow, and plans have been made to mitigate for changes to water quality. | See Section 19.3.3.3 for dust control and ESC mitigation, as well as the ESCP for further details. |

| Comment | Source | WKR's Response | Where Addressed |
|---|---|---|---|
| IAG members stated that it is important that water is protected if the Project is built. | IAG 2025b | WKR has assessed the potential for the Project to affect both water quantity and quality and has proposed mitigation measures to reduce the Project's effects and help preserve these water resources. | See Change to Surface Water Quantity (Section 19.3.2), Change to Surface Water and Sediment Quality (Section 19.3.3), and Change in Groundwater Quality (Section 19.3.4). |
| During a public comment period for the NIRB, Kitikmeot Inuit Association raised concerns about harmful substances entering watercourses, as well as changes to hydrology, microclimates, soil moisture, water quality, and localized flooding. | NIRB 2024 | WKR has assessed the potential for the Project to affect water quality (including the introduction of sediments and contaminants). changes to hydrology (including soil moisture and localized flooding). Mitigation measures are proposed to address altered drainage patterns and surface water quality; federal guidelines will be applied to monitor and interpret water chemistry as it relates to human consumption. | See Change to Surface Water Quantity (Section 19.3.2), Change to Surface Water and Sediment Quality (Section 19.3.3), and Change in Groundwater Quality (Section 19.3.4). |
| During a public scoping meeting for the NIRB, Taloyoak community members expressed concern regarding earlier spring melts causing increased sediment. | NIRB 2025 | WKR has assessed the potential for the Project to affect water quality (including the introduction of sediments). changes to hydrology (addressed in the surface water quantity section, which looks at hydrological regime). Mitigation measures are proposed to minimize effects on hydrology and sedimentation. | See Change to Surface Water Quantity (Section 19.3.2), Change to Surface Water and Sediment Quality (Section 19.3.3) |
| During a public scoping meeting for the NIRB, Taloyoak community members shared that if a bridge were to be constructed at Netsilik River, the river system would need to continue to support natural water movement and fish passage, including maintaining connectivity between the rivers and the ocean through suitable crossing designs such as culverts. | NIRB 2025 | WKR has reviewed comments focused on the change in surface water quantity and has considered this within the assessment on surface water quantity.<br>Mitigation measures are proposed to minimize effects on hydrology and sedimentation. | See Section 19.3.2 for the assessment of change in Surface Water Quantity. |
| During a public scoping meeting for the NIRB, Gjoa Haven community members inquired if Project activities would affect drinking water. | NIRB 2025 | WKR has assessed the potential for the Project to affect water quality (including the introduction of sediments and contaminants). Mitigation measures are proposed to address surface water quality; federal guidelines will be applied to monitor and interpret water chemistry as it relates to human consumption. | See Change to Surface Water and Sediment Quality (Section 19.3.3) |

| Comment | Source | WKR's Response | Where Addressed |
|---|---|---|---|
| During a public scoping meeting for the NIRB, Cambridge Bay community members shared that the water in Tree River has become warmer in recent years. | NIRB 2025 | WKR has assessed the potential for the Project to affect water quantity (which addresses changes in hydrological regime that might be influenced by seasonal temperatures). The water resources assessment also considers the effects of climate change on surface water quantity. Mitigation measures are proposed to minimize effects on hydrology. | See Change to Surface Water Quantity (Section 19.3.2) |
| During engagement on previous projects, Yellowknives Dene First Nation stated that water quality is the most significant VC and water quality should remain as close to baseline conditions as possible in order to have good water quality that supports wildlife, fish and aquatic life, and continued cultural use. With respect to mining, the Nation stated that members are particularly concerned about water quality and the effects of mining on the environment. | YKDFN 2017, 2019 | WKR has assessed the potential for the Project to impact both water quantity and quality and has proposed mitigation measures to reduce the Project's effects and help preserve these water resources.<br>Water management for quarries and mobile camps is addressed in the Borrow Pits and Quarry Management Plan and the Water Management Plan, respectively.<br>Mineral exploration is not part of the proposed Project itself, but construction of the Grays Bay Road and Port will likely lead to the increased development of mining operations in the area. These mines will be subject to their own environmental impacts assessment and will be subject to the laws and regulations of the Nunavut Government. | See Change to Surface Water Quantity (Section 19.3.2), Change to Surface Water and Sediment Quality (Section 19.3.3), and Change in Groundwater Quality (Section 19.3.4).<br>Impacts from other projects are addressed in the Cumulative Effects Section (Section 19.4).<br>See also Traditional, Land, Marine, and Resource Use (Volume 9, Section 24) |
| During engagement on a previous project, North Slave Métis Alliance expressed concern about introduced sediment affecting fish and fish habitat, stating that fish are sensitive and require clean water. | NSMA 2001 | WKR has assessed the potential for the Project to affect both water quality and sediment quality and has proposed mitigation measures to reduce the Project's effects from erosion and sediment and help preserve these water resources. | See Change to Surface Water Quantity (Section 19.3.2), Change to Surface Water and Sediment Quality (Section 19.3.3), and Change in Groundwater Quality (Section 19.3.4).<br>Measures to prevent changes to surface water and sediment quality are discussed in Section 19.3.3.3 and measures for groundwater are discussed in Section 19.3.4.3. |

| Comment | Source | WKR's Response | Where Addressed |
|---|---|---|---|
| During engagement on a previous project, Northwest Territory Métis Nation expressed concerns about water quality as a result of mining activities. | NWTMN 2012 | Water management for quarries and mobile camps is addressed in the Borrow Pits and Quarry Management Plan and the Water Management Plan, respectively.<br>Mineral exploration is not part of the proposed Project itself, but construction of the Grays Bay Road and Port will likely lead to the increased development of mining operations in the area. These mines will be subject to their own environmental impacts assessment and will be subject to the laws and regulations of the Nunavut Government. | See Change to Surface Water Quantity (Section 19.3.2), Change to Surface Water and Sediment Quality (Section 19.3.3), and Change in Groundwater Quality (Section 19.3.4).<br>Impacts from other projects are addressed in the Cumulative Effects Section (Section 19.4). |
| During a public scoping meeting with the NIRB, community members in Yellowknife expressed concern about the contamination of water resources and potential effects to wildlife. | NIRB 2025 | WKR has assessed the potential for the Project to affect water quality (including the introduction of sediments and contaminants). Mitigation measures are proposed to address surface water quality; federal guidelines will be applied to monitor and interpret water chemistry. | See Change to Surface Water and Sediment Quality (Section 19.3.3) |

#### *19.2.2.2 Surface Water Quantity*

### Regional Climate

To characterize baseline climate conditions for the Project, the Climate Profile TDR selected four study locations: Grays Bay, Kugluktuk, Ulu, and Jericho. Grays Bay, Ulu, and Jericho were chosen to represent the northern, central, and southern portions of the project area, respectively, while Kugluktuk provided a coastal comparison to Grays Bay. Data collection methods for each location are summarised in Table 19.10.

**Table 19.10 Representative Stations**

| Representative Locations | Data collection method |
|---|---|
| Grays Bay | Combination of PCIC-Blend gridded data (1991-2012) and downscaled multi-model ensemble mean data (2013-2020). |
| Ulu | Combination of PCIC-Blend gridded data (1991-2012) and downscaled multi-model ensemble mean data (2013-2020). |
| Kugluktuk | ECCC composite Kugluktuk record developed using the Kugluktuk A (ID: 2300902), Kugluktuk A (ID: 2300903), and Kugluktuk Climate (ID: 2300904) stations. |
| Jericho | ECCC composite Lupin record developed using the Lupin A (ID: 23026HN) and Lupin CS (ID: 230N002) stations. |

Note:
Table references Climate Profile TDR (Volume 5, Appendix 12A)

The regional climate is characterized by long, cold winters and short, cool summers. Key baseline findings, as summarized from the Climate Profile TDR, related to temperature, precipitation, and wind include the following:

- Annual mean temperatures range from approximately -14.2 degrees Celsius (°C) at Grays Bay to -9.7°C at Kugluktuk. Mean winter temperatures are -31.1°C at Grays Bay and -26.0°C at Kugluktuk. Summer temperatures are mild, with mean values of 4.5°C at Grays Bay and 8.9°C at Kugluktuk.
- Extreme cold events (minimum temperature is equal to or less than -30°C) are common in winter, with Grays Bay experiencing an average of 77 such days per year. Extreme heat events (maximum temperature is equal to or greater than 25°C) are less common, with the highest number of extreme heat events seen at Jericho and Kugluktuk, which average 2–4 days annually.
- Freeze-thaw cycles are days (24-hour periods) with a maximum temperature greater than 0°C and a minimum temperature equal to or less than -1°C. The average number of freeze-thaw cycles annually ranges from 28 days at Ulu, Jericho, and Grays Bay to 34 days at Kugluktuk.
- Frost days are defined as days with a minimum air temperature below 0°C. The average number of frost days annually ranges from 250 days at Jericho to 269 days at Ulu.
- Ice days are defined as days with a maximum air temperature below 0°C. The average number of ice days annually ranges from 210 days at Jericho to 233 days at Ulu.
- Annual total precipitation ranges from approximately 233 mm at Grays Bay, 234 mm at Kugluktuk, 316 mm at Jericho and 338 mm at Ulu. The highest seasonal precipitation occurs in summer and autumn, while winter and spring are drier but still contribute significantly to snowpack.
- Snowfall is a dominant component of annual precipitation. Grays Bay receives approximately 134 cm of snow annually, while Kugluktuk receives over 206 cm. Snowfall occurs on approximately 100 days per year at the Kugluktuk and Lupin Stations (representative of Jericho), with snowfall events (equal to or greater than 10 cm/day) occurring on average 1-2 days per year.

- Local and Indigenous people in the Kitikmeot Region have observed changes in snow over the recent decades, which have been recorded as part of the NTKP (Banci and Spicker 2024). Changes have been noted in snow consistency and structure, with more powdery, less cohesive snow that is less suitable for traditional uses such as igloo construction.
- Wind conditions vary seasonally and geographically across the project region. Mean annual wind speeds at Kugluktuk are 15.1 km/h, with monthly means ranging from 12.7 km/h in April to 17.8 km/h in January. Wind direction is predominantly from the west or southwest for October through April, and east or north for May through September.
- Historical records show that wind gusts can exceed 100 km/h, particularly during winter storms. The highest recorded gust at Kugluktuk was 106 km/h. At Lupin (representative of Jericho), gusts have reached up to 109 km/h.
- Through the NTKP (Banci and Spicker 2024), local and Indigenous people in the Kitikmeot Region have recorded observations of wind conditions, highlighting differences between summer and winter conditions. Wind could cause difficulties in winter travel around the Grays Bay area. It was noted that the predominant wind direction in summer is from the southwest.

### Hydrology

The PDA is characterized by low-gradient terrain underlain by permafrost and bedrock, resulting in limited subsurface infiltration and high surface runoff (MMG Ltd. 2013; Sabina 2020). These conditions result in surface water retention, with numerous ponds, lakes, and wetlands distributed throughout the region. Irregular channels with scattered boulders connect many of these waterbodies, with water flowing in some streams only during the short summer runoff period. In small channels, high flows may only last a few days, whereas in larger channels high flows can persist for several weeks (Wolfden 2006).

Hydrological processes refer to the physical processes involved in the movement, distribution, and storage of water within the hydrologic cycle. Several factors characterize the timing, distribution, and magnitude of the annual flow regime in permafrost-dominated watersheds, including:

- Snowpack: The depth and snow-water equivalent accumulated over winter prior to each year's freshet.
- Meteorological Conditions: The timing and rate of snowmelt are influenced by temperatures rising above freezing and the duration that temperatures remain above freezing. Precipitation, sun exposure, elevation, and wind also affect evapotranspiration and sublimation rates.
- Flow Routing: The complexity of watersheds, including the presence of lakes, ponds, wetlands, and interconnected channels, can influence the rate from the onset of snow melting to the peak freshet flow.
- Storage deficit: Before contributing to streamflow, ponds, wetlands and lakes, and soil within the watershed must fill up or reach saturation prior to discharging water during the freshet. A previous dry year and low snowpack can take additional time to recharge before snowmelt begins to contribute to runoff. The runoff from summer rainfall events can be greatly reduced by large soil moisture deficits in the watershed (Favaro 2014).

The Project intersects five primary watersheds that drain to the Arctic Ocean: Burnside River (24,630 $km^2$), Hood River (10,280 $km^2$), James River (3,930 $km^2$), Kennarctic River (1,390 $km^2$), and an unnamed watershed that discharges to the Arctic Ocean (23.3 $km^2$).

The Burnside River watershed, the largest, is on the south end of the Project, and encompasses the proposed road corridor to Contwoyto Lake and the Jericho Station PDA for servicing the Jericho Diamond Mine. The Hood River watershed, to the north, is crossed by the proposed main road PDA and includes the Ulu Gold project. The James River watershed is a major tributary of the Hood River. The Burnside, Hood, and James Rivers flow eastward to Bathurst Inlet, with approximately two-thirds of the total road corridor length situated within these three watersheds. Most of the remaining road corridor is within the Kennarctic River watershed, which drains north to Grays Bay and is crossed by the Port Intake Lake (south intake lake), Aerodrome PDA, and a small portion of the Port PDA. The High Lake Mine is also in the Kennarctic River watershed. The unnamed watershed that discharges to the Arctic Ocean drains a much smaller area (23.3 $km^2$), and is crossed by the Port PDA, Port Intake Lake (north intake lake), and a small portion of the Aerodrome PDA.

Hydrologic baseline conditions were characterized using surface water quantity data from active and historical hydrometric stations operated by the WSC, as well as project-specific stations from the Ekati and Hope Bay mine sites.

The watersheds intersected by the Project exhibit a nival flow regime, with peak annual flows generally occurring during freshet in response to snowmelt. In larger watersheds, peak flows can be delayed due to attenuation in lakes and ponds. Post-freshet runoff is influenced by rainfall, evaporation, melting of the active permafrost layer, and the release of stored water from surface waterbodies. Summer precipitation events can increase streamflow, though typically to a lesser extent than freshet flows.

As part of the Grays Bay Road and Port Project Hydrology Baseline Report (Appendix 19A) a review and analysis of available hydrometric data in the Kitikmeot Region of Nunavut was completed. Streamflow data was analyzed, and key hydrological parameters were calculated, including runoff, peak flows, low flows, and ice depth conditions, using hydrometric data from WSC stations and regional mine sites at the Ekati Diamond Mine and Hope Bay Mine over the past 30 years. Stations were chosen for each analysis based on their size, peak flow occurrence criteria, and data quality thresholds. A summary of the key findings is as follows:

- Annual average runoff from selected hydrometric stations ranged from 115 mm to 264 mm (Table 19.11). For hydrometric stations with drainage areas comparable to those encountered along the road corridor (ranging from 3 $km^2$ up to 4,513 $km^2$), annual average runoff ranged from 115 mm to 244 mm. Minimum measured annual runoff from selected hydrometric stations ranged from 27 to 162 mm, and maximum measured annual runoff ranged from 196 to 417 mm.
- Monthly runoff distribution reflects a nival regime, with approximately 60 to 95% of annual runoff occurring between June and September (Table 19.12). At seven of the ten stations, peak monthly runoff occurred in June, coinciding with the spring freshet shortly after air temperatures rise above freezing (Table 19.12).

- At three of the ten stations, peak monthly runoff occurs in July (Table 19.12). The delay may be attributed to retention of meltwater within the watershed, a greater influence of summer rainfall events, or a delayed onset of the freshet due to climatic conditions.
- Peak unit discharge (discharge adjusted for drainage area [litres per second per square kilometre ($L/s/km^2$)]) shows an inverse relationship with drainage area, with smaller watersheds producing higher peak flows relative to their area (Figure 19.4).
- Winter conditions result in complete channel freeze-up in smaller systems, typically from late October to early November. During the open water summer period (June to September) the median 7-day low flows for seven WSC stations and two Ekati mine sites were calculated (Table 19.11). The median 7-day low flows range from 1.5 $L/s/km^2$ at Vulture-Polar to 6.0 $L/s/km^2$ at Burnside River Near the Mouth.
- Baseline hydrology data collection for the Izok Corridor Project (MMG Ltd. 2013) showed ice thickness measurements from regional lakes range from 1.25 to 2.05 m (Table 19.13). Recent measurements from the Hope Bay project (April 2023) show ice thicknesses between 1.67 m and 1.93 m (ERM 2024a).
- At the Snap Lake project, the timing of ice-off and ice-on dates for Snap Lake were recorded from 2008 to 2022, with ice-off occurring in early to mid-June and ice-on dates of mid-October to early November (De Beers Group 2023).
- Local and Indigenous people in the Kitikmeot Region have observed changes in ice cover over the recent decades, which have been recorded as part of NTKP (Banci and Spicker 2024). Changes in lake ice have been documented in increased melting time and decreased ice quality. A quote from an interview in 2013 states:
  - "*What we are seeing in the snow, from our travels, it's not the same snow as 40 or 50 years ago. And what we're seeing is the same thing with ice conditions, its not the same as 50 years ago, because of the content of the snow and water*".

**Figure 19.4 Regional Regression Analysis - Peak Unit Discharge (L/s/km²) and Drainage Area (Grays Bay Road and Port Project Hydrology Baseline Report Appendix 19A)**

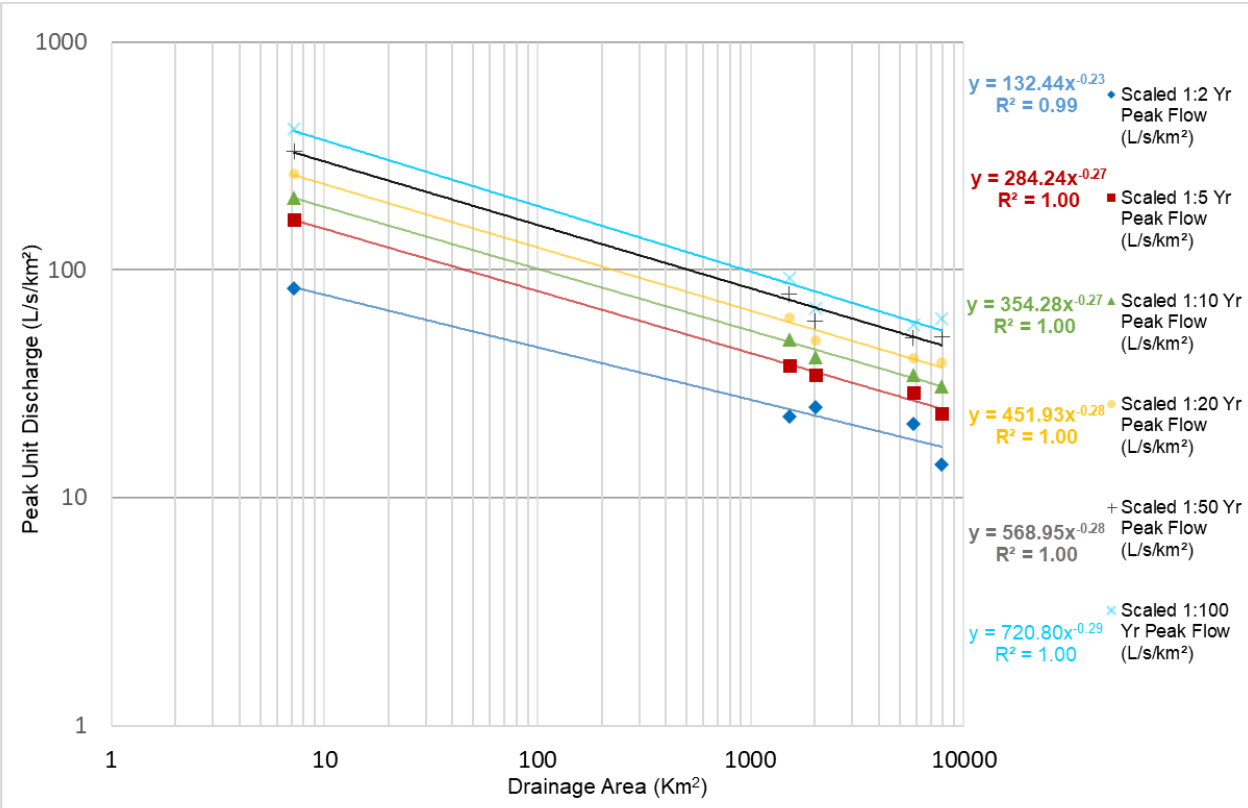


**Table 19.11 Mean Annual Runoff and 7-Day Low Flow at Selected Hydrometric Monitoring Stations**

| Station ID | Station Name | Drainage Area ($km^2$) | Mean Annual Discharge ($m^3/s$) | Mean Annual Runoff (mm) | Minimum Annual Runoff (mm) | Maximum Annual Runoff (mm) | Median Summer 7-day Low Flow ($L/s/km^2$) |
|---|---|---|---|---|---|---|---|
| 07SA004 | Indin River above Chalco Lake | 1,520 | 7.8 | 162 | 52 | 307 | 2.8 |
| 07SA008 | Snare River above Indin Lake | 7,886 | 31 | 122 | 48 | 196 | 2.2 |
| 10RA001 | Back River below Beachy Lake | 19,600 | 105 | 169 | 100 | 261 | 3.2 |
| 10QA001 | Tree River near the Mouth | 5,810 | 41 | 221 | 140 | 388 | 5.2 |
| 10PA002 | Yamba River below Daring Lake | 2,010 | 16 | 244 | 130 | 417 | 5.2 |
| 10QC001 | Burnside River near the mouth | 16,800 | 141 | 264 | 162 | 359 | 6.0 |
| 10QD001 | Ellice River near the mouth | 16,900 | 85 | 159 | 127 | 201 | 1.9 |
| Ekati | Slipper-Lac de Gras[1] | 185 | 0.71 | 121 [1] | 28 [1] | 298 [1] | 2.2 [2] |
| Ekati | Vulture Polar[2] | 7 | 0.03 | 147 | n/a | n/a | 1.5 |
| Ekati | Cujo Outflow[1] | 3 | 0.01 | 127 | 27 | 261 | n/a |
| Hope Bay[3] | Windy Outflow | 14 | 0.06 | 129 | n/a | n/a | n/a |
| Hope Bay[3] | Patch Outflow | 32 | 0.12 | 121 | n/a | n/a | n/a |
| Hope Bay[3] | PO Outflow | 35 | 0.16 | 140 | n/a | n/a | n/a |
| Hope Bay[3] | Ogama Outflow | 75 | 0.27 | 115 | n/a | n/a | n/a |
| Hope Bay[3] | Doris Creek TL-2 | 90 | 0.37 | 130 | n/a | n/a | n/a |
| Hope Bay[3] | Roberts Hydro-2 | 98 | 0.41 | 133 | n/a | n/a | n/a |
| Hope Bay[3] | Little Roberts Outflow | 194 | 0.73 | 118 | n/a | n/a | n/a |

Notes:

[1] Ekati Annual Report (ERM 2024b)

[2] Back River Project (Sabina 2015)

[3] Hope Bay Project (ERM 2024a)

Table references Grays Bay Road and Port Project Hydrology Baseline Report (Appendix 19A)

### Table 19.12 Seasonal Runoff Distribution (%) at Selected Hydrometric Monitoring Stations

| Station ID | Station Name | Drainage Area ($km^2$) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 07SA004 | Indin River above Chalco Lake | 1,520 | 3.4 | 2.1 | 1.6 | 1.2 | 6.2 | 29.2 | 19.1 | 10.2 | 7.6 | 8.2 | 6.4 | 4.8 |
| 07SA008 | Snare River above Indin Lake | 7,886 | 3.7 | 2.4 | 2.1 | 1.7 | 4.4 | 20.2 | 23.5 | 13.5 | 8.6 | 8.2 | 6.7 | 5 |
| 10RA001 | Back River below Beachy Lake | 19,600 | 0.5 | 0.3 | 0.2 | 0.2 | 1.8 | 38.5 | 22.9 | 13.2 | 11.3 | 7.2 | 2.6 | 1.3 |
| 10QA001 | Tree River near the Mouth | 5,810 | 2.3 | 1.5 | 1.5 | 1.4 | 2.4 | 10.6 | 26.7 | 19.6 | 14.5 | 10.5 | 5.6 | 3.4 |
| 10PA002 | Yamba River below Daring Lake | 2,010 | 2.5 | 1.2 | 0.7 | 0.5 | 1.8 | 15.8 | 25.7 | 19.4 | 12.8 | 9.6 | 6.0 | 4.0 |
| 10QC001 | Burnside River near the mouth | 16,800 | 1.2 | 0.8 | 0.8 | 0.7 | 3.6 | 41.1 | 18.8 | 11.3 | 10.7 | 6.1 | 3.0 | 1.9 |
| 10QD001 | Ellice River near the mouth | 16,900 | 0.0 | 0.0 | 0.0 | 0.0 | 1.5 | 53.4 | 21.9 | 7.9 | 11.3 | 3.4 | 0.5 | 0.1 |
| 10OPC004 | Coppermine River Above Copper Creek | 46,200 | 3.8 | 2.7 | 2.5 | 2.1 | 4.7 | 22.3 | 15.4 | 13.2 | 12.2 | 9.7 | 6.5 | 4.9 |
| Ekati | Slipper-Lac de Gras Stream | 185 | 0.0 | 0.0 | 0.0 | 0.0 | 6.7 | 50.1 | 19.8 | 9.5 | 10.8 | 3 | 0.1 | 0.0 |
| Ekati | Vulture-Polar | 7 | 0.0 | 0.0 | 0.0 | 0.0 | 10 | 49 | 21.6 | 8.8 | 9.6 | 0.9 | 0.1 | 0.0 |

Note:
Table references Grays Bay Road and Port Project Hydrology Baseline Report (Appendix 19A)

**Table 19.13 Lake Ice Thickness Measurements**

| Project / Source | Site Name | Measurement Date | Northing (m) | Easting (m) | Ice Thickness (m) | Distance from Proposed Road Alignment (km) |
|---|---|---|---|---|---|---|
| Izok Corridor Project | Lake Site 1 | May 9-10, 2012 | 7509953 | 504954 | 1.84 | 253 |
| | Lake Site 2 | | 7508056 | 505805 | 1.88 | 253 |
| | Lake Site 3 | | 7500893 | 505638 | 2.00 | 790 |
| | Lake Site 4 | | 7497382 | 506194 | 2.05 | 1050 |
| | Lake Site 5 | | 7496214 | 506090 | 1.96 | 541 |
| | Lake Site 6 | | 7488224 | 507053 | 1.91 | 523 |
| | Lake Site 7 | | 7487108 | 507229 | 1.68 | 790 |
| | Lake Site 8 | | 7485738 | 507424 | 1.63 | 1,314 |
| | Iznogoudh Lake | May 14, 2012 | 7281925 | 415040 | 1.25 | 746 |
| | Iznogoudh Lake | | 7281408 | 414908 | 1.35 | 746 |
| | Izok Lake | | 7280435 | 417643 | 1.52 | 484 |
| | Izok Lake | | 7280345 | 417489 | 1.39 | 484 |
| | Itchen Lake | | 7280373 | 419799 | 1.28 | 470 |
| | Itchen Lake | | 7279278 | 419460 | 1.50 | 1,003 |
| Hope Bay AEMP | Windy Lake | April 21, 2023 | 7553269 | 431630 | 1.85 | 683 |
| | Glenn Lake | April 20, 2023 | 7560337 | 430183 | 1.69 | 176 |
| | Patch Lake | April 21, 2023 | 7549739 | 434660 | 1.79 | 178 |
| | Imniagut Lake | April 21, 2023 | 7551490 | 433559 | 1.82 | 180 |
| | Po Lake | April 24, 2023 | 7549393 | 436576 | 1.91 | 431 |
| | Ogama Lake | April 24, 2023 | 7553517 | 436148 | 1.80 | 430 |
| | Doris Lake | April 24, 2023 | 7558222 | 433815 | 1.67 | 683 |
| | Little Roberts Lake | April 20, 2023 | 7562826 | 434665 | 1.93 | 925 |

Note:
Table references Grays Bay Road and Port Project Hydrology Baseline Report (Appendix 19A)

### *19.2.2.3 Surface Water and Sediment Quality*

The Project lies within the tundra of the continuous permafrost zone of the Canadian Arctic. It crosses five main watersheds that flow to the Arctic Ocean, listed from south to north: Burnside River, Hood River, James River, Kennarctic River, and an unnamed watershed that discharges to the Arctic Ocean near Grays Bay (see Figure 3.1 in Appendix 19A). Additional watercourses along the northernmost portion of the proposed alignment flow directly into the Arctic Ocean.

Federal and Federal-Territorial water quality monitoring sites have not yet been established within the RAA. The closest federal site is the Coppermine River (site: NW10PC0019 in the Coppermine River watershed), located approximately 225 km west of the Project (see inset in Figure 1.2 in Appendix 19C) and outside of the RAA; therefore, data from this site were not considered applicable to the assessment. A literature review was conducted to support the understanding of regional water quality conditions, and the results are summarized below.

Surface water quality in the Canadian Arctic Archipelago is influenced by bedrock geology, seasonal hydrology, and landscape physiography (Brown et al. 2020). Brown et al. (2020) observed that the geochemistry of small, coastal-draining rivers in the region differs from that of larger Arctic rivers, which are influenced by more extensive and diverse landscapes.

Elliott et al. (2021) described drinking water sources of communities in Nunavut, noting that surface water, primarily lakes, is the sole source of potable water. Some communities also rely on creeks, rivers, or glacial meltwater (Elliott et al. 2021). These sources are further described in Appendix 19C. Drinking water sources identified by Kitikmiut include: the Burnside River, most lakes and rivers - preferably large lakes and flowing rivers, rock crevasses, aniloakhinik (places where water was forced to the surface due to the pressure of the surrounding permafrost) and neelak (locations of permanent ice) (Banci and Spicker 2024).

#### Water Chemistry and Sediment

Surface water and sediment quality sample collection, analytical methods, results, and QA/QC procedures are described in Appendix 19C. Overall, monitoring data within the LAA and RAA are limited. Data collected in 2012 and 2024 along the alignment, at the proposed High Lake Mine area, and near the Port site are included to characterize existing conditions. Results were compared to relevant guidelines and are summarized below.

#### *Kennarctic River*

Six samples were collected from the Kennarctic River in August of 2012. The measured in situ water quality parameters had river temperatures between 9.6°C and 11.3°C, with dissolved oxygen (DO) levels ranging from 91.8% to 132% saturation. Conductivity varied from 48 to 73 microsiemens per centimetre (µS/cm), pH ranged from 7.86 to 8.57, and total dissolved solids (TDS) were between 0.043 and 0.066 milligrams per litre (mg/L). Total suspended solids (TSS) were below detection limits (<3.0 mg/L), turbidity ranged from 0.22 to 0.46 Nephelometric Turbidity Unit (NTU), and oxidation-reduction potential ranged from 111.0 to 132.0 millivolts. Water hardness ranged from 27.3 to 31.4 mg/L as calcium carbonate ($CaCO_3$), with calcium and magnesium as the dominant cations and bicarbonate as the main anion. Alkalinity ranged from 23.0 to 25.4 mg/L (total as $CaCO_3$), while chloride was less than 2.73 mg/L, sulphate was less than 9.19 grams per litre, and fluoride concentrations were below detection limit (0.050 mg/L). Total cyanide was consistently undetectable.

For nutrients, total ammonia (as N) was below detection limits (<0.0050 mg/L) and orthophosphate was below 0.0021 mg/L, total Kjeldahl nitrogen (TKN) ranging from <0.050 to 0.099 mg/L, nitrate (as N) was below 0.0831 mg/L, and nitrite (as N) was below detection limit (<0.0020 mg/L). Organic carbon levels were below 2.1 mg/L with dissolved organic carbon (DOC) between 1.2 and 1.7 mg/L and total organic carbon (TOC) from 1.2 to 2.1 mg/L.

Most metal concentrations were below guideline levels, except for dissolved copper, which ranged from 0.00063 to 0.00112 mg/L—exceeding the FEQG long-term guideline by up to 5 times.

### *Other Streams*

Based on the August 2012 monitoring results, surface stream temperatures at stream sites within the Burnside River, Hood River, James River, and Wentzel River watersheds ranged from 10.2°C to 13.8°C, while DO levels ranged from 9.2 mg/L to 13.3 mg/L (85.7 % to 118.9 % saturation). In situ conductivity varied from 18 to 102 µS/cm, and pH ranged from acidic to neutral (5.6 to 7.0). Turbidity ranged from 0.3 to 1.0 NTU, TDS ranged from <10.0 to 61 mg/L, and TSS were below the detection limit (3.0 mg/L). Water hardness ranged from very soft to soft (6.0 to 40 mg/L as $CaCO_3$), with calcium and magnesium as dominant cations and bicarbonate as the main anion. Alkalinity ranged from <5.0 to 36 mg/L, while chloride was below 2.0 mg/L, fluoride concentrations were below detection limit (<0.050 mg/L), and sulphate concentrations were below 11 mg/L. Total cyanide remained below detection limits (<0.002 mg/L).

For nutrients, total ammonia was below detection limit (<0.0050 mg/L), TKN from <0.050 to 0.500 mg/L, and nitrate (as N) was below 0.148 mg/L, nitrite (as N) was below detection limit (0.002 mg/L). Total phosphorus ranged from <0.001 to 0.008 mg/L, and orthophosphate was below detection limit (<0.0010 mg/L). Organic carbon levels varied, with DOC from 2.0 to 10 mg/L and TOC from 1.3 to 9.5 mg/L. Three metals exceeded guidelines, including total aluminum (1 of 10 sites, 2x CCME long-term and 1.3x FEQG), dissolved copper (10 of 10 sites, up to 9x FEQG), and total copper (1 of 10 sites, marginally above the CCME long-term).

### *Lakes*

Water quality data were available for lakes within the RAA, including those in the general area of the proposed High Lake Mine (sampled in August 2012), and for the potential water intake location (PWI-1) within the LAA near the Port site of the Project (sampled in August 2024).Overall, lake water depths varied significantly, ranging from one m to over 30 m. Temperature profiles showed surface temperatures between 9.6°C and 11.4°C, cooling to as low as 5.0°C at depth (in August). Dissolved oxygen levels were high, ranging from 99.3% to 104.8% saturation, indicating well-oxygenated waters. Field pH values were slightly alkaline (7.2 to 7.9), and surface conductivity ranged from 0.036 to 0.156 µS/cm, suggesting low ionic content.

Conductivity values ranged from 50 to 221 µS/cm and pH ranged from 6.7 to 7.7. Total dissolved solids ranged from 49 to 52 mg/L, TSS was below detection limits (<3 mg/L), and turbidity was minimal (0.4 to 0.8 NTU). Water hardness and alkalinity varied from soft to moderately hard (19 to 89 mg/L $CaCO_3$) and 7 to 38 mg/L $CaCO_3$, respectively. Chloride concentrations ranged from <2 to 35 mg/L), while fluoride and cyanide were consistently below detection limits (<0.05 mg/L and <0.002 mg/L, respectively). Nutrient levels including total phosphorus ranged from <0.001 to 0.004 mg/L, and nitrogen species were mostly below detection thresholds, indicating limited eutrophication potential. Organic carbon (DOC and TOC) ranged from 2 to 5 mg/L.

Most metal concentrations were below guidelines, with some exceptions. Concentrations above guidelines were observed for total aluminum (10 of 23 samples), total cobalt (7 of 23 samples), total cadmium (7 of 23 samples), dissolved copper (23 of 23 samples) from mostly the High Lake sites L16a and L16b. Within the High Lake Mine area, dissolved copper levels were particularly high, exceeding guidelines by up to 1,215 times the FEQG (High Lake sites L16a and L16b) and up to 10 times the FEQG in lakes in the High Lake area (sites L908, L904, L905, and L906); field pH measurements from these sites were circumneutral, ranging from 7.16 to 7.91. The reference lake site (HLC3) showed dissolved copper concentrations above the FEQG (8 to 10 times the FEQG) and a field pH of 7.94. Some metals (e.g., aluminum, iron, and copper) were above relevant guidelines in the potential water intake location (PWI-1) with field pH values ranging from 6.80 to 7.85.

### *Sediment*

Sediment samples were collected from streams located along the alignment in the Burnside River (X03-055A) and Hood River (X01-085 and X01-094) watersheds, and from lake PWI-1 in the Wentzel River watershed (PL-SQ-01, PL-SQ-02, PL-SQ-03). In the streams, the sediment was comprised of mostly coarse sand and some silt or fine sand as the sub-dominant substrate. Sediment pH values were slightly acidic, ranging from 5.39 to 5.60. Organic matter content was low, between <1.0% and 2.4%, indicating limited biological activity or organic accumulation in the sediments. Concentrations of total metals were below applicable guidelines.

In lake PWI-1, the sediment is comprised of mostly silt, with clay as the sub-dominant material. Total metal concentrations exceeded applicable guidelines at several sites. Metal concentrations above guidelines were observed for arsenic, chromium, copper, iron, manganese, and nickel, with exceedances ranging from 1.1 to 3 times the ISQG, and iron also exceeding the PEL at one site. polycyclic aromatic hydrocarbons were infrequently detected above guideline levels in lake PWI-1. However, acenaphthene, acenaphthylene, and dibenz (a,h)anthracene exceeded the ISQG at all three sampled sites, with dibenz (a,h)anthracene reaching up to four times the guideline. Naphthalene was detected at one site at the guideline limit.

## Geochemistry

The evaluation of the ML/ARD potential of geologic materials at the PDA is presented in the Izok Corridor ML/ARD Risk Assessment (see Appendix 19B). A review of publicly available data was conducted as well as sample data collection programs in 2005, 2011, and 2012. This risk assessment report summarizes the desktop assessment and ABA data collected in 2005, 2011, and 2012. It includes details of sampling, methods, and results (including tables and figures), as well as the results of the ML/ARD risk analysis. A brief overview of these results is provided here.

The Project is situated in the Slave Geological Province, a Late Archean craton that extends from the north end of the Great Slave Lake in Northwest Territories to the Coronation Gulf in Nunavut (Wolfe et al. 2017). The Slave Geological Province is characterized by volcanic and sedimentary units that have been overprinted by multiple phases of deformation and multiple phases of mid- to lower-crustal, composite granitoid intrusion events (Bleeker 2002). The following description is summarized from Bleeker and Hall (2007). The Slave craton comprises a large basement complex (Mesoarchean to Hadean) that underlies the western to central parts of the craton, which is intruded by multiple plutonic suites (2720-2670 million years ago [Ma]) and batholithic granites (2595-2585 Ma), see Appendix A Regional Bedrock Geology in Volume 6 Appendix 14A. The Yellowknife Supergroup, a supracrustal sequence, comprises quartzite and banded iron formations, greenstone sequences, young arc-like sequences, turbidite blankets, and conglomerates deposited between 2600 and 2800 Ma. Mineral deposits formed across the Slave Craton often as shear-hosted or vein-hosted showings/deposits in the greenstone belts or within the banded iron formations, also rift-related magmatic suites and arc around the craton's margins, and Phanerozoic kimberlite pipes hosting diamond showings/deposits.

At the time of the study, the Project intersects 12 distinct geological units within the Slave Geological Province. The acid base accounting test results are listed in Appendix A.1 of Appendix 19B and are summarized in Table 19.14. A total of 53 of the 206 samples were considered PAG. Some rock types, including Aal, Aam, Agd, Ath, and Atm had lower rinse pH values when compared to other units. The carbonate NPR was below 2 for Aam, Ath, Atl, Atm, Pg, and the surficial material samples, indicating a potential for these units to be classified as PAG.

An ML/ARD risk rating was assigned to each of the 34 road sections that are within the RAA (see Section 19.2.1.2). The results of the ML/ARD risk assessment are summarized as follows:

- A total of 9 road sections (excluding sections 1 through 12 – see Section 19.2.1.2), covering 63.9 km of the alignment (27 % of the alignment), are classified as moderate-low risk or higher (see Table 4.1, Table 4.2, and Table 4.3 in Appendix 19B).
- 5 sections (55.3 km, 24% of the alignment) are considered to have variable or uncertain risk (see Table 4.4 in Appendix 19B.
- 18 sections (129.3 km, 56% of the alignment) are assessed as low risk.
- 2 sections (2.3 km, 1% of the alignment) are deemed no risk, as no quarries or rock cuts are proposed.

**Table 19.14 Summary of Median ABA Data for each Lithology Tested in the RAA**

| Unit | n | Paste pH | Rinse pH | Total Carbon (wt. %) | CaNP (kg $CaCO_3$/t) | Bulk NP (kg $CaCO_3$/t) | Total Sulphur (wt. %) | Non-Sulphate Sulphur (wt. %) | Carbonate NPR |
|---|---|---|---|---|---|---|---|---|---|
| **Rock Type** | | | | | | | | | |
| Aal | 9 | 8.1 | 5.9 | 0.34 | 0.8 | 5.8 | 0.05 | 0.02 | 2.67 |
| Aam | 4 | 6.9 | 5.6 | 0.51 | 0.8 | 3.6 | 0.165 | 0.14 | 0.24 |
| Agb | 39 | 8.3 | 6.8 | 0.11 | 0.8 | 8.1 | 0.01 | 0.01 | 2.56 |
| Agd | 3 | 7.8 | 5.7 | 0.11 | 0.8 | 0.5 | 0.01 | 0.01 | 2.56 |
| Agk | 34 | 7.7 | 6.1 | 0.09 | 0.8 | 2.4 | 0.01 | 0.01 | 2.56 |
| Ath | 11 | 7.9 | 5.5 | 0.11 | 0.8 | 3.2 | 0.05 | 0.04 | 0.64 |
| Atl | 6 | 8.2 | 7.2 | 0.14 | 0.8 | 3.6 | 0.09 | 0.09 | 0.32 |
| Atm | 15 | 7.0 | 5.5 | 0.15 | 0.8 | 3.1 | 0.08 | 0.06 | 0.43 |
| Avc | 1 | 8.6 | 8.1 | 1.13 | 88.3 | 92.6 | 0.08 | 0.08 | 35.3 |
| Avf | 11 | 8.9 | 6.3 | 0.13 | 3.3 | 8.6 | 0.01 | 0.01 | 8.00 |
| Avm | 33 | 8.6 | 6.8 | 0.14 | 1.7 | 9.6 | 0.02 | 0.02 | 2.56 |
| Pg | 15 | 8.2 | 7.5 | 0.07 | 1.4 | 7.8 | 0.02 | 0.02 | 1.78 |
| **Surficial Material** | | | | | | | | | |
| Granular | 8 | 7.0 | 5.1 | 0.41 | 1.3 | 3.6 | 0.04 | 0.04 | 1.33 |
| Sediment | 13 | 5.6 | 5.6 | 1.67 | 0.8 | 0.6 | 0.03 | 0.02 | 1.33 |

Notes:

n= number of samples for geologic unit or sediment; CaNP = carbonate neutralization potential calculated based on the amount of total inorganic carbon x 83.32 kilograms (kg) $CaCO_3$/t and expresses as tonnes $CaCO_3$ equivalent/1000 tonnes of material; Bulk NP is based on the entire mineral assemblage; Non-Sulphate Sulphur = total sulphur – sulphide sulphur; and NPR is the ratio of neutralization potential to acid potential.

The longest segments in the RAA with moderate-high to moderate-low risk are concentrated in five key areas (see Table 4.1 and Figure 4.1 in Appendix 19B) as listed below.

1. Chainage 48+400 to 58+400 – 10 km (Sections 7 & 9)
2. Chainage 213+800 to 223+800 – 10 km (Section 31)
3. Chainage 245+200 to 256+400 – 12.2 km (Sections 33 & 34)
4. Chainage 263+600 to 285+000 – 22.5 km (Sections 36 & 37)
5. Chainage 324+500 to 336+900 – 12.4 km (Section 41)

Moderate-low and higher-risk road sections are primarily located in the northern portion of the Izok Road alignment, particularly within the Hood River and Kennarctic River watersheds, where both quarries and rock cuts are planned. Due to complex geology and limited sampling, several sections are classified as having variable or uncertain risk. These areas contain a mix of low and moderate-risk zones and will be further investigated to refine quarry and rock cut locations.

Most of the road (129.3 km) is considered low risk for ML/ARD, based on low ratings for stressors, pathways, and receptors. However, due to geological variability and low sampling density, additional testing will be conducted near proposed development sites with moderate geological ratings, as part of the Borrow Pits and Quarry Management Plan (see Volume 11).

The intercepted lithologies include sedimentary units (e.g., turbidites), volcanics units (e.g., basalt), felsic (e.g., granitoids) and mafic (e.g., gabbro) intrusive units. Sedimentary units are typically fine-grained, layered, and formed from the compaction of sediments. They often have higher porosity and may contain more reactive minerals like sulphides, making them more prone to ML/ARD. Volcanic and intrusive rocks are generally harder, more crystalline, and formed from cooled magma. They tend to have lower porosity and more stable mineral compositions, often with higher neutralization potential due to carbonate or silicate minerals.

Unconsolidated surficial materials along the Izok Road, particularly near Grays Bay Port, are found in layers over 50 cm deep in low-lying areas. Twenty-one soil samples from this region were rated low risk (ML/ARD risk rating 1) for ML/ARD potential. This is due to their thin, weathered nature and origin from transported glaciofluvial or marine sediments, rather than sulphide-bearing bedrock.

Most surficial material samples showed very low sulphide sulphur (<0.01%) and inorganic carbon (<0.8%), with low paste pH (4.8–6.2) attributed to high organic content. Only one sample (LX-HL-45) showed characteristics similar to the underlying bedrock, warranting further testing before any development nearby. Visual inspections are also recommended to check for signs of ARD.

A summary of the ML/ARD risk ratings is listed in Table 19.15:

**Table 19.15 Summary of ML/ARD Risk Rating for Lithology**

| Lithological Code* | Description | ML/ARD Risk Rating (1–4) (per Lithology) | Notes |
|---|---|---|---|
| Aal, Aam, Ath, Atl, Atm | Argillite and turbiditic mudstones | 4 | High S, low NP |
| Avf, Avm | Volcanic rocks | 2 | Variable S and NP |
| Agb, Agk | Granitoids | 2 | Low S, high NP |
| Ams | Mafic intrusives/volcanics | 3 | No samples, conservative rating |
| Pg | Mafic sills/dykes | 2 | Low S, moderate NP |
| Surficial (Granular, Sediment) | Soils | 1 | Weathered, low ARD risk |

Notes:

* see Table 3.1 in Appendix 19B for lithology codes and full descriptions; ML/ARD= metal leaching/acid rock drainage; S= sulphur; NP= neutralization potential

ML/ARD Risk Rating is expressed on a scale from 1 to 4, where 1 represents a low-risk rating and 4 represents high risk. Intermediate ratings (2 and 3) indicate increasing levels of potential for ML/ARD.

#### *19.2.2.4 Groundwater Quality*

The groundwater hydrostratigraphy of the Project can be separated into two groundwater zones:

- Shallow Groundwater – water hosted in the overburden and weathered bedrock within the near surface in the active zone above the permafrost, which undergoes seasonal freeze and thaw cycles
- Deep Groundwater – water hosted in the fractured bedrock beneath the permafrost

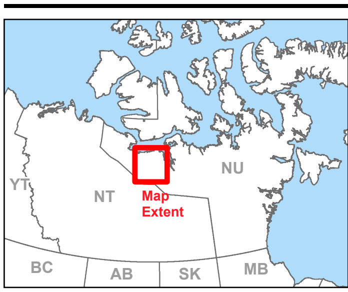
Taliks (unfrozen portions of ground within the permafrost) provide pathways for groundwater flow between the shallow and deep groundwater zones.

The Project is situated within the Slave Geologic Province of the Canadian shield and has a typical stratigraphy consisting of a thin layer of unconsolidated overburden that ranges up to 25 m in thickness overtop of low porosity crystalline bedrock (Morse et al. 2023). Fractures within the bedrock are the main structures that store and transport groundwater though this otherwise impermeable hydrostratigraphic unit. The upper weathered surface of the bedrock is known to be much more fractured and permeable than deeper portions of the bedrock unit (AECOM 2012).

In addition to the lithology of the project area, the permafrost conditions also play an important role in the hydrostratigraphy of the Project area. The Project is classified as an area of continuous permafrost and permafrost is expected to exist across over 90% of the RAA (Nunami Stantec Limited 2025). Previous studies in the region have found that this permafrost can range from 250 m to over 500 m in thickness as shown in Figure 19.5 (AECOM 2011; BGC 2006). Permafrost acts as an impermeable barrier in the subsurface that separates the deep groundwater system hosted within the fractured bedrock from the shallow groundwater system hosted within the unconsolidated overburden and weathered bedrock within the active zone. These groundwater systems are only able to interact where permafrost is absent in areas known as taliks. Open taliks exist where no permafrost is present and a direct connection between the shallow and deep groundwater systems can be established. Open taliks are only expected to occur beneath lakes that are wide enough and deep enough to avoid freezing to their base, as these lakes prevent permafrost formation by insulating the ground beneath them (BGC 2006).

Smaller lakes and water features may have an insulating effect large enough to decrease the thickness of the permafrost beneath them but not fully prevent permafrost formation. These locations will have a locally increased thickness of the shallow groundwater system.

Seasonal temperature changes will also influence the extent of the shallow groundwater system within the active zone. During the winter months, the ground will be frozen from the surface to the base of permafrost and little shallow groundwater flow will occur. In the warmer months, the active zone will thaw and allow for shallow groundwater movement. Previous studies have estimated the active zone to range in thickness from 1.5 m to 8 m depth. The maximum measured active layer thickness at investigated locations are provided in Figure 19.6. Average annual ground temperatures near the top of permafrost range from -1.4°C to -7°C as shown in Figure 19.7 (BGC 2006, 2007; AECOM 2012).


- Permafrost Thickness
- Grays Bay Port
- Grays Bay Road
- Grays Bay Winter Road
- Local Assessment Area
- Regional Assessment Area
- Advanced Mineral Exploration Site
- Closed Mine Site
- Territorial Boundary
- Tibbitt to Contwoyto Winter Road
- Watercourse
- Ocean
- Waterbody

0 10 20 Kilometres

(At original document size of 8.5x11) 1:1,350,000

N

***Notes***
**1.** Coordinate System: WGS 1984 UTM Zone 12N
**2.** Data Sources: Governments of Nunavut and Canada, Stantec

*Project Location*
Kitikmeot Region, Nunavut

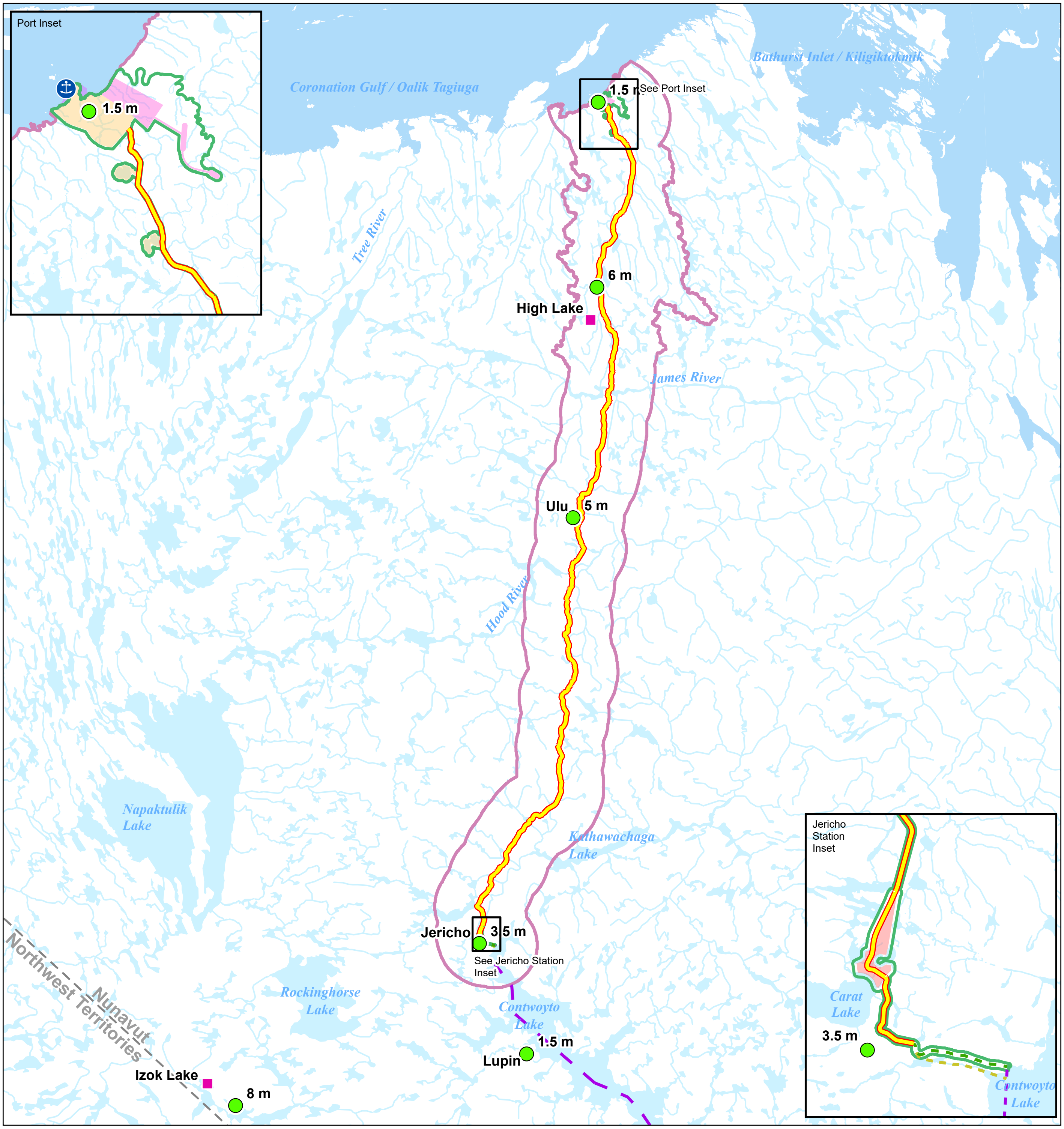
Prepared by SLEMAY on 2026-02-02
TR by DSPRY on 2026-02-02

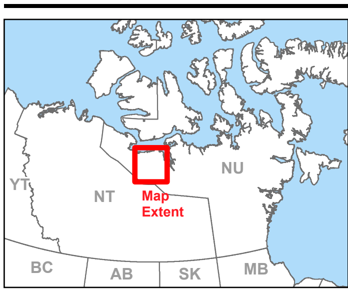
*Client/Project*
123514868_094

West Kitikmeot Resources Corp
Grays Bay Road and Port

*Figure No.*
**19.5**

*Title*
**Estimated Permafrost Thickness**




Active Layer Measurement
Grays Bay Port
Grays Bay Road
Grays Bay Winter Road
Grays Bay Winter Road Optional Alignment

**Project Development Area (PDA)**

Aerodrome
Jericho Station
Port (Landside Infrastructure)
Port (Marine-based Infrastructure)

Local Assessment Area (LAA)
Regional Assessment Area (RAA)
Advanced Mineral Exploration Site
Closed Mine Site
Territorial Boundary
Tibbitt to Contwoyto Winter Road
Watercourse
Ocean
Waterbody

0 10 20 Kilometres

(At original document size of 8.5x11) 1:1,350,000

N

NUNAMI STANTEC LIMITED

WEST KITIKMEOT RESOURCES CORP

Project Location
Kitikmeot Region, Nunavut

Prepared by SLEMAY on 2026-02-02
TR by DSPRY on 2026-02-02

Client/Project
123514868_095

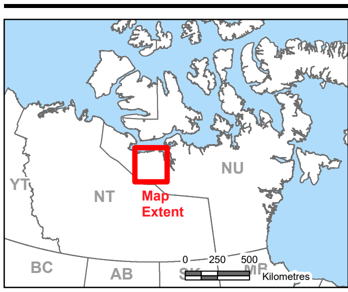
West Kitikmeot Resources Corp
Grays Bay Road and Port

Figure No.
**19.6**

Title
**Measured Active Layer Thickness**

**Notes**
**1.** Coordinate System: WGS 1984 UTM Zone 12N
**2.** Data Sources: Governments of Nunavut and Canada, Stantec

\\Ca0002-ppfss05\geomatics\Clients\Nunami_Stantec\GBRP\Figures\123514868_095_ActiveLayerThickness Revised: 2026-02-02 By: dcspry


Average Ground Temperature

Grays Bay Road

Grays Bay Winter Road

Grays Bay Winter Road Optional Alignment

**Project Development Area (PDA)**

Aerodrome

Jericho Station

Port (Landside Infrastructure)

Port (Marine-based Infrastructure)

Local Assessment Area (LAA)

Regional Assessment Area (RAA)

Advanced Mineral Exploration Site

Closed Mine Site

Territorial Boundary

Tibbitt to Contwoyto Winter Road

Watercourse

Ocean

Waterbody

0 10 20 Kilometres

(At original document size of 8.5x11) 1:1,350,000

N

NUNAMI STANTEC LIMITED

WEST KITIKMEOT RESOURCES CORP

*Project Location*
Kitikmeot Region, Nunavut

Prepared by SLEMAY on 2026-02-02
TR by DSPRY on 2026-02-02

*Client/Project*
123514868_096

West Kitikmeot Resources Corp
Grays Bay Road and Port

*Figure No.*
**19.7**

*Title*
**Average Annual Ground Temperature**

***Notes***
**1.** Coordinate System: WGS 1984 UTM Zone 12N
**2.** Data Sources: Governments of Nunavut and Canada, Stantec

There are few investigations into the quality of groundwater within the RAA as most communities and projects utilize surficial water sources to meet their water needs. Although groundwater is not often used as a source of drinking water within the RAA, it remains a potential resource for drinking water that could be used in the future and groundwater systems are likely connected to the *Aniloakhinik* (cold-water springs) that are used as drinking sources by residents (Banci and Spicker 2024).

Due to limited groundwater utilization for domestic uses, sources of groundwater quality data in the region are limited to those collected related to mining projects. Mining groundwater data is often representative of the composition of the deep groundwater below the permafrost, and not necessarily the shallow active zone groundwater. This can bias the data as groundwater from these mine locations may naturally contain higher amounts of dissolved heavy metals that are associated with nearby mineral deposits and may not represent typical groundwaters found away from these areas. However, given the limited quantity of groundwater quality data available, these data are potentially important in understanding potential changes to shallow “active zone” groundwater/surface water quality.

Groundwater has been sampled from both the High Lake project within the RAA and the Izok Lake Mine to the southwest of the RAA (AECOM 2013). The deepest intervals of sampled groundwater come from the Izok Lake Mine area where samples were collected from depths of 70-72 m below surface. These deeper groundwaters contain higher amounts of TDS than shallow groundwaters. TDS content is expected to increase with depth and deep groundwaters are more likely to naturally exceed drinking water guidelines than shallow groundwaters. A summary of the groundwater quality at these sites is provided in Table 6 of AECOM (2013).

Groundwater has been observed to exceed Health Canada guidelines for Drinking Water (Health Canada 2024) at the Izok Lake Mine for the following parameters:

- Arsenic (at depths ranging from 15.8 to 72 m below surface).
- Manganese (at depths ranging from 2.1 to 72 m below surface).

Sampled groundwater also exceeded several aesthetic objectives at the Izok Lake Mine that can affect the taste and/or appearance of the water:

- TDS (at depths ranging from 25.9 to 72 m below surface).
- Chloride (at depths ranging from 26.7 to 72 m below surface).
- Iron (Izok Lake Mine area, at depths ranging from 2.1 to 72 m below surface).
- Sulfate (Izok Lake Mine area, at a depth of 72 m below surface). Only 1 groundwater sample was collected from the High Lake area. This sample was collected at a depth of 44.5 m and did not exceed any of the drinking water guidelines. Assessment of Project Effects on Water Resources

# 19.3 Assessment of Project Effects on Water Resources

## 19.3.1 Project Interactions with Water Resources

Table 19.16 identifies, for each potential effect, the project activities that might interact with the VC and result in the identified effect. These interactions are indicated by a check mark or a dash and are discussed in detail in the following sections, in the context of effects pathways, standard and Project-specific mitigation measures, and residual effects.

A summary of key feedback shared by Kitikmiut, other Indigenous groups, and other potentially affected communities relevant to water resources and available at the time of filing is consolidated in Table 19.9 and integrated into the assessment of potential effects on water resources where applicable. WKR will continue to respond to questions and concerns from Kitikmiut, other Indigenous groups, and other potentially affected communities through its ongoing engagement efforts. Information provided following submission of the IS will be reviewed in the context of the IS and for incorporation into project planning, as appropriate.

**Table 19.16 Project Interactions with Water Resources**

| Project Activities | Effects | | |
|---|---|---|---|
| | Change to Surface Water Quantity | Change to Surface Water and Sediment Quality | Change to Groundwater Quality |
| **Construction** | | | |
| Mobilization/demobilization of machinery /equipment, vehicles, materials, and fuel (e.g., by barge, sea lift, boat, or road) | - | - | - |
| Staging and storage of materials, fuel, equipment and pre-fabricated components | - | ✓ | ✓ |
| Chemical and hazardous material transport, storage and management (including explosives) | - | ✓ | ✓ |
| Establishment and operation of camps (e.g., mobile camps and permanent accommodations), maintenance yards, and laydowns | ✓ | ✓ | ✓ |
| Machinery/equipment and vehicle refuelling / fuel storage handling | - | ✓ | ✓ |
| Site preparation and earthworks of disturbance area (e.g., vegetation clearing, stripping and stockpiling of organic and overburden materials, grading, blasting, drilling) | ✓ | ✓ | ✓ |
| Construction of port landside facilities, aerodrome, road, and Jericho Station (e.g., buildings/facilities, fuel storage, laydown areas; public use area; access roads; water intake; power generation - diesel (may include wind turbine or solar array); all-season gravel airstrip) | ✓ | ✓ | ✓ |
| Borrow source and quarry development (e.g., blasting, crushing, sorting, stockpiling of temporary and permanent areas) | ✓ | ✓ | ✓ |
| Water withdrawal and water discharge to support construction activities (e.g., winter road construction, dust control, material compaction) | ✓ | ✓ | - |

| Project Activities | Effects | | |
|---|---|---|---|
| | **Change to Surface Water Quantity** | **Change to Surface Water and Sediment Quality** | **Change to Groundwater Quality** |
| Watercourse crossing construction (e.g., bridge and culvert installation) | ✓ | ✓ | ✓ |
| Ground based transportation (e.g., workforce, materials, supplies) | - | - | - |
| Air transport (e.g., personnel transport, resupply) | - | - | - |
| Waste management and sewage facilities (e.g., development and use of a permanent waste management facility and on-site landfill; handling and storage of hazardous and non-hazardous waste; incineration of domestic waste; open air burning; management of black and grey water) | - | - | - |
| Construction of Marine-based infrastructure (e.g., construction of large vessel wharves, medium vessel wharf, small craft harbour, barge landing area, desalination line, vessel refuelling line / fuel line to bulk fuel storage, including nearshore dredging, infilling, pile driving, blasting) | - | - | - |
| Taxes, Contracts, Purchases (e.g., procurement of goods and services; employment of workers) | - | - | - |
| Closure and reclamation of temporary borrow sources/quarries, camps, workspaces, laydowns (e.g., erosion stabilization, revegetation, restoration of natural drainage patterns, prevention of future vehicular access) | ✓ | ✓ | ✓ |
| **Operations and Maintenance** | | | |
| Port landside operations (e.g., use and maintenance of accommodations, borrows, roads, power generation; aerodrome operations including use and maintenance of airstrip and facilities; and Jericho Station operation and maintenance). | ✓ | ✓ | ✓ |
| Marine port use and operations (e.g., vessels and cargo loading/unloading, barge landing operations, small craft harbour operations, maintenance dredging) | - | - | - |
| Borrow source and quarry operations (e.g., blasting, crushing, sorting, and stockpiling of permanent areas) | ✓ | ✓ | ✓ |
| Desalination operation and wastewater treatment (e.g., marine water use and effluent discharge) | - | - | - |
| Water withdrawal / use (e.g., potable water, dust control, maintenance) at Port facilities, and temporary water withdrawals and discharge for road maintenance | ✓ | ✓ | - |
| Road maintenance / use (e.g., transport of equipment, workers, and supplies; maintenance of bridge/culverts; snow clearing; grading and gravel replacement; dust control) | ✓ | ✓ | ✓ |
| Bulk Fuel Storage (e.g., operation of permanent fuel facilities) | - | ✓ | ✓ |
| Vessel Fuel Line / Refuelling (e.g., directly offloading from east wharf or use of floating fuel pipeline; above ground insulated pipeline to bulk fuel storage tanks) | - | - | - |
| Equipment maintenance | - | - | - |

| Project Activities | Effects | | |
|---|---|---|---|
| | Change to Surface Water Quantity | Change to Surface Water and Sediment Quality | Change to Groundwater Quality |
| Chemical and hazardous material transport, storage and management (including explosives) | - | ✓ | ✓ |
| Winter road construction and use (e.g., annual winter road construction and maintenance) | ✓ | ✓ | ✓ |
| Air transport (e.g., personnel transport, resupply) | - | - | - |
| Waste management (e.g., use of a permanent waste management facility and on-site landfill; handling and storage of hazardous and non-hazardous waste; incineration of domestic waste; open air burning; management of black and grey water) | - | - | - |
| Taxes, Contracts, Purchases (e.g., procurement of goods and services; employment of workers) | - | - | - |

Notes:
✓ = Potential interaction
– = No interaction

Some context is provided herein to summarize the Project interactions with Water Resources that are most relevant to the effects assessment:

- The primary sources of Project interaction with water resources are winter road construction, gravel road maintenance and use (i.e., traffic), water withdrawals and discharges during construction and operation, borrow source use and quarry operations, and construction and operation of Port landside facilities.
- The embankment (granular surfacing material and supporting embankment) will consist mainly of rock and granular surfacing materials obtained from temporary quarries. Rock / soil cuts will be required along certain portions of the road alignment and where geotechnical conditions allow, cut material will be reused for construction.
- General construction and maintenance interactions that are typically associated with road and facility infrastructure (also identified in Table 19.16) including vehicle and equipment staging within construction workspaces, temporary fueling along the construction workspace and fuel storage, site preparations, blasting, earthworks, culvert and bridge installations.
- Temporary and permanent quarries and borrow sources will be located along the road alignment, including within the Port PDA, Aerodrome PDA, and Jericho Station PDA, as source aggregate material for the roads. Quarries are anticipated to be located approximately every 7 km along the alignment, with every third quarry becoming a permanent source of road material. Permanent quarries within the Port PDA will be maintained through Operations and Maintenance phase of the port.

- Drilling and blasting of rock will be required at quarries and at locations of rock cut. Explosives to be used will be primarily ammonium nitrate and diesel fuel (ANFO). Prilled ammonium nitrate will be stored at designated rock quarries and at the port site in a designated, secured location and in accordance with the appropriate legislation and permits.
- Temporary water withdrawals and discharge to the receiving environment are expected to be required in several areas along the PDA to facilitate dust control during construction and to facilitate winter vehicle and equipment access (i.e., ice crossings for equipment access while permanent crossings are being built). Temporary water withdrawals may also be required to support mobile camps. Wastewaster (i.e., grey and black water) associated with camp facilities will be disposed of offsite. Permanent water withdrawal will be required to support facility operations.

Comprehensive details with respect to the Project Description are provided in Volume 2 – Introduction, Project Description, and Alternatives.

The following project components and activities are not expected to interact with water resources during the Construction and/or Operations and Maintenance phases:

- Construction Phase
  – Mobilization/demobilization of machinery /equipment, vehicles, materials, and fuel. These activities are not expected to interact with water resources unless there is an accidental event. Accidental events (e.g., spills) are assessed separately in Volume 10, Section 32.
  – Staging and storage of materials, fuel, equipment and pre-fabricated components
  – Chemical and hazardous material transport, storage and management (including explosives)
  – Machinery/equipment and vehicle refuelling / fuel storage handling
  – Water withdrawals and discharge are not expected to interact with groundwater quality.
  – Ground-based transportation (e.g., workforce, materials, supplies) and air transport are not expected to interact with water resources.
  – Construction of Marine-based infrastructure is not expected to interact with (freshwater) water resources. Impacts to the marine environment are assessed in Volume 8, Section 21.
  – Taxes, contracts, and purchases are not expected to interact with water resources.
  – Wastewater associated with camps (i.e., grey water, black water) will be disposed of off-site and not considered an interaction.
- Operations and Maintenance Phase
  – Marine port use and operations and desalination operations are not expected to interact with water resources.
  – Water withdrawal and discharge to support operations is not expected to interact with groundwater quality.
  – Vessel Fuel Line / Refuelling and equipment maintenance are not expected to interact with water resources (spills are assessed separately in Volume 10, Section 32).

- Air transport and taxes, contract, and purchases are not expected to interact with water resources.
- Permanent wastewater management facilities associated with the Port are not expected to interact with (freshwater) water resources, as wastewater will be discharged to the marine environment. Impacts to the marine environment are assessed in Volume 10, Section 32.

## 19.3.2 Change to Surface Water Quantity

### *19.3.2.1 Analytical Assessment Techniques*

The assessment considers desktop studies from existing projects in the region (Sections 19.2.1.1 and 19.2.2.2), baseline conditions in the LAA and RAA, and hydrological processes related to project activities and disturbance areas. The Project can affect water quantity, including the spatial and temporal distribution of water.

### *19.3.2.2 Project Effects Pathways*

A change in surface water quantity may occur through two primary project effect pathways:

- Altered surface drainage patterns and runoff that results from water withdrawals for construction and operations (e.g., dust control, winter road maintenance, potable water supply)
- Altered surface water drainage patterns and runoff associated with landcover changes during construction (e.g., vegetation clearing, grading, use of borrow sources) and operation (e.g., roads, culverts, bermed areas)

These pathways are discussed in relation to applicable project activities as listed in Table 19.16 These pathways may also result in effects on water resources relied upon by Kitikmiut, other Indigenous groups, and other potentially affected communities (Volume 9, Sections 24 and 25). IAG members stated that water needs to be protected if the Project is built (IAG 2025b). During engagement on previous projects, Yellowknives Dene First Nation stated that water quality is the most significant VC and water quality should remain as close to baseline conditions as possible to have good water quality that supports wildlife, fish and aquatic life, and continued cultural use (YKDFN 2017, 2019). During engagement on a previous project, North Slave Métis Alliance expressed concern about introduced sediment affecting fish and fish habitat, stating that fish are sensitive and require clean water (NSMA 2001).

NTKP consultants shared that water resources are less abundant as average water levels are decreasing, and permafrost is receding quickly. They explained that water levels have decreased over time, and many rivers are now dry in the fall. Areas where decreased water levels have been observed include Fairy Lake River, the Bathurst Inlet area, and Gordon Bay River (Banci and Spicker 2024).

Two lakes (North Intake Lake and South Intake Lake) have been identified for potential potable water sources to support facility operations in the Port vicinity. Temporary water withdrawal from rivers or tributaries near the PDA will also be required for the purposes of construction and road maintenance. Associated

The potable water and temporary water withdrawal volumes are expected to be small relative source capacity. Both temporary and permanent water withdrawals are expected to be proportionately small relative to water source locations.

Changes to surface drainage patterns may occur where the road and Port infrastructure intersect existing drainage pathways. Watercourse crossing construction may temporarily influence streamflow where flow diversion around the in-channel work is required. Localized drainage patterns will be altered by Project activities related to stormwater infrastructure development (e.g., ditches, bermed areas, culverts, erosion and sediment control structures). Culverts and bridges will be installed to maintain drainage and stream flow connectivity.

Surficial disturbance during construction (e.g., clearing, grading, compaction of existing surface material) can reduce infiltration and increase surface water runoff or alter drainage patterns. Vegetation clearing can exacerbate these effects by reducing infiltration capacity and altering hydrologic responses. Examples of hydrologic response changes related to vegetation clearing include reduced precipitation interception, reduced transpiration, and higher snow melt rates from increased solar radiation. Soil and overburden material removal, along with surface compaction, further limits infiltration. These changes can affect mean annual flow, high and low flows, and monthly distribution of flow in instances where the reduction of water is substantial.

#### *19.3.2.3 Mitigation, Enhancement, and Management Measures*

Potential effects on surface water quantity will be mitigated through a combination of regulatory controls, best management practices (BMP), and site-specific measures. Mitigation measures are discussed below for the potential project effects pathways on surface water quantity. These measures take into consideration the values identified by Kitikmiut, other Indigenous groups, and other potentially affected communities. The effectiveness of these measures is considered high for preventing or reducing change in surface water quantity.

The following management plans are applicable to mitigating project effects on surface water quantity:

- Water Management Plan
- Waste Management Plan
- Erosion and Sediment Control Plan
- Road Management Plan
- Borrow Pits and Quarry Management Plan
- Closure and Reclamation Plan

The following subsections present specific BMPs and/or mitigation measures to prevent or limit potential adverse effects on surface water quantity. Mitigation measures will be documented in the fully developed management plans referenced above (and presented in Volume 11) and are expected to be effective when implemented, monitored, and adaptively managed.

### *Surface Water Use and Discharge*

Water withdrawal and discharge will be regulated under Nunavut Water Board (NWB) licensing requirements. Licenses will be required for both construction activities (temporary licenses), and for the permanent potable water supply. License conditions will define approved water sources, discharge locations, and operational requirements. These conditions will consider authorized withdrawal and discharge points, maximum daily withdrawal volumes and maximum daily withdrawal rates based on system capacity. Monitoring requirements are commonly included as a condition of the licenses to confirm compliance with limits.

Water license conditions will incorporate environmental flow needs (EFN) which considers quantity, timing, and quality of water flows required to sustain aFquatic ecosystem functions. In the absence of a territorial-specific EFN policy, Fisheries and Oceans Canada (DFO) Central and Arctic Region framework will apply (DFO 2013). Based on this framework:

- cumulative water withdrawals (from all users) will not exceed 10% of instantaneous streamflow
- streamflows must remain above 30% of the mean annual discharge (DFO 2013)
- under-ice withdrawals will follow the DFO Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut (DFO 2010). For the project location, the protocol indicates that a maximum ice thickness of 2.0 m is appropriate for determining under-ice water volume, and cumulative (all users) water withdrawal would be limited to 10% of the under-ice water volume for lakes exceeding an open-water depth of 3.5 m.

Water licenses through the NWB will specify allowable water discharge associated with the Project. The limits and conditions specified in the NWB licence will be followed to protect the receiving environment. The Waste Management Plan will address mitigation measures for wastewater disposal.

### *Managing Runoff and Drainage*

The following mitigation measures address potential effects on surface water quantity as a result of runoff or altered drainage patterns:

- Culverts are integrated through the project design to convey drainage and flow and reduce potential effects related to altered drainage patterns and surface water runoff.
- Water crossings will be designed and constructed with consideration of climate change to facilitate streamflow conveyance and fish passage.
- Culverts will be installed according to the Road Construction Management Plan and BMPs for construction works at watercourses and waterbodies. BMPs include isolating the work area from the waterbody, diverting streamflow around the work area, maintaining the streamflow rate, and returning the flow immediately downstream of the work area. Guidelines from other jurisdictions may be considered, in lieu of a specific territorial publication regarding in-channel works, such as British Columbia's Requirements and Best Management Practices for Making Changes In and About a Stream in British Columbia (Government of British Columbia 2022).

- The Erosion and Sediment Control Plan (ESCP) will provide details on mitigation measures that will be in place during construction and operation, such as silt fencing along drainage pathways, watercourses, and waterbodies. Implementing erosion and sediment control practices during construction and operation will facilitate runoff management by reducing ground, vegetation, permafrost disturbance and maintaining runoff infiltration capacity in the local region.
- Disturbed areas that become unused, such as construction laydown areas and spent borrow sources and quarries, will be progressively reclaimed and re-vegetated according to the Closure and Reclamation Plan where applicable. This will facilitate a hydrologic response in the reclaimed area similar to that of pre-development conditions and reduce erosion and sedimentation.
- Special considerations for surface water management will be addressed for borrow pits and quarries in the Borrow Pits and Quarry Management Plan. Non-contact runoff will be directed around development areas to the extent possible. Contact water resulting from direct precipitation or snowmelt within borrow pits and quarries will be intercepted, contained, and released downstream after water quality objectives have been met.

#### *19.3.2.4 Project Residual Effects on Surface Water Quantity*

After the application of mitigation measures, residual effects on surface water quantity are anticipated to result primarily from surface water withdrawals and localized changes in runoff response and drainage patterns. These changes reflect the nature of the Project, which includes highway embankments and ditches that are likely to change drainage patterns on a localized scale (i.e., the LAA) by directing water to an area along the sides of the road and through designated culverts along the infrastructure. Temporary water withdrawals and discharges to facilitate construction and maintenance will likely alter flow at a localized scale (i.e., the LAA) to areas downstream or within the same stream catchment area. Soil overburden removal, combined with surface compaction, will further limit infiltration which can influence flows and drainage patterns at a small, localized scale. Localized alterations to drainage patterns as a result of road infrastructure is expected to be limited to the LAA.

Residual effects are limited to the temporary withdrawal and discharge locations associated with construction and operation, and permanent withdrawal associated with potable water supply during operation. The PDA represents a small proportion of the contributing areas (e.g., the Road PDA represents approximately 0.2% of the Burnside River watershed area). Given the Project’s small footprint relative to watershed size, these changes are expected to result in changes to mean monthly and annual streamflow (including peak and low flows), volume of lakes, or lake levels that are considered low magnitude (i.e., <10% change in streamflow or lake volume). This is supported by requirements through the Nunavut Water Board, which has authority over water withdrawal licensing. Licenses will consider EFN guidelines and withdrawals will only occur from larger waterbodies with sufficient assimilative capacity, further reducing the potential for change in streamflow and lake volume.

Residual effects from landcover changes and altered runoff response along the Road PDA are also expected to be low in magnitude (i.e., less than 10% of change in streamflow and lake volume compared to existing conditions). While vegetation clearing and overburden material removal may have localized effects on runoff, these changes are not expected to result in changes above 10% of the mean monthly and annual streamflow (including peak and low flows), volume of lakes, or lake levels. Culverts will be installed where needed to maintain pre-existing drainage patterns, and bridges and culverts will be sized to accommodate ice.

Although the identified water intake lakes have not been specified as drinking water sources through Inuit, Indigenous, and Community Knowledge, large lakes and streams were identified to be general sources for drinking water. The magnitude of residual effects to surface water quantity is predicted to be low for the identified intake lakes and outlet streams, and not measurable in the RAA. Therefore, the residual effect is not anticipated to be sensitive to Indigenous drinking water source needs.

Residual effect on surface water and sediment quantity are expected to be:

- Project phase: Construction and Operations and Maintenance
- Direction: adverse (a change from natural conditions)
- Magnitude: low
- Geographic extent: LAA
- Timing: moderately sensitive to the timing of natural low flow conditions
- Duration: long-term
- Frequency: Continuous (streamflow is continuous)
- Reversibility: reversible (when withdrawals cease and culverts are established)

Residual effects of this VC may interact directly or indirectly with other VC’s, including aquatic ecology, vegetation, and wildlife.

## 19.3.3 Change to Surface Water and Sediment Quality

### *19.3.3.1 Analytical Assessment Techniques*

Potential effects on surface water and sediment quality were assessed by comparing existing baseline conditions in the LAA and RAA (summarized in Section 19.2.2 and detailed in Appendix 19C: Freshwater and Sediment Quality Data Summary Report) to conditions anticipated during Project Construction and Operations and Maintenance. Baseline conditions were characterized using historical data, literature review, and community-based knowledge, and supplemented by the Izok Corridor ML/ARD Risk Assessment.

To assess potential changes in surface water and sediment quality, the following were considered:

- Suspended sediment and turbidity were qualitatively evaluated through anticipated land disturbance, construction activities, and potential for runoff or water discharge to introduce sediment that could increase baseline sediment concentrations in the LAA. These anticipated activities were compared to baseline water quality data.
- Chemical parameters in water and sediment were qualitatively assessed by comparing baseline conditions to applicable guidelines (CCME, FEQG, Health Canada) for aquatic life and human receptors. The assessment considered potential future influences from wastewater discharge, ML/ARD, and the introduction of nitrogen compounds associated with blasting activities.

- Dust deposition findings from the Air Quality VC (Volume 5, Section 11) were incorporated into the assessment to evaluate the potential for dustfall to increase sediment-bound contaminants in waterbodies adjacent to the roadway.
- Drainage patterns were qualitatively assessed using terrain and hydrology mapping to identify areas where changes in flow paths could mobilize sediments or contaminants.
- The ML/ARD risk ratings were evaluated for potential leachate pathways to surface water and sediment

#### *19.3.3.2 Project Effects Pathways*

Project activities could result in changes to surface water and sediment quality through the following pathways:

- Introduction of suspended sediments resulting from water discharge (associated with temporary withdrawals) during construction and operations, and in-channel works at water crossings (e.g., culvert installations) that may enter waterbodies
- Introduction of suspended sediments or contaminants resulting from runoff in disturbed areas (e.g., vegetation clearing, grading, borrow source use) that may enter waterbodies
- Introduction of suspended sediments due to dust deposition that may settle and mobilize to receiving waterbodies
- Increased contaminant loading due to runoff or altered drainage patterns from construction activities, bermed areas, and erosion and sediment control structures that may mobilize contaminants to receiving waterbodies
- Increased contaminant loading due to ML/ARD from exposed rock and borrow materials
- Nitrogen compound mobilization to the aquatic environment through the use of explosives

These pathways may lead to measurable changes of chemical parameters that extend beyond the variability of existing conditions, and may potentially exceed applicable water quality guidelines for the protection of human receptors e.g., drinking water quality guidelines) and ecological receptors (e.g., guidelines for the protection of freshwater aquatic life). The potential effects, the effect pathways, and the measurable parameters for surface water and sediment quality are described in Table 19.2.

As some waterbodies within the LAA and RAA are relied upon by Kitikmiut, other Indigenous groups, and other potentially affected communities (Volume 9, Sections 24 and 25), changes in surface water and sediment quality may also affect traditional land, marine, and resource use. NTKP consultants stated that limited but widespread potable water sources are found on land, and they should be preserved for future use. Large lakes and flowing rivers are the preferred drinking water sources. They stated that water quality varies by location and season, with some areas having sulfur or saline contamination and reported declining drinking water quality near Kugluktuk, Bernard Harbour, and Coppermine River (Banci and Spicker 2024).

NTKP consultants reported that water quality varies across the Project area. The best water sources in the summer are among deep rock crevices. Cold water springs (*aniloakhinik*) and permanent ice (*neelak*) are inland sources of water. Aniloakhinik are found in sandy areas, near eskers. These resources should be preserved. *Neelak* are known to exist near Anialik, Kennarctic River and the west side of Grays Bay. Additional waters sources used by Kitikmiut include lakes, rivers, rock basins, snow, and ice (Banci and Spicker 2024).

Suspended sediment may be introduced to the aquatic environment through water discharge during construction (associated with temporary water withdrawals), dust settlement and mobilization through runoff, or an alteration in localized drainage patterns that mobilize sediment to receiving waterbodies. Increased suspended sediment concentrations can reduce water clarity, limit light penetration, raise water temperature, reduced dissolved oxygen. Elevated suspended sediment concentrations lead to an increase in contaminants (if present) within the suspended particles, thereby further degrading water quality and increasing stress of aquatic life.

Temporary water withdrawals and discharges will be required to support construction and maintenance activities (e.g., winter road maintenance, dust control). A permanent water withdrawal will be required for potable water in facilities associated with the Port. Wastewater, including sewage from construction camps, will be treated in a wastewater treatment plant and discharged to the marine environment via an outfall or to the terrestrial environment in sumps (Volume 2, Section 2.6.2.4).

Reduced streamflow as a result of water withdrawal can raise water temperatures, lower dissolved oxygen, and concentrate contaminants (if present). Water discharge associated with temporary withdrawals can introduce sediment or contaminants to receiving waterbodies. Water discharge from temporary withdrawals may increase downstream flows above baseline conditions which can create stress on aquatic environments.

ML/ARD from exposed rock and borrow materials can release metals and acidity into receiving waterbodies via surface runoff, affecting surface water and sediment quality. Nitrogen compounds from blasting activities (e.g., ammonium nitrate/fuel oil explosives) may also enter receiving waterbodies through runoff. Elevated concentrations of metals and metalloids (e.g., aluminum, copper, nickel, zinc, cobalt, iron, manganese, arsenic, selenium, antimony, molybdenum) may pose risks to aquatic ecosystems and human health if chemical parameters are present in concentrations above the range of natural background levels and applicable guidelines. These contaminants can accumulate in sediments and, for certain metals and metalloids (e.g., mercury, selenium, cadmium, lead), bioaccumulate in fish, potentially increasing exposure for wildlife and humans that rely on these resources.

#### *19.3.3.3 Mitigation, Management, and Enhancement Measures*

Potential effects on surface water and sediment quality will be mitigated through a combination of regulatory controls, BMPs, and site-specific measures. These measures are designed to prevent or reduce changes to water and sediment quality during all phases of the Project. The effectiveness of these measures is considered high for preventing or reducing change in surface water and sediment quality based on use of standard best management practices included in plans referenced below and compliance with regulatory and permit requirements. Mitigation measures were selected based on applicable regulations, industry standards, and the mitigation hierarchy of avoid, reduce, and restore. Fully developed management plans (Volume 11) will document these measures and guide implementation. These management plans include:

- Erosion and sediment control measures will be outlined in the ESCP.
- Dust management and suppression measures will be outlined in the Air Quality Monitoring and Management Plan.
- Water management infrastructure (i.e., culverts) will be outlined in the Water Management Plan (WMP).
- ML/ARD management measures will be outlined in the Borrow Pits and Quarry Management Plan and WMP.
- Reduce spillage of explosives, improve blast efficiency, and reduce or eliminate the risk of nitrogen mobilization to the aquatic environment as outlined in the Explosives Management Plan (EMP).
- Hydrocarbon and chemical spill prevention measures as outlined in the Fuel Management Plan and Spill Contingency Plan. Spills are considered in the accidents and malfunctions section (Volume 10, Section 34) and therefore not an effect pathway and not included in this section.

These measures take into consideration the values identified by Kitikmiut, other Indigenous groups, and other potentially affected communities. IAG members recommended that snow management mitigate the impacts of melting dust-entrained snow on water quality. This could include silt fencing to monitor sediment and erosion (IAG 2025a).

During engagement on previous projects, the Kitikmeot Inuit Association has expressed concern about the adequacy of mitigation planning implemented by developers (KIA 2003; NIRB 2004). In recognition of this concern, mitigation measures for surface water and sediment quality are being designed to align with best practices, demonstrating WKR’s commitment to addressing changes to surface water and sediment quality.

The following subsections present specific BMPs and/or mitigation measures to prevent or limit potential adverse effects on surface water and sediment quality. Mitigation measures will be documented in the fully developed management plans and are expected to be effective when implemented, monitored, and adaptively managed.

### *Surface Water Use and Discharge*

Water withdrawal and discharge will be regulated under NWB licensing requirements. Licenses will be required for both construction activities (temporary licenses), and for the permanent potable water supply. License conditions will define approved water sources, discharge locations, and operational requirements. These conditions will consider authorized withdrawal and discharge points, maximum daily withdrawal volumes and maximum daily withdrawal rates based on system capacity. Monitoring requirements are commonly included as a condition of the licenses to confirm compliance with limits.

Water license conditions will incorporate EFN which considers quantity, timing, and quality of water flows required to sustain aquatic ecosystem functions. In the absence of a territorial-specific EFN policy, the DFO Central and Arctic Region framework will apply (DFO 2013). Based on this framework:

- cumulative water withdrawals (from all users) will not exceed 10% of instantaneous streamflow,
- streamflows must remain above 30% of the mean annual discharge (DFO 2013)
- under-ice withdrawals will follow the DFO Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut (DFO 2010). For the Project location, the protocol indicates that a maximum ice thickness of 2.0 m is appropriate for determining under-ice water volume. Cumulative (all users) water withdrawal would be limited to 10% of the under-ice water volume for lakes exceeding an open-water depth of 3.5 m.

### *Erosion and Sediment Control Measures*

Mitigation measures to prevent or reduce mobilization of sediments and contaminants into waterbodies from runoff, altered drainage patterns, and erosion include the implementation of standards and BMPs described in the ESCP, guided by (but not limited to) the following resources:

- Northern Land Use Guidelines: Roads and Trails (GNWT 2010)
- Measures to Protect Fish and Fish Habitat (DFO 2025)
- Code of Practice: Culvert Maintenance (DFO 2022)
- Guidance adopted from other northern jurisdictions, e.g., the GNWT Department of Transportation - Erosion and Sediment Control Manual (GNWT 2013)

The Project includes the development of management plans (ESCP; Volume 11), which provide reference to BMPs to be used for erosion and sedimentation control. Mitigation measures to prevent or reduce erosion and sediment loading into the aquatic environment include the following:

- A project-specific ESCP will be developed and implemented to reduce sedimentation into the aquatic environment during construction
- Repairs and adjustments will be conducted as necessary to align with CCME guidelines for water quality in fish-bearing receiving environments.
- Material stockpiles will be kept a minimum of 31 m from a watercourse or waterbody with the appropriate erosion control mitigation to prevent sediment from entering a watercourse or waterbody.

- Non-contact water will be diverted around infrastructure and directed to natural downstream drainage networks.
- Delineate and visually identify the boundaries of work areas and limit the amount of clearing of freshwater riparian vegetation.
- Machinery will not be left in any waterbody.
- Work within the active stream channel will be avoided where practical.
- Instream work will be reduced or avoided to the extent possible.
- Runoff control will be implemented to avoid entry to waterbodies including: installing drainage per design specifications; diverting water from entering watercourse; and controlling of flow velocity.
- Temporary isolation will occur for the placement of rip rap and culverts and will follow the code of practice: temporary cofferdams and diversion channels (Interim) (DFO 2025).
- Rip rap will be free of silt and other debris.
- Ponded water will be directed away from watercourses.
- Cleared snow will be directed away from watercourses and drainages.

Surface water and sediment quality monitoring will be conducted as required to confirm effectiveness of the mitigation measures and to facilitate adaptive management (Section 19.7).

### *Metal Leaching and Acid Rock Drainage*

Changes to surface water and sediment quality may occur if project components (e.g., quarries, granular borrow sources, stockpiles, road base materials) have the potential for ML/ARD. Runoff and leachate from these components can enter watercourses and affect surface water and sediment quality. Concerns about the potential for ML/ARD impacts generated by blasted materials during project construction been raised by IAG members (IAG 2025a).

The design and implementation of mitigation measures and BMPs associated with the development and use of borrow source and quarry materials for the Project will be guided by (but not limited to) the following resources:

- Northern Land Use Guidelines: Roads and Trails (GNWT 2010)
- Northern Land Use Guidelines: Pits and Quarries (GNWT 2015)
- Quarry Sampling and Testing Guidance for Identification of Acid Rock Drainage and Metal Leaching Potential (GNWT 2022)
- Quarry Development Plan Template (GNWT n.d.)
- Mine Environmental Neutral Drainage Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (Price 2009)

An ML/ARD Risk Assessment for the Izok Road alignment (which overlaps entirely with the Water Resources LAA) determined moderate-low and higher-risk road sections are primarily located in the northern portion of the Izok Road alignment, particularly within the Hood River and Kennarctic River watersheds, where both quarries and rock cuts are planned. Due to complex geology and limited sampling, several sections are classified as having variable or uncertain risk. These areas contain a mix of low and moderate-risk zones and will be further investigated to refine quarry and rock cut locations (Lorax 2013). Most of the road (55% 129.3/230 km of all-season road and 3 km of winter road) is considered low risk for ML/ARD, based on low ratings for stressors, pathways, and receptors. However, due to geological variability and low sampling density, additional testing will be conducted near proposed development sites with moderate geological ratings, as part of the Borrow Pits and Quarry Management Plan (see Volume 11).

To limit the interaction of ML/ARD material with oxygen and surface water, an ML/ARD Management Plan will include managing ML/ARD material exposed during construction (e.g., road fill, platforms, borrow sources, etc.). Any rock material sourced for use above the high water mark will be subject to acid rock drainage/metal leaching testing, with only acceptable material used in construction. ML/ARD material that cannot be avoided will be further evaluated by assessing the site-specific conditions including, but not limited to, the geochemical results, the volume of material to be used, the proximity to sensitive receptors, and the grain size of the material. This evaluation will help identify if the material can be mitigated through measures such as site-specific planning, designated use of material, and water management. Designated use of the material may include encapsulating ML/ARD material (if encountered).

### *Explosives Management*

The Project is anticipated to use ANFO explosives for the development of quarries and roadway materials. The undetonated nitrogen component of the explosives, AN, is highly water-soluble. The use of ANFO explosives may result in releases of nitrogen (which can be detected as nitrate, nitrite, and ammonia) from quarries and quarry materials by runoff to the aquatic environment.

Blasting-related nitrogen compounds can enter waterbodies through spillage (during the loading of blastholes or during transportation), by the movement of water through the blasthole, by the erosion of explosives from flowing water through the blasthole, and by leaching of undetonated explosive from the blast rubble and quarry materials.

A project-specific EMP will be developed to implement industry standard practices for managing the release of nitrogen from blasting activities. Mitigation that will help protect water and sediment quality from potential nitrogen loading due to the use of ANFO explosives include the following:

- Storage of explosives will be controlled and runoff from storage areas will be contained.
- To the extent possible, blasting activities will be completed during winter months to avoid freshet runoff.
- Blast holes will be kept free of water where practical to avoid the incomplete combustion of ANFO.
- Explosives will be sealed and kept dry to prevent the incomplete combustion of ANFO.

- The handling and transport of explosives will be carried out by the supplier and blasting contractor under a licence to conduct such work and according to the requirements of applicable regulations including the *Explosives Act, Transport of Dangerous Goods Act*, and National Fire Code of Canada.
- Blast rock will not enter a waterbody or watercourse unless the material is being used for channel armouring.

### *Dust Deposition*

An increase in dust deposition is a likely result of land disturbance from project activities. The design and implementation of mitigation measures and BMPs associated with dustfall will be guided by (but not limited to*) Northern Land Use Guidelines: Roads and Trails* (GNWT 2010), the Government of Nunavut's *Environmental Guideline: Dust Suppressants* (GN 2024), the Government of Nunavut's *Environmental Guideline for Dust Suppression on Unpaved Roads* (GN 2014). In addition to erosion and sedimentation controls outlined in Section 19.3.3.3 and the ESCP (Volume 11) that will help control dustfall related to the land disturbance, mitigation measures specific to dustfall control include the following:

- Dust suppression will be conducted as necessary to reduce dust and sediment from entering watercourses or waterbodies. The application of dust suppressant(s) will adhere to Government of Nunavut's guidance (GN 2014, 2024).
- Reduced speed limits may be temporarily posted during periods of drier conditions to reduce fugitive dust generation.

### *19.3.3.4 Project Residual Effects on Surface Water and Sediment Quality*

With the implementation of mitigation measures described in Section 19.3.3.3, residual effects on surface water and sediment quality are expected to low magnitude (i.e., within the variability of pre-construction conditions). Linear road development requires construction activities that will disturb the landscape and alter localized drainage patterns through ditches and culverts to facilitate flow. Residual effects are primarily associated with construction activities, such as earthworks, water withdrawals and discharge, culvert installation, and material handling. These activities may introduce suspended sediment or trace contaminants to nearby waterbodies through runoff, dust deposition, or in-channel works. ML/ARD from exposed rock and borrow materials and nitrogen compounds from blasting may also enter waterbodies; however, these pathways will be managed through Project-specific plans and best practices.

With the application of proven mitigation measures and management practices that target surface water use and discharge, erosion and sediment, ML/ARD, and explosives, and dust deposition, changes to surface water and sediment quality are predicted to be:

- Project phase: Construction, Operations and Maintenance
- Direction: adverse
- Magnitude: low, generally within the range of natural variability and below guideline thresholds for aquatic life and human health

- Geographic extent: the LAA; generally confined to the PDA with short distances that extent downstream
- Timing: Medium-term in duration, applies to the Construction and Operations and Maintenance phases of the Project (ad-hoc events that are short term in duration)
- Frequency: Irregular in frequency, occurring as short-term events linked to specific activities such as earthworks, water withdrawals, culvert installation, maintenance
- Reversibility: Reversible, as effects are tied to finite construction or maintenance activities and will diminish following reclamation and restoration of disturbed areas.

Residual effects are not expected to extend beyond the LAA. Water from smaller watercourses intersecting the PDA will undergo substantial mixing before entering the mainstems of the Burnside River, the Hood River, the James River, and the Kennarctic River, further reducing the potential for downstream impacts beyond the LAA.

Seasonal variation is expected to influence the timing of residual effects. For example, erosion and sedimentation from activities such as vegetation clearing, topsoil removal, in-channel work, and dustfall are expected to be negligible during the winter months, when the ground and water bodies are frozen and covered with snow. Increased runoff may temporarily elevate sediment transport from disturbed areas, but these effects will be mitigated through erosion and sediment control measures. Minor, short-term increases in sediment concentrations may occur during construction activities such as culvert installation or grading. These changes are expected to within the variability of pre-construction conditions with the implementation of mitigation measures and aquatic monitoring.

The duration of residual effects is considered medium-term and applied to the Construction and Operations and Maintenance phases of the Project. This is because the primary effect pathways for changes in surface water and sediment quality are directly tied to construction activities, including material sourcing. Exceptions include culvert and bridge maintenance associated with Operations and Maintenance, as well as fugitive dust from summer roadway use. Dust can contribute trace sediments and metals to adjacent waterbodies during dry periods. However, these activities will be managed using the mitigation measures outlined in Section 19.3.3.3 and are not expected to change in surface water and sediment quality parameters (e.g., pH, suspended sediments, anions and nutrients, total and dissolved metals), that are beyond the variability of pre-construction conditions.

Adherence to the ML/ARD Management Plan will limit the interaction of ML/ARD material with oxygen and surface water. With testing, material management strategies in place, the potential for metal leaching or acidic drainage is considered negligible and not result in adverse or long-term changes to water and sediment quality. Water and sediment quality monitoring will be conducted as required to confirm effectiveness of the mitigation measures and to facilitate adaptive management.

Residual nitrogen compounds may occur in runoff from blasting areas; however, adherence to the EMP will reduce concentrations to levels not expected to results in changes within the variability of pre-construction conditions. Therefore, blasting activities are not anticipated to result in adverse or long-term changes to water and sediment quality.

During construction, residual effects are expected to occur as multiple, irregular events without a fixed schedule, reflecting the variable timing and location of construction activities across the PDA.

Although these effects are adverse (representing a change from natural conditions), they are anticipated to be relatively small compared to the overall size of the watersheds intersected by the Project. As noted in the Change in Surface Water Quantity section (Section 19.4.2), the PDA and downstream areas of the LAA affected by Project activities represent a small portion of the overall contributing areas within the watersheds intersected by the Project. Residual effects are reversible as disturbed areas are reclaimed and hydrologic processes return to pre-construction conditions with the installation and maintenance of culverts, and runoff and dust associated with traffic on the road is expected to result in low magnitude changes to surface water and sediment quality. Water and sediment quality monitoring will be implemented to confirm mitigation effectiveness and support adaptive management (Section 19.7)

## 19.3.4 Change in Groundwater Quality

The assessment of potential Project-related effects on groundwater quality is guided by the IS Guidelines for the Project, as well as federal and territorial regulations. This assessment considers concerns identified by Kitikmiut, other Indigenous groups, and other potentially affected communities (see Table 19.9), the work from previous studies in the region (Sections 19.2.1.1 and 19.2.2), the hydrological conditions within the LAA and RAA (Section 19.2.2.4), and possible impacts related to Project activities and disturbance areas (Table 19.16). IAG members stated that water needs to be protected if the Project is built (IAG 2025b).

In Nunavut, groundwater quality standards follow federal guidelines (see Section 19.1.6.3). Impacts to groundwater quality will be considered according to these standards and other potential concerns that have been identified by Kitikmiut who use groundwater springs and surficial water bodies connected to the groundwater system as sources of potable water (see Table 19.9).

In the following discussion, potential impacts to groundwater quality will specify whether they apply to shallow groundwater (hosted within the active zone) and/or deep groundwater (hosted below the permafrost and within open taliks).

### *19.3.4.1 Analytical Assessment Techniques*

The shallow groundwater system within the RAA is generally hosted in the active zone which exists within 8 m of the surface above a layer of continuous permafrost. This permafrost acts as an impermeable barrier between the shallow groundwater system and the deep groundwater system. Shallow groundwater is much more likely be affected by Project activities than deeper groundwater as the impermeable layer of permafrost that separates the two systems can exceed 500 m thickness in the Project area (BGC 2006). The shallow groundwater system is intimately connected to the surficial water bodies and can be evaluated by using surficial groundwater as a proxy for shallow groundwater composition. Therefore, the analysis applied to surficial water will also apply to shallow groundwater (see Section 19.3.3). While the pathways, mitigation measures, and residual affects pertaining to shallow groundwater are discussed in the following sections, the remainder of this analytical assessment focuses on the deep groundwater system.

Pathways for contaminants to reach the deep groundwater system will only exist where open taliks occur. To assess the potential effects on the quality of the deep groundwater system, locations where the surficial and deep groundwater systems can interact (i.e., open talik locations) must be identified.

A mapping exercise was conducted to determine where the open taliks are likely to exist and to determine their proximity to the LAA. This mapping exercise applied the permafrost thickness model previously developed for the High Lake area by BGC Engineering Inc. (2006) to the entire RAA. This model uses the shape (round or elongate) and extent (diameter) of a water body to estimate the thickness of the talik beneath it. Only lakes that are deep enough to avoid freezing completely during the winter months can insulate the ground beneath them to form taliks. If these lakes are large enough, they can insulate a wide enough area to prevent the formation of permafrost beneath them, forming an open talik. These large lakes with open talik potential are also preferred as sources of drinking water over smaller lakes in the region (Banci and Spicker 2024).

While this model is based on parameters that are specific to the High Lake area, many of the assumptions in the model are generally applicable to the rest of the RAA (see Table 19.17).

**Table 19.17 Comparison of Talik Model Parameters**

| Model Parameter | Value used in BGC (2006) | Values Applicable to RAA |
|---|---|---|
| Geothermal Gradient | 1.6°C/100 m | 0.5-1.76°C/100 m for the Canadian Shield[1] |
| Average Annual Ground Temperature | -7°C | -4°C to -8°C (reduced talik thickness threshold to account for variability)[2] |
| Bedrock Thermal Conductivity | 3.33 W/m°C | 1.9-3.2 W/m°C (granite), 0.25-2.8 W/m°C (schist and shale)[3] |
| Volumetric Water Content | 2% | 1% in fresh bedrock, up to 5% in fractured zones[4] |

Notes:

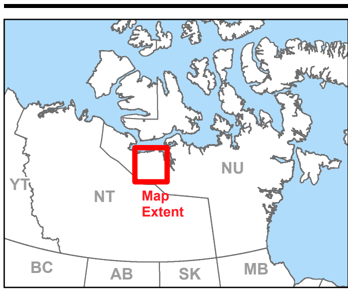
1 Lévy et al. (2010); Miranda et al. (2022).

2 AECOM (2012); Eppelbaum et al. (1996); BGC (2013).

3 Eppelbaum et al. (1996).

4 AECOM (2013).

Due to the uncertainty in permafrost thickness across the RAA, any taliks that are estimated to reduce the permafrost thickness by 300 m or more are categorized as possibly open while any taliks that are estimated to reduce the permafrost thickness by 400 m or more are categorized as being highly likely to be open. For round lakes, thresholds for ‘possible’ and ‘highly likely’ classifications are met at diameters of 425 m and 460 m, respectively. For elongate lakes, the widths required to meet these classifications are 215 m and 240 m, respectively. A map showing the potential for the water bodies within the RAA to host an open talik is provided in Figure 19.8.


**Open Talik Potential within 100m of Road**

- Highly Likely
- Possible
- Unlikely

**Open Talik Potential**

- Highly Likely
- Possible
- Unlikely
- Grays Bay Road
- Grays Bay Winter Road
- Grays Bay Winter Road Optional Alignment
- Local Assessment Area (LAA)
- Regional Assessment Area (RAA)
- Advanced Mineral Exploration Site
- Closed Mine Site
- Territorial Boundary
- Tibbitt to Contwoyto Winter Road
- Watercourse
- Ocean
- Waterbody

0 10 20 Kilometres

(At original document size of 8.5x11) 1:1,350,000

N

NUNAMI STANTEC LIMITED

WEST KITIKMEOT RESOURCES CORP

**Notes**

**1.** Coordinate System: WGS 1984 UTM Zone 12N
**2.** Data Sources: Governments of Nunavut and Canada, Stantec

*Project Location*
Kitikmeot Region, Nunavut

Prepared by SLEMAY on 2026-02-02
TR by DSPRY on 2026-02-02

*Client/Project*
123514868_097

West Kitikmeot Resources Corp
Grays Bay Road and Port

*Figure No.*
**19.8**

*Title*
**Open Talik Potential of Water Bodies within the RAA**

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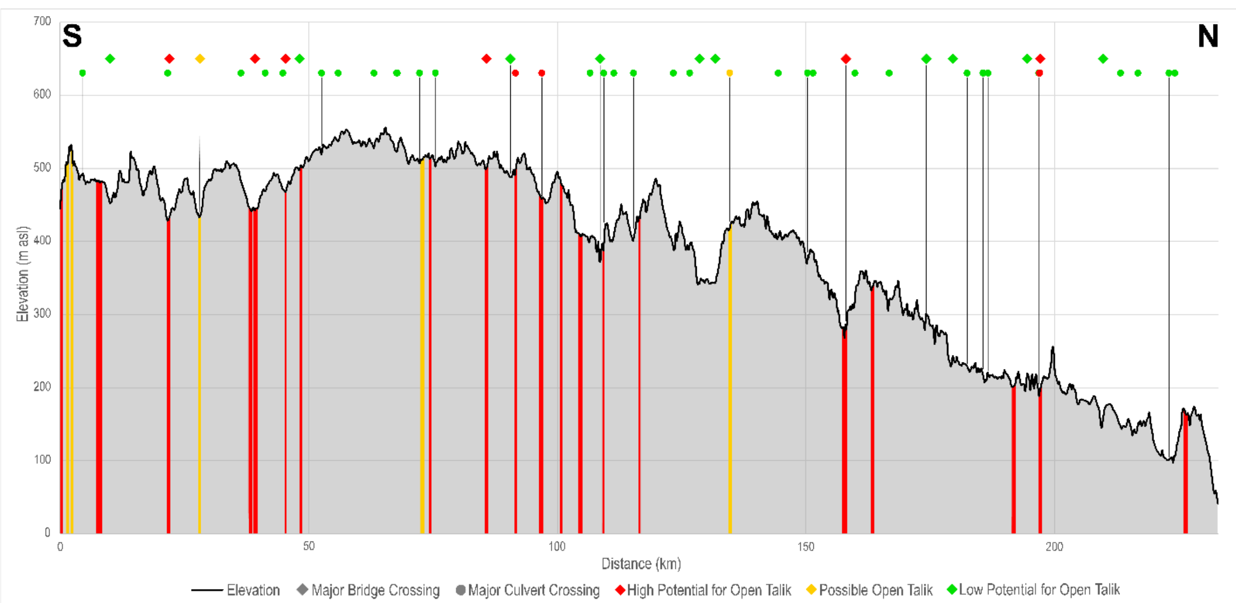
The route proposed in the Project has a length of 230 km of all-season road and 3 km of winter road, stretching from the Jericho Mine Site to Grays Bay. Of this, 48.1 km, or 20.6%, has a water body located within 100 m of the centreline of the roadway (this 100 m buffer is roughly equal to the LAA); however, most of these water bodies are small and are unlikely to be associated with open taliks. Only 6.0 km of the roadway (2.6%) is within 100 m of lakes that are highly likely to host open taliks, with another 0.9 km of road within 100 m of lakes that may possibly host open taliks. Together, there are roughly 7 km of roadway (3%) that has a proximal pathway to impact deep groundwater quality. Seven of the major bridge crossings and four of the major culvert crossings are also within areas where open taliks and a direct connection to deep groundwater may exist.

The sections of the roadway and crossings within these sections should be appropriately managed to reduce the potential for impacts to deep groundwater. The locations of these sections of the roadway are shown in Figure 19.9 along a cross section that follows the proposed road alignment.

Even in areas where open taliks are likely to exist, the low permeability of the bedrock in these areas will limit the transport of contamination into deep groundwater reservoirs. Previous studies have estimated the hydraulic conductivity of weathered bedrock to range from $6.52 \times 10^{-8}$ to $1.13 \times 10^{-5}$ metres per second (m/s) with an average of $6.54 \times 10^{-7}$ m/s, while hydraulic conductivity of fresh bedrock varies from $2.46 \times 10^{-10}$ to $1.9 \times 10^{-6}$ m/s and tends to decrease with increasing depth (AECOM 2012).

**Figure 19.9 Crossings and Open Talik Potential Along the Roadway**



#### *19.3.4.2 Project Effects Pathways*

A change in both shallow and deep groundwater quality is a potential effect of the Project through mixing with surficial water that has been contaminated by surface runoff and seepage, traffic on project roads, dust from road traffic and stockpiles, nutrient input from blasting activities, runoff from fuel storage sites, possible fuel spills, spills from vehicles along the route, construction/operation of camps. IAG members expressed concerns about the acidification of water from blasted materials and residual nitrogen (IAG 2025a). Many of these pathways are temporary and will only exist during the construction of the roadway. These pathways may also result in effects on water resources relied upon by Kitikmiut, other Indigenous groups, and other potentially affected communities (Volume 9, Sections 24 and 25). For example, the past operations at Carat Lake are expected to have extended down gradient of the lake and may have may have affected the water quality in the Jericho River (KIA 2003). These pathways to downstream or down gradient water resources should also be considered.

Excavation and installation of subsurface infrastructure also have the potential to directly impact shallow and deep groundwater quality. Even if the installation of subsurface infrastructure does not introduce contamination into groundwater, this infrastructure may provide preferential pathways for contamination from the surface to enter into the shallow groundwater system, and possibly into the deep groundwater system where open taliks exist.

Changes in the distribution of permafrost can also lead to changes in groundwater quality by changing the groundwater flow system. Changes in groundwater flow could lead to mixing of waters that would not normally mix as well as potentially affecting surface water bodies. Residents of the Kitikmeot Region have noted that permafrost has been receding quickly in the north due to changes in climate and mitigation measures are needed to ensure that the Project does not further accelerate these impacts (Banci and Spicker 2024). These pathways are summarized in Table 19.2 and discussed further below.

Shallow groundwater is generally affected by the same pathways as surficial water bodies and the Project effect pathways described in Section 19.3.3.2 also apply to shallow groundwater. As for deep groundwater, impacts will be limited across much of the Project by the confining effect of the thick permafrost layer. Project activities are not anticipated to cause significant changes to the distribution of permafrost. Given that permafrost is estimated to be >250 m thick across most of the project area, it is unlikely that Project activities will change the distribution of permafrost enough to increase the mixing rates of shallow and deep groundwater. Only 7 km (3%) of the proposed roadway is estimated to be within 100 m of open taliks where permafrost is absent and a pathway for contamination to move between deep and shallow water could exist. The potential for this interaction will be further limited by the decreasing permeability of the bedrock unit with increasing depth.

### *19.3.4.3 Mitigation, Management, and Enhancement Measures*

Shallow groundwater is likely to be impacted if surficial water bodies are impacted as these two natural water systems are intimately connected. Deep groundwater will only be impacted if surficial water bodies and shallow groundwater are impacted in areas where open taliks are present, as these are the only locations where pathways for contamination to enter the deep groundwater system exist. Mitigation measures focus on preventing changes to surficial water quality and maintaining permafrost stability, which in turn protects groundwater quality. Key measures include industry standard best practices for erosion and sediment control, spill prevention, and permafrost protection during construction and operations. These measures are supported by management plans including the Water Management Plan, Road Construction Management Plan, Borrow Pits and Quarry Management Plan, and Spill Contingency Plan (see Volume 11). Provided the appropriate mitigation measures for surficial water bodies are followed, the shallow and deep groundwater systems should also be protected. These measures take into consideration the values identified by Kitikmiut, other Indigenous groups, and other potentially affected communities.

The effectiveness of these measures is considered high for preventing contamination of groundwater resources, with little uncertainty for most practices. Some uncertainty remains regarding permafrost protection, as roadway construction will alter the thermal regime; however, adherence to best practices will substantially reduce this risk.

As there are few groundwater monitoring wells in the region it may be difficult to directly monitor groundwater quality. Instead, surficial water quality monitoring can be used as a proxy for potential impacts to active zone/shallow groundwater quality. Surficial water quality monitoring will be conducted as required to confirm the effectiveness of the implemented mitigation measures. If impacts to surficial water bodies are observed near locations that are likely to contain open taliks, groundwater sampling may also be justified. *Aniloakhinik* (groundwater springs) bring deep groundwater to the surface and could also be sampled to assess groundwater impacts in areas where the springs are located, such as to the west of Grays Bay (Banci and Spicker 2024); however, this monitoring would only identify contamination after it has entered the deep groundwater system.

### *19.3.4.4 Project Residual Effects on Groundwater Quality*

Shallow groundwater within the active zone is intimately connected to surficial water resources and is subject to the same low magnitude (within the range of natural variability), adverse, irregular and reversable residual effects (see Section 19.3.3.4).

If surficial water quality is managed according to the mitigation measures discussed in Section 19.3.3.3, the Project is not anticipated to cause adverse long-term residual effects on deep groundwater quality as the only pathway for contamination to reach deep groundwater is through interaction with surficial waters. Deep groundwater found beneath the permafrost is less susceptible to residual effects as the contamination pathway for deep groundwater only exists along 3% of the PDA. However, any impacts that do occur will be reversible as the potential sources of contamination are tied to construction activities which are limited in duration. Residual effects from excavation and installation of subsurface infrastructure on both shallow and deep groundwater are expected to be low magnitude and potentially adverse.

Adherence to the project mitigation plans will limit the impact of these activities and prevent the creation of permeable pathways that could lead to the contamination of groundwater in the future. Effects related to construction or maintenance activities are expected to diminish over time once activities are completed, Additionally, given long residence time for deep groundwater, any deep groundwater impacts are expected to dissipate before reaching potential groundwater users.

Residual effects on the distribution of permafrost are unavoidable and irreversible but are expected to be low in magnitude. Mitigating the change in permafrost distribution is not only important for groundwater quality but is necessary to prevent settlement and slumping/slope failures of the roadway and other surface infrastructure. The installation of surface infrastructure will have some impact on the permafrost distribution as it will modify the thermal properties of the ground surface; however, the resulting impacts to groundwater quality and flow paths are expected to be minimal as only the upper portion of the permafrost layer will be affected and existing separations between the shallow and deep groundwater systems are expected to be maintained.

The duration of potential residual effects is medium-term for shallow groundwater and long-term for deep groundwater. This is because deep groundwater systems have longer subsurface residence times and slower transport rates than shallow systems and should any contamination enter into the deep groundwater system it will take longer to move through the subsurface and/or dilute with other groundwaters.

Most shallow and deep groundwater residual effects are limited to the Construction phase. Like surficial water bodies, both shallow and deep groundwater are less susceptible to contamination during the winter months when the active zone is frozen. The effects of construction actives during winter months are therefore expected to be negligible. During operation of the roadway, culvert/bridge maintenance, dust control, and spill response activities will be appropriately managed using the mitigation measures in Section 19.3.3.3 to limit the impact to surficial and shallow groundwater quality. Provided impacts to these water resources are appropriately managed, no measurable impacts to deep groundwater quality are expected. Additionally, groundwater resources are rarely used as drinking water sources within the RAA. While adverse residual effects are expected to be negligible or low magnitude for groundwater resources, any impacts that do occur are unlikely to affect the public.

### 19.3.5 Summary of Project Residual Effects

Table 19.18 summarizes project residual effects on Water Resources.

**Table 19.18 Project Residual Effects on Water Resources**

| Residual Effect | Residual Effects Characterization | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Project Phase | Direction | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility |
| Changes to Surface Water Quantity | C/O | A | L | LAA | MS | LT | C | R |
| Changes to Surface Water and Sediment Quality | C/O | A | L | LAA | MS | MT | IR | R |
| Changes to Groundwater Quality | C/O | A | L | LAA | MS | MT/LT[1] | IR/C[2] | R/I[2] |

**Key:**

See Table 19.3 for detailed definitions

***Project Phase:***
*C: Construction*
*O: Operation*

***Direction:***
*P: Positive*
*A: Adverse*
*N: Neutral*

***Magnitude:***
*NMC: No Measurable Change*
*L: Low*
*M: Moderate*
*H: High*

***Geographic Extent:***
*PDA: Project Development Area*
*LAA: Local Assessment Area*
*RAA: Regional Assessment Area*

***Timing:***
*NS: No sensitivity*
*MS: Moderate sensitivity*
*HS: High sensitivity*

***Duration:***
*ST: Short-term*
*MT: Medium-term*
*LT: Long-term*

***Frequency:***
*S: Single event*
*IR: Irregular event*
*R: Regular event*
*C: Continuous*

***Reversibility:***
*R: Reversible*
*I: Irreversible*

*N/A: Not applicable*

Notes:

[1] Applies to deep groundwater only

[2] Pertaining to the change in permafrost distribution

### 19.3.6 Transboundary Effects

An assessment of the potential for transboundary effects on water resources is provided in Volume 10, Section 33 - Transboundary Effects Assessment.

### 19.3.7 Effects of Climate Change on Water Resources

> *Anthropogenic-driven climate change is a major environmental challenge and has added complexity and uncertainty to predicting future conditions and the reliability of project design, infrastructure, and mitigation strategies. Arctic temperatures are increasing four times the rate of the global average (IPCC 2021). This change has been observed by the Kitikmiut, including lake and river water levels with areas drying out faster and drastic changes in weather, including rain in the winter and decreased snow accumulation because of increased wind (Banci and Spicker 2024). The expected climate profile for the Project, including information on historical and projected climate conditions, for project-relevant climate parameters and thresholds, as well as general climate conditions (e.g., annual mean temperature and total precipitation), is provided in Volume 5, Section 12.*

NTKP consultants reported that the Kitikmeot communities are experiencing changes in water quality and quantity as a result of climate change.

> *The climate is changing and the weather is different now. Even the lakes have changed. Long ago when you made tea using water from the river or lakes it used to be good. Now the water doesn't make very good tea anymore. The Coppermine River is starting to change too. Inuit have begun to talk about the changes now. Even to drink out of the river is not very good because the water is changing.* (Banci and Spicker 2024)

> *Changes in water quality were attributed to less rain and snowfall, changes in weather, increased contaminants such as dust, mineral exploration and mine development, melting of permafrost because of global warming, airborne pollutants, too many tourists, leaving garbage on the land and an overpopulation of geese. Less change had been seen in water quality inland, compared to coastal areas. However, even inland areas had seen the effects of climate change.* (Banci and Spicker 2024)

With respect to groundwater and freshwater springs, NTKP consultants shared the following observations:

> *Inuit got their water from rocky areas. Now the water doesn't taste well because the rocks are dried up…*(Banci and Spicker 2024)

> *When we used to walk around south of here (Kugluktuk), there used to be lots of natural spring water everywhere. These are not as visible anymore as the land seems to be getting dry every year. We used to drink out of these natural springs and they were really cold. They are drying up and are not seen around anymore.* (Banci and Spicker 2024)

> *A lot of this permafrost is receding very fast, that's what we've been noticing. A lot of areas where the permafrost, sometimes when you have pressure, that pressure leaks on the permafrost and the water shoots up and you have these natural fountains. You don't see very many of those very often now due to climate change nowadays. The water has really changed over the last few years already.* (Banci and Spicker 2024)

> *The lakes start to get dry, even the rock basins where water collects, when the land is very dry. When it rains those places get full of water. These changes are happening around Cambridge Bay. Those places start to dry out because the sun is too hot and it doesn't rain. If I can't find good water it's going to be difficult.* (Banci and Spicker 2024)

> *Long ago where I used to travel during the winter the rivers were good for traveling on but now they are very shallow… When it starts to freeze in the fall the rivers have no water, like the Ahiak (Fairy Lake River) that flows into Kugluktuk… When I traveled there, there was no water in it. In some areas, lots of rocks were showing.* (Banci and Spicker 2024)

Future climate conditions are presented in the Climate Profile TDR (see Volume 5, Appendix 12A). Projected changes in climatological and meteorological conditions could affect water resources for the Project. Higher temperatures may lead to earlier snowmelt, longer growing seasons, and shifts in the timing and magnitude of the spring freshet, potentially reducing summer streamflows. A reduction in freeze-thaw cycles and frost/ice days could accelerate permafrost thaw, increasing groundwater contributions and the extent of open taliks, but also potentially destabilizing terrain.

Increased winter snowfall may enhance spring runoff, raising the risk of spring flooding. More intense rainfall events could increase the likelihood of flash flooding and erosion. Shifts in snowfall characteristics may also affect snowpack water content and melt dynamics.

A change in climate is expected to affect Water Resources in the LAA and RAA with or without the Project. As noted in Volume 2, Section 2.1.2, a key objective of the project design includes the development of permanent infrastructure that both reduces potential negative effects on the environment, including Water Resources, and remains resilient to the impacts of climate change. The mitigation measures developed for the Project will continue to be effective under the various climate prediction scenarios as they include measures accommodate change to water resources. For example, culverts will be sized to accommodate predicted flows, extreme rainfall, and changes to the permafrost regime. Project-related residual effects are not anticipated to change under climate change scenarios; but if issues arise, adaptive management will be used to develop solutions where practical.

# 19.4 Assessment of Cumulative Effects

## 19.4.1 Project Residual Effects Likely to Interact Cumulatively

Table 1 in Appendix 9A of Volume 4 (Environmental Assessment Methodology) presents the project inclusion list, which identifies other projects and physical activities whose effects might act cumulatively with the residual effects of the Project. Where residual effects from the Project act cumulatively with residual effects from other projects and physical activities (Table 19.19), a cumulative effects assessment is carried out. Only Projects in the RAA were considered.

Kitikmiut, other Indigenous groups, and other potentially affected communities have expressed deep and multifaceted concerns about water sources and quality, based on both Inuit, Indigenous, and Community Knowledge and monitoring observations (Table 19.9). WKR recognizes the Inuit, Indigenous, and Community perspectives and concerns about changes in water quality and quantity and the potential cumulative effects on water quality from other industries. For example, NTKP consultants and community members of the Kitikmeot Region have reported a decline in drinking water quality over time and are concerned that existing water resources will be affected by project activities (Banci and Spicker 2024; GBRP 2017; NIRB 2004). WKR has considered these concerns in the cumulative effects assessment.

**Table 19.19 Interactions with the Potential to Contribute to Cumulative Effects for Water Resources**

| Physical Activities | Effects | | |
|---|---|---|---|
| | Changes to Surface Water Quantity | Changes to Surface Water and Sediment Quality | Changes to Groundwater Quality |
| **Past** | | | |
| Bathurst Inlet | - | - | - |
| Omingmaktok | - | - | - |
| Snap Lake Mine | - | - | - |
| **Present** | | | |
| Arcadia Bay Project | - | - | - |
| B2Gold George Property | - | - | - |
| B2Gold Marine Laydown Area | - | - | - |
| Bulk Carriers | - | - | - |
| Cambridge Bay | - | - | - |
| Chuk and Fire Shear Blocks | - | ✓ | - |
| Commercial Cargo | - | - | - |
| Commercial and Domestic Harvesting | - | - | - |
| Coppermine Project | - | - | - |
| Coppermine River Project | - | - | - |
| Diavik Diamond Mine | - | - | - |
| Ekati Diamond Mine | - | - | - |

| Physical Activities | Effects | | |
|---|---|---|---|
| | **Changes to Surface Water Quantity** | **Changes to Surface Water and Sediment Quality** | **Changes to Groundwater Quality** |
| Epworth Project | - | - | - |
| Fishing Vessels | - | - | - |
| Gahcho Kué Diamond Mine | - | - | - |
| Goose Mine | - | - | - |
| Hackett River Project | - | - | - |
| High Lake (Izok Corridor Project) | - | - | - |
| High Lake East | - | - | - |
| Hood River Gold Project | - | ✓ | - |
| Hope Bay Project | - | - | - |
| Hydroelectric | - | - | - |
| Icebreakers | - | - | - |
| Itchen Lake Property | - | - | - |
| Izok Lake (Izok Corridor Project) | - | - | - |
| Jericho Mine | - | ✓ | ✓ |
| Kennady North - Exploration | - | - | - |
| Kugluktuk | - | - | - |
| Lupin Mine | - | - | - |
| Muskox Nickel Property | - | - | - |
| Nunavut Community Infrastructure | - | - | - |
| NT Community Infrastructure | - | - | - |
| Overflights | - | - | - |
| Passenger Ships and Pleasure Craft | - | - | - |
| Pistol Lake Project | - | - | - |
| Rae Copper Exploration Project | - | - | - |
| Rockinghorse (Koamaogaktok) Project | - | - | - |
| Roma Project | - | ✓ | - |
| Scientific Research | - | - | - |
| South Kitikmeot Gold Project | - | - | - |
| Tanker Ships | - | - | - |
| Tibbit to Contwoyto Winter Road | - | ✓ | ✓ |
| Tourism | - | - | - |
| Tree River Lodge | - | - | - |
| TTMG Project | - | - | - |
| Tugs/Barges | - | - | - |
| Ulu Gold Project | - | ✓ | - |

| Physical Activities | Effects | | |
|---|---|---|---|
| | **Changes to Surface Water Quantity** | **Changes to Surface Water and Sediment Quality** | **Changes to Groundwater Quality** |
| Wolf/Mistake Lake Property | - | - | - |
| Yellowknife City Gold Project | - | - | - |
| **Past and Reasonably Foreseeable** | | | |
| Indin Lake Gold Project | - | - | - |
| Mon Mine | - | - | - |
| Yellowknife Gold Project | - | - | - |
| **Project-Related Physical Activities** | | | |
| **Reasonably Foreseeable** | | | |
| Arctic Economic and Security Corridor | - | - | - |
| Courageous Lake Mine | - | - | - |
| NICO | - | - | - |
| **Reasonably Foreseeable Induced** | | | |
| Grays Bay Road and Port: Bulk Fuel Storage Expansion, Grays Bay Port | ✓ | ✓ | - |
| Grays Bay Road and Port: Bulk Fuel Storage Expansion: Jericho | - | ✓ | - |
| Grays Bay Road and Port: Airstrip Expansion | ✓ | ✓ | ✓ |
| Grays Bay Road and Port: Road Traffic | - | - | - |
| Grays Bay Road and Port: Port Traffic | - | - | - |
| Grays Bay Road and Port: Air Traffic | - | - | - |
| Grays Bay Road and Port Phase 2 –Jericho Mine to NT Border | - | ✓ | ✓ |
| Hackett River Project | - | - | - |
| Hackett and Back River Access Road | - | ✓ | ✓ |
| High Lake Mine (Izok Corridor Project) | ✓ | ✓ | ✓ |
| Izok Lake Mine (Izok Corridor Project) | - | - | - |
| Izok Lake Access Road | - | ✓ | ✓ |

Notes:

✓ = Other projects and physical activities whose residual effects have the potential to interact cumulatively with Project residual effects.

– = Interactions between the residual effects of other projects and residual effects of the Project are not expected.

The projects identified for cumulative effects assessment may differ across surface water quantity, surface water and sediment quality, and groundwater quality because each aspect of the Water Resources VC considers unique pathways and receptors. For example, surface water quantity focuses on flows, while surface water, sediment, and groundwater quality assessments consider chemical and physical parameters. These differences reflect component-specific methodologies.

Physical activities identified in Table 19.19 that are not likely to interact cumulatively with residual effects of the Project (i.e., no check mark) are briefly discussed below. Activities with potential for cumulative effects are discussed in subsequent sections.

Residual effects on the Water Resources VC are anticipated to be spatially restricted to the LAA. As a result, projects and activities within the RAA that are not anticipated to affect the LAA have been excluded from consideration as potential sources of cumulative effects. The excluded projects include current, past, or reasonably foreseeable activities are listed in Table 19.19 and summarized below:

- Certain mineral exploration programs, proposed mines, and active mines (e.g., Arcadia Bay Project, Lupin Mine)
- Activities and projects associated with vessels (e.g., Canadian icebreakers, tanker ships)
- Various activities (e.g., domestic, recreational, and commercial harvest, tourism, scientific research, tanker ships, port traffic)
- Transportation projects, including the portion of the Arctic Economic and Security Corridor, residing in the Northwest Territories.
- Hydroelectric projects
- Activities related to community infrastructure

These above listed activities are not expected to result in measurable changes to downstream water quantity, surface water and sediment quality, or groundwater quality in the Water Resources LAA. In consideration of the scope, environmental footprint, and mitigation measures associated with these activities, cumulative effects on surface water quantity, surface water and sediment quality, or groundwater quality in the Water Resources LAA are not anticipated.

Potential cumulative effects associated with projects and/or physical activities that may interact with water quantity, surface water and sediment quality, and groundwater quality within the LAA are discussed below.

## 19.4.2 Changes to Surface Water Quantity

### *19.4.2.1 Cumulative Effect Pathways*

Potential cumulative effects on surface water quantity arising from past, present, and reasonably foreseeable induced physical activities have the same effect pathways as those identified for the Project, and, therefore, could act cumulatively with residual Project effects. Change in surface water quality could result from the following reasonably foreseeable induced physical activities:

- High Lake Mine (Izok Corridor Project), if developed, could result in changes to surface water quantity associated with diversions, containment, water treatment and discharge, disturbance to landcover (e.g., vegetation and overburden removal) and altered drainage patterns
- Grays Bay Road and Port: Airstrip Expansion could result in changes to landcover that can result in altered drainage patterns and runoff
- Grays Bay Road and Port: Bulk Fuel Storage Expansion

These shared pathways and interacting projects require a cumulative effects assessment to determine if the combined impacts to surface water and sediment quality within the RAA are considered significant.

#### *19.4.2.2 Mitigation, Management, and Enhancement Measures for Cumulative Effects*

Future physical activities will require territorial and federal approvals and permitting and/or environmental impact assessments. These processes require future proponents to identify and assess potential effects to surface water quantity and identify and implement appropriate mitigation measures. It is expected that proponents of present and future projects will implement similar mitigation measures as those applied to the Project (Section 19.3.2.3) to reduce their contributions to cumulative effects on surface water quantity. These mitigation measures include measures outlined in relevant NWB licence authorizations. Part of the application process for a water license involves a hydrological assessment to evaluate the proposed withdrawal in relation to water availability, which should consider natural water supply, EFN, and other water users.

Cumulative (all water users) withdrawal recommended by DFO for the protection of EFN is less than 10% of natural streamflow (DFO 2013). This is within the low magnitude category for residual effects on surface water quantity. The timing of withdrawal is recommended to be limited to periods when streamflow would remain greater than 30% of mean annual discharge after all withdrawals. Additional details regarding surface water withdrawal mitigation, which would also apply to cumulative effects mitigation, are provided in Section 19.3.2.3. Complying with water withdrawal limits, conditions of water licences (for water use or discharge), and any additional direction from the NWB is expected to be an effective mitigation measure for cumulative effects on surface water quantity.

Mitigation measures discussed in Section 19.3.2.3 related to landcover-runoff response changes and drainage pattern changes would also apply to other potential projects, such as the High Lake Mine. Water management and ESC plans for other projects are expected to provide effective mitigation measures.

#### *19.4.2.3 Cumulative Effects*

Existing environmental conditions reflect cumulative effects on the environment from past and present physical activities. The majority of waterbodies in the RAA are relatively undisturbed or greenfield in nature. The anthropogenic disturbances that do exist are primarily related to exploration mining and winter access roads. Reasonably foreseeable induced physical activities may contribute to further changes in surface water quantity in the RAA. Some physical activities may result in landcover disturbance during construction but are reversible following the installation of culverts and reclamation of temporary borrow sources, while others may result in long-term changes (e.g., mining operations, all-season roads).

It is assumed that the Grays Bay Road and Port: Airstrip Expansion, and Bulk Fuel and Storage will have similar types of effects on surface water quantity as they will have similar earthworks and construction activities, along with long-term maintenance as compared to the Project. These activities can result in changes to drainage patterns and runoff response due to vegetation clearing, grading, and berms. The High Lake Mine, if developed, may interact cumulatively with Project effects related to surface water withdrawal, water containment, treatment, and discharge, as well as landcover and drainage pattern changes.

With the implementation of best management practices including the NWB conditions for water license authorization, the residual cumulative effects on surface water quantity in the RAA are expected to be adverse, low magnitude, long-term in duration, and continuous in frequency. Some of the residual effects are reversible following construction (e.g., installation of culverts to facilitate flow, temporary withdrawals, temporary erosion and sediment control measures removed from construction area), while others may be irreversible (e.g., permanent embankments and berms along the airstrip and road, long-term settling ponds).

### 19.4.3 Changes to Surface Water and Sediment Quality

#### *19.4.3.1 Cumulative Effect Pathways*

Potential cumulative effects on surface water and sediment quality from past, present, and reasonably foreseeable induced projects and physical activities are associated with the same effect pathways as those identified for the Project. These pathways include the introduction of sediments resulting from water discharge, increased contaminant loading due to ML/ARD, and nitrogen compound mobilization to the aquatic environment. Projects involving quarry or mine development with explosives may contribute to cumulative effects, along with reasonably foreseeable induced future road developments. A detailed list of projects and activities within the RAA that may interact cumulatively with the Project is provided in Section 19.4.1 (Table 19.19) and summarized here:

- Jericho Mine – a closed open-pit diamond mine located approximately 1 km southwest of the proposed alignment near Contwoyto Lake, which may contribute effluent and seepage from legacy mine infrastructure.
- High Lake Mine – if developed, could introduce ML/ARD and sediment mobilization and act cumulatively with the Project.
- Mineral exploration sites – including Chuk Block (West Kitikmeot Resources Corp), and Hood River Gold, Roma, and Ulu Gold projects (Blue Star Gold Corp.), which may add drilling fluids, hydrocarbons from fuel handling, and metal leaching.
- Bulk fuel storage expansions – at Grays Bay Port and Jericho sites, which pose risks of hydrocarbon-contaminated runoff from bermed containment areas, accidental releases during fuel transfer operations, and stormwater drainage mobilizing hydrocarbons and fine sediments
- Linear infrastructure projects – such as the Tibbitt to Contwoyto Lake Road, Grays Bay Road Phase 2, Hackett and Black River Access Roads, Izok Lake Access Roads, which can alter surface water and sediment quality through runoff, sedimentation, dustfall, and hydrological changes associated with permafrost disturbance.
- Airstrip expansion – potential expansion of the proposed 6,000 feet (1,829 m) gravel airstrip up to 8,000 feet (2,438 m) to accommodate larger aircraft, located adjacent to the project alignment.

These shared pathways and interacting projects require a cumulative effects assessment to determine if the combined impacts to surface water and sediment quality within the RAA are considered significant.

#### *19.4.3.2 Mitigation, Management, and Enhancement Measures for Cumulative Effects*

During engagement on previous projects, the Kitikmeot Inuit Association has expressed concern about the adequacy of mitigation planning implemented by developers (KIA 2003; NIRB 2004). In recognition of this concern, mitigation measures for surface water and sediment quality are being designed to align with best practices and are described in detail in Section 19.4.3.3, demonstrating WKR's commitment to addressing potential cumulative effects.

Future physical activities will require territorial and federal approvals and permitting and/or environmental impact assessments. These processes require future proponents to identify and assess potential effects to surface water and sediment quality and identify and implement appropriate mitigation measures. It is expected that proponents of present and future projects will implement similar mitigation measures as those applied to the Project (Section 19.3.3.3) to reduce their contributions to cumulative effects on surface water and sediment quality. These mitigation measures include measures outlined in relevant NWB licence authorizations, erosion and sediment control measures, water treatment to meet water quality guidelines for the protection of aquatic life and human health, guidelines associated with the development and use of borrow source and quarry materials, explosive management, and dust control.

Complying with best management practices such as those described in Section 19.3.3.3 are expected to be an effective mitigation measure for cumulative effects on surface water quantity.

#### *19.4.3.3 Cumulative Effects*

Existing environmental conditions reflect cumulative effects on the environment from past and present physical activities. The majority of waterbodies in the RAA are relatively undisturbed or greenfield in nature. The anthropogenic disturbances that do exist are primarily related to exploration mining and winter access roads. Other past, present, and reasonably foreseeable projects and activities within the RAA may contribute to changes in surface water and sediment quality through the same effect pathways described in Section 19.4.3.2. These effect pathways may interact cumulatively with those of the Project within shared watersheds, as informed by Inuit and other Indigenous groups' shared knowledge concerning water resources.

Existing stresses due to past mining activities and climate change have been identified by Knowledge Holders. The cumulative effects assessment acknowledges that the baseline environment is already under pressure. Through the Project-specific Inuit Knowledge report compiled from the NTKP database, NTKP consultants emphasized that tailings ponds must be properly managed to prevent contamination of water resources (Banci and Spicker 2024). During engagement on previous projects, the Kitikmeot Inuit Association expressed concerns about contamination from mining, noting potential for eutrophication, nitrate toxicity, and sedimentation affecting aquatic life and human health (KIA 2003; NIRB 2024). Similarly, Northwest Territory Métis Nation and Yellowknives Dene First Nation raised concerns about water quality impacts from mining activities (NWTMN 2012; YKDFN 2017, 2019). The assessment recognizes that Kitikmiut have observed that water quality varies by location and season, with some areas affected by sulfur or saline contamination (Banci and Spicker 2024). While the Project's residual effects are expected to be adverse in direction and low in magnitude, these historical and ongoing concerns underscore the sensitivity of the receiving environment and the importance of robust mitigation planning.

With the application of established mitigation measures and management practices targeting erosion, sedimentation, ML/ARD, dustfall, and blasting, cumulative effects on surface water and sediment quality are predicted to result in no measurable change beyond the Project's localized residual effects. Other projects and activities within the RAA are also expected to apply their own mitigation measures and best practices, which further reduces the potential for cumulative interactions.

The geographic extent of cumulative effects on surface water and sediment quality is anticipated to be limited to the LAA, where hydrological connectivity exists between Project components and nearby waterbodies. Timing is considered moderately sensitive because Project-related effects may coincide with natural seasonal cycles such as spring freshet or fish spawning. The duration of potential cumulative effects is expected to be medium-term, occurring primarily during construction, with multiple irregular events such as episodic runoff or sediment mobilization. These interactions occur against a backdrop of long-term, non-reversible climate change impacts reported by Inuit, including shorter freezing periods and reduced water levels.

Cumulative effects are expected to be reversible within the Project footprint, as changes in surface water and sediment quality are primarily linked to finite construction-phase activities. These pathways are directly associated with Project development and are not expected to persist into the Operations and Maintenance phase. Land disturbances during construction will be managed using BMPs, mitigation measures, and site-specific reclamation programs—such as promoting vegetation regrowth—to prevent long-term impacts and address historical community concerns regarding inadequate protection of water resources at previous mine sites like Jericho Mine. Cumulative effects will also be considered in management planning developed in collaboration with Kitikmiut, including attention to culturally important water resources such as the *aniloakhinik* (cold-water springs near eskers). Long-term, Inuit co-developed monitoring programs will be essential to verify these predictions.

### 19.4.4 Changes to Groundwater Quality

#### *19.4.4.1 Cumulative Effect Pathways*

Potential cumulative effects on groundwater quality from past, present, and reasonably foreseeable induced projects and physical activities follow the same effect pathways as those associated with the Project (see Section 19.3.4.2). These pathways include those that are likely to affect surficial water such as surface runoff and spills, excavation activities, installation of subsurface infrastructure, and alteration of permafrost distribution. A detailed list of projects and activities within the RAA that may interact cumulatively with the Project is provided in Section 19.4.1.

- Jericho Mine – a closed open-pit diamond mine located approximately 1 km southwest of the proposed alignment near Contwoyto Lake, which may contribute effluent and seepage from legacy mine infrastructure. Mining operations will also alter the distribution of permafrost in the subsurface and could create new pathways for communication of surficial contamination with the deep groundwater system,

- Airstrip expansion – potential expansion of the proposed 6,000 feet (1,829 m) gravel airstrip up to 8,000 feet (2,438 m) to accommodate larger aircraft, located adjacent to the project alignment. Landcover changes would alter surface water and sediment quality and the permafrost distribution which can in turn affect groundwater quality.
- Linear infrastructure projects – such as the Grays Bay Road Phase 2, Hackett and Black River Access Roads, Izok Lake Access Roads, and the Tibbit to Contwoyto Winter Road.
- High Lake Mine – if developed, could mobilize contaminants through surface water sources that have the potential to affect groundwater quality and could create new pathways that allow for the interaction of the deep groundwater system with surficial contaminants.

Numerous NTKP consultants and community members of the Kitikmeot Region have provided concerns of the potential cumulative impacts the project may have with mining operations (KIA 2003; NWTMN 2012; YKDFN 2017, 2019, Banci and Spicker 2024). As these projects create disturbance deep underground, they have a high potential to interact with groundwater resources. As a result, the potential cumulative effects between mining operations and the Project have been carefully considered.

#### *19.4.4.2 Mitigation, Management, and Enhancement Measures for Cumulative Effects*

Mitigation measures to limit cumulative effects will be the same as those used to mitigate the impacts of the Project (see Section 19.3.4.3 for groundwater mitigation measures and Section 19.3.3.3 for surface water mitigation methods which also apply to shallow groundwater resources). Nearby projects have the same duty to avoid or reduce their impacts to water resources and will have their own mitigation plans, water license conditions, and responses that they will follow. Mining operations have the highest potential to impact groundwater resources but are required to conduct their own environmental impact assessment and develop mitigation measures that will avoid or reduce groundwater impacts both within and outside of their site before their operations can commence.

#### *19.4.4.3 Cumulative Effects*

Other projects within the RAA may contribute to changes in groundwater quality. Like this Project, the primary pathway for changes in groundwater quality is through interaction with surficial water, excavation, activities, and changes to permafrost distribution. Mining projects are particularly likely to interact with groundwater resources and concerns about future mining operations have been raised numerous times throughout project engagement and during engagement on previous projects (KIA 2003; NWTMN 2012; YKDFN 2017, 2019; NIRB 2024). Most potential groundwater impacts from the Project are limited to the construction phase when ground disturbance effect pathways are active and are expected to be low magnitude and reversible. Other projects and activities within the LAA will have operations that will occur after the construction of the Project is complete, making these potential impacts non-cumulative with the project effects.

Provided that the other activities within the LAA follow established mitigation measures and best practices such as erosion mitigation, dust control, proper design of tailings facilities, ML/ARD control, and safe explosive use and storage, the cumulative effects on groundwater quality are expected to be neutral with no long-term trends anticipated. Cumulative effects that may occur are expected to be of low magnitude and reversible. Like surficial water resources, groundwater resources are less susceptible during winter conditions when the ground is frozen.

The only exception is the potential to change the extent of permafrost which may be irreversible. Residual effects on the distribution of permafrost are unavoidable when the ground surface is altered. Future intersections and quarries built along the proposed roadway have the potential to cause cumulative effects on permafrost distribution. Like the project effects, these resulting impacts to permafrost are expected to be minimal as only the upper portion of the permafrost layer will be affected and separation between the shallow and deep groundwater systems will be maintained. Large mining operations may have the potential to disrupt the entirety of the permafrost column, but these impacts will not be coincident with the potential effects of the Project and will be mitigated under their own management plan.

If cumulative effects occur in shallow groundwater, these effects are expected to be medium-term, while effects on deep groundwater may last have a longer duration as deep groundwater systems have longer residence times and slower flow rates.

### 19.4.5 Summary of Cumulative Effects

Table 19.20 summarizes the cumulative effects on Water Resources.

Cumulative effects on water resources are anticipated between the Project and certain identified physical activities in the RAA (Table 19.19). Potential effects on water resources from ‘Present’ and ‘Reasonably Foreseeable’ physical activities may occur regardless of the Project, with the characterization of effects (e.g., extent or magnitude) potentially influenced by the Project. Overall, the cumulative effects are predicted to be low in magnitude for change in surface water quantity, change in surface water and sediment quality, and change in groundwater quality.

With the hydrography of the arctic consisting of numerous waterbodies and small watercourses occupying relatively small sub-watersheds within the major river watersheds, multiple projects (past, current, and reasonably foreseeable) have not been identified within the same sub-watershed. At the watershed scale of the major rivers, potential residual effects of other projects at their point of interaction in a mainstem channel or lake are expected to be unmeasurable due to the relatively small disturbance areas of the projects relative to the watershed area.

Surface water withdrawal for the Project is predicted to contribute up to a low magnitude change in surface water quantity with the LAA, which is expected to be reduced to an unmeasurable change within the RAA due to additional flow contributions downstream. Cumulative effects are more likely to occur during times of natural low flow conditions; therefore, the timing would be moderately sensitive and the duration would be medium-term or long term.

**Table 19.20 Residual Cumulative Effects on Water Resources**

| Residual Cumulative Effect | Residual Cumulative Effects Characterization | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Magnitude** | **Direction** | **Geographic Extent** | **Timing** | **Duration** | **Frequency** | **Reversibility** |
| Changes in surface water quantity | L | A | RAA | MS | MT/LT | C | R/I |
| Contribution from the Project to Residual Cumulative Effect | The Project is expected to have no measurable effect where downstream interaction with effects from other projects is possible. | | | | | | |
| Changes in surface water and/or sediment quality | L | A | LAA | MS | MT | IR | R |
| Contribution from the Project to Residual Cumulative Effect | Considering the scope, scale, and proximity of these activities, cumulative effects on surface water and sediment quality are expected to be neutral, with no measurable long-term trends anticipated. | | | | | | |
| Changes in groundwater quality | L | A | LAA | MS | MT/LT[1] | IR/C[2] | R/I[2] |
| Contribution from the Project to Residual Cumulative Effect | The Project is expected to have negligible impact on groundwater quality as potential impacts are generally constrained to the construction phase. Mitigation plans will be utilized during the construction phase to reduce these potential impacts and no long-term effects outside of natural variability are anticipated. | | | | | | |

**Key:**

See Table 19.3 for detailed definitions

***Direction:***
*P: Positive*
*A: Adverse*
*N: Neutral*

***Magnitude:***
*NMC: No Measurable Change*
*L: Low*
*M: Moderate*
*H: High*

***Geographic Extent:***
*PDA: Project Development Area*
*LAA: Local Assessment Area*
*RAA: Regional Assessment Area*

***Timing:***
*NS: No sensitivity*
*MS: Moderate sensitivity*
*HS: High sensitivity*

***Duration:***
*ST: Short-term*
*MT: Medium-term*
*LT: Long-term*

***Frequency:***
*S: Single event*
*IR: Irregular event*
*R: Regular event*
*C: Continuous*

***Reversibility:***
*R: Reversible*
*I: Irreversible*

*N/A: Not applicable*

Notes:
[1] Applies to deep groundwater only
[2] Pertaining to the change in permafrost distribution

Cumulative effects on surface water and sediment quality are expected to be low in magnitude and reversible. Potential cumulative effects on surface water and sediment quality from past, present, and reasonably foreseeable projects and physical activities are associated with the same effect pathways as those associated with the Project (see Section 19.4.3.2). These pathways include potential erosion and sedimentation resulting from land-disturbing activities such as vegetation and/or topsoil removal, in-channel works, permafrost alteration, and dustfall. Projects involving quarry/mine development with explosives may also contribute to cumulative effects.

Cumulative effects on groundwater quality are also expected to be low in magnitude and reversible, with the exception of potential changes to permafrost which may be irreversible. Cumulative effects are expected to be limited to the LAA. Potential impacts are generally confined to the shallow groundwater system (mainly addressed in the assessment of surface water effects), but operations near open taliks could affect the deep groundwater system. Cumulative effects that overlap with the Project effects will have similar effect pathways (excavation, surface runoff, change in permafrost distribution) and mitigation measures. If cumulative effects do occur, they are likely to be medium-term if they affect the shallow groundwater system and long-term if they affect the deep groundwater system, due to longer subsurface residence times.

Cumulative changes to the distribution of permafrost in the shallow subsurface may be irreversible. These changes in permafrost distribution can change the thickness of the active zone and shallow groundwater system but is not expected to impact the deep groundwater system. These cumulative impacts will be limited to where future activities that alter the ground surface coincide with project activities.

## 19.5 Significance of Effects

### 19.5.1 Significance of Project Residual Effects

A summary of the Project's residual effects is described in Section 19.7. The Project's residual effects on surface water quantity, surface water and sediment quality, and groundwater quality are characterized as low in magnitude, reversible, and geographically confined to the LAA (see Table 19.18). While not expected to affect water quality in the long term, potential changes to the distribution of permafrost in the shallow subsurface may not be reversible. Based on these characterizations and the significance criteria outlined in Section 19.1.1.6, including criteria identified by IAG members, the residual effects on surface water quantity and quality, sediment quality, and groundwater quality are predicted to be not significant.

### 19.5.2 Significance of Cumulative Effects

A summary of the Project's cumulative effect is described in Section 19.4.5. The Project's cumulative residual effects on surface water, groundwater, and sediment quality are characterized as low magnitude, reversible, and are geographically limited to the LAA for surface water and sediment quality, and groundwater quality (see Table 19.20). Cumulative effects on surface water quantity may extend to the RAA. Cumulative effects on the distribution of permafrost in the shallow subsurface may not be reversible, but are not expected to impact water quality. It is reasonable to assume that past, present, reasonably foreseeable, and reasonably foreseeable induced projects have been and will be required to implement mitigation measures to maintain the surface water quantity, surface water and sediment quality, and groundwater quality. The Project contribution to residual cumulative effects is considered low with the Project design considerations to facilitate drainage patterns and avoid areas that are ecologically sensitive, and the implementation of mitigation measures described in Sections 19.3.2.3, 19.3.3.3, and 19.3.4.3.

Overall, given the small contribution of Project effects to cumulative residual effects on surface water quantity and quality, sediment quality, and groundwater quality within the RAA as well as expected mitigation measures for the Project as well as mitigation to be adopted by other projects and activities in the RAA, cumulative effects are expected to be not significant.

### 19.5.3 Summary of Mitigation, Management, and Enhancement Measures

Kitikmiut, other Indigenous groups, and other potentially affected communities have expressed deep and multifaceted concerns about water sources and quality, based on both Inuit, Indigenous, and Community Knowledge and monitoring observations (Table 19.9). WKR recognizes the Inuit, Indigenous, and Community perspectives and concerns about changes in water quality and quantity. In consideration of these concerns, mitigation measures are being developed to limit the Project's effects on water.

To manage potential impacts on surface water quantity, surface water and sediment quality, and groundwater quality, a comprehensive set of mitigation measures and management strategies will be implemented. These measures are based on applicable regulations, BMPs, peer-reviewed literature, and a mitigation hierarchy that prioritizes avoidance, reduction, and restoration. Key actions include erosion and sediment control, dust control and suppression, water management infrastructure, management of ML/ARD, improved handling of explosives to reduce nitrogen mobilization, and spill prevention for hydrocarbons and potentially other chemicals. These mitigation measures are detailed in multiple conceptual management plans and are expected to be effective when properly implemented, monitored, and adaptively managed, helping to protect the drinking water resources and freshwater habitats identified during consultation and engagement (Table 19.9). With these strategies in place, potential Project-related effects are anticipated to be negligible and not result in long-term adverse changes to water resources. Preventing adverse changes to surface water will also limit the potential pathways for contaminants to enter groundwater. Monitoring will be conducted to confirm its effectiveness and to support adaptive management of surface water, and additional monitoring of groundwater may be required in areas with open taliks.

For water resources, several management plans will be in place to mitigate potential effects on surface water quantity. These include:

- Water Management Plan
- Waste Management Plan
- Erosion and Sediment Control Plan
- Road Construction Management Plan / Road Management Plan
- Borrow Pits and Quarry Management Plan
- Follow-up and Adaptive Management Plan
- Closure and Reclamation Plan

To mitigate the effects of surface water withdrawal and discharge, the Project will comply with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act*, which regulates water use and discharge through the Nunavut Water Board. Water withdrawals and discharge will remain within licensed volumes, and applications will include hydrological assessments and evaluations of EFN. In the absence of a territorial EFN policy, the DFO framework will be used to protect aquatic ecosystems and other water users (DFO 2013).

Runoff from developed areas will be managed through stormwater infrastructure and erosion and sediment control structures. Water crossings will be designed to accommodate the impacts of climate change and to support fish passage. Disturbed areas will be progressively reclaimed to restore natural hydrology and reduce erosion.

To maintain natural drainage patterns, construction activities will follow BMPs such as isolating work areas from waterbodies and diverting streamflow around work areas. Culverts and bridges considered major structures or high risk will be sized to handle up to high water events, accounting for ice conditions and the effects of climate change. In the event of ice blockages, steam trucks may be used to maintain the flow.

To reduce the impact on groundwater quality, BMPs such as designs that reduce heat transfer to the ground and proper design and maintenance of culverts will be used to reduce permafrost degradation and the potential for the development of preferential pathways along subsurface infrastructure. Preserving the existing permafrost will help to maintain isolation between the groundwater that supplies the cold-water springs and *aniloakhinik* used as drinking water sources from surficial contaminant sources. Adherence to the practices outlined in the Road Construction Management Plan and Borrow Pits and Quarry Management Plan will ensure that the potential for direct impacts to groundwater quality are minimized.

## 19.6 Prediction Confidence and Uncertainty

### 19.6.1 Prediction Confidence

Prediction confidence varies by effect type:

**Surface Water Quantity**: Moderate, due to uncertainty in hydrologic conditions at individual crossings and potential delays in detecting localized issues in remote areas. With the large number of water and drainage crossings required for the Project, it is not financially or logistically feasible to develop a field-based baseline characterization for surface water hydrology for each crossing. The mitigation measures discussed are expected to be implemented and effective, but due to the length of the proposed roadway and limited infrastructure and worker presence, there is potential for delayed observation and response if systems malfunction in remote areas (e.g., fallen silt fencing or clogged culverts). This may result in a temporary greater change in surface water quantity in the localized area.

**Surface Water and Sediment Quality**: High, based on proven mitigation measures (see Section 19.5.3) and predictable pathways. The Project mitigation measures are designed to address key sources of potential impact, including erosion and sedimentation, fugitive dust, ML/ARD, and nitrogen loading from explosives.

**Groundwater Quality**: Low to moderate, reflecting limited baseline data and variability in groundwater systems. Confidence in the groundwater quality assessment is reduced by the limited availability of baseline groundwater quality data, which constrains the ability to fully characterize potential residual effects. The only groundwater quality data that is available comes from mine sites which naturally have high concentrations of dissolved solids and often exceed drinking water quality guidelines. These measurements are not likely to be representative of the entire PDA, particularly of the shallow-active zone groundwater quality. The Project's long, linear footprint crosses multiple conceptual groundwater flow systems, the variability of which makes it difficult to describe or define the background water quality and quantify potential impacts.

Confidence in the assessment is strengthened by the Project design and planned mitigation measures. Specifically, the Project does not include the long-term, continuous discharges to either groundwater or surface water, and the Project incorporates design criteria to prevent the creation of preferential flow pathways along subsurface infrastructure that could lead to contaminant migration. These factors eliminate many of the typical effects pathways that could result in significant residual effects on groundwater quality.

Although additional pre-construction data collection and refinement of project design will further strengthen the confidence of the effects prediction, the robust Project design and application of standard mitigation measures means that the current lack of groundwater data is not expected to affect the conclusion that significant residual effects on groundwater quality are unlikely. WKR will continue engagement with Inuit, other Indigenous groups, and potentially affected communities, to incorporate feedback into Project planning where appropriate.

### 19.6.2 Assumptions

Results of this effects assessment are highly dependent on effective implementation of Project mitigation measures, and the characterization of Project residual effects and cumulative effects were developed under the assumption that mitigation measures will be respected and followed during the entire time of the Project.

### 19.6.3 Gaps and Uncertainties

The surface water quantity and groundwater quality assessments are supported by regional datasets and mine-site data, which may not fully represent PDA conditions. The surface water and sediment quality predictions are supported by qualitative assessments in the absence of a suitable predictive model for linear infrastructure projects in northern environments.

Potential gaps in the availability of site-specific information are expected to be addressed with pre-construction data collection and refinement of project design. WKR will continue engagement with Inuit, other Indigenous groups, and potentially affected communities, incorporating feedback into Project planning where appropriate.

Climate change has had noticeable effects in the region. Winter seasons with frozen ground and lakes have gotten shorter on average (Banci and Spicker 2024). Both surface water and groundwater are less vulnerable to impacts when the ground is frozen and continued shortening of the winter season may create more opportunities for water impacts.

As average temperatures and precipitation increase over time, permafrost will continue to melt and opportunities for the mixing of surface water and groundwater will increase. This could lead to either an increase in dissolved material or dilution of shallow groundwater. Groundwater, especially deep groundwater has been shown to exceed several drinking water guidelines in some locations and increased rates of mixing between groundwater and surface waters could lead to reduced water quality. Permafrost melting and increased groundwater mixing may be partially responsible for the changes in drinking water taste noted in Table 19.9. While the Project effects on the distribution of permafrost are expected to be minimal, future changes in the distribution of permafrost due to climate change could continue to lead to changes in groundwater quality that are outside of WRK's control.

## 19.7 Follow-up and Monitoring

Potential measurable adverse effects to surface water quantity have been identified where surface water withdrawals would occur, namely the port intake lakes, as well as their outlet streams. Hydrologic studies have not been undertaken at these lakes or outlet streams, and lake recharge rates and the hydrologic character of the outlet streams are not known. Predictive modelling would have a high uncertainty due to the dependency that small streams have on the hydrological processes unique to the arctic landscape (see Section 19.2). Lake level and streamflow data collection may be a consideration to support a water licence application. A monitoring program may also be a condition of a future water licence, as determined by the Nunavut Water Board.

Monitoring water quality will be included in the Water Management Plan with important consideration to culturally significant waterbodies. The Water Management Plan includes monitoring commitments specific to water quality, with regular monitoring and reporting of surface water quality. Existing baseline data can be used to support future monitoring efforts. Surface water quality will be monitored during watercourse crossing construction and borrow and quarry operations. Monitoring of construction and operations practices will occur to assess the effectiveness of mitigation measures employed and their functionality. Monitoring will include:

- Sampling of water quality parameters (e.g., turbidity, metals, nutrients) at representative locations, as required.
- Periodic inspection of erosion and sediment control structures during high-flow periods.
- Verification of ML/ARD management effectiveness through water quality monitoring, where required.
- Dustfall monitoring near sensitive waterbodies during construction and operations, where required.

As part of follow-up and adaptive management, which will be addressed within the individual environmental management plans (Volume 11), mitigation measures will be regularly reviewed and updated to verify and improve their effectiveness. If environmental degradation is observed during follow-up or monitoring activities, intervention mechanisms will be triggered through the adaptive management process. WKR will continue to respond to questions and concerns from Kitikmiut, other Indigenous groups, and other potentially affected communities through its ongoing engagement efforts and information provided following submission of the IS will be reviewed in the context of the IS and for incorporation into Project planning, including adaptive management and monitoring, as appropriate.

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# 20 Assessment of Potential Effects on Freshwater Fish & Fish Habitat

Freshwater Fish and Fish Habitat was selected as a valued component (VC) because of their importance to aquatic ecosystem health, they are valued by people for traditional, cultural, and recreational purposes, and are protected under the federal *Fisheries Act.* The Grays Bay Road and Port Project (Project) has the potential to interact directly and indirectly with freshwater fish and fish habitat during construction and operation of the road and land-based infrastructure.

For Inuit, the freshwater environment is an essential resource relied upon for hunting, travel, and connection to the land. Freshwater fish are an important part of the Inuit seasonal diet, and essential during times of food shortages (Banci and Spicker 2024).

> *Ekalok (fish) were an important part of the Inuit seasonal diet, and essential during times of food shortages, especially if caribou did not arrive because of a change in migration route or calving area. People fished wherever they camped and travelled, primarily during the spring and fall, to coincide with spawning runs.* (Banci and Spicker 2024)

Potential changes to the freshwater environment as a result of Project activities may affect the ability of Inuit of the Kitikmeot Region (hereafter referred to as Kitikmiut), other Indigenous groups, or other potentially affected communities to harvest and use this critical resource, and result in adverse changes such as decreased harvesting success and risks to food security. This assessment incorporates Inuit, Indigenous, and Community Knowledge to identify and respect traditional values and perspectives, enhance this assessment.

This assessment is linked to other VC assessments, either through integration (information from other VC is incorporated into this assessment) or support (information from this assessment is incorporated into the assessment of other VCs):

- Water Resources (Volume 7, Section 19) – provides information on surface water quality and quantity in freshwater watercourses, whereby changes in surface water quantity could affect fish habitat and changes in surface water quality could affect fish health, growth, or survival.
- Vegetation (Volume 6, Section 15) – provides information on changes to vegetation, whereby changes in riparian vegetation could affect bank stability, cover/shade, and organic debris inputs that could affect the suitability of fish habitat.
- Air Quality (Volume 5, Section 11) – provides information on changes to air quality, whereby changes in air pollutants (e.g., fossil fuel emissions, dust) could affect fish habitat and changes in surface water quality could affect fish health, growth, or survival.

- Wildlife (Volume 6, Section 16-18) – provides information on birds and other wildlife, whereby changes in fish health, growth, or survival could affect the health, growth, or survival of wildlife that consume fish.
- Traditional Land, Marine, and Resource Use (Volume 9, Section 24) – provides information on freshwater fish species that are harvested by Kitikmiut, other Indigenous groups, and other potentially affected communities, whereby changes in fish health, growth, or survival could affect fish harvesting for subsistence and cultural purposes.

## 20.1 Scope of Assessment

This section defines and describes the scope of the assessment of potential effects on the Freshwater Fish and Fish Habitat VC. The Freshwater Fish and Fish Habitat VC includes fish and fish habitat as defined by the *Fisheries Act* (Section 20.1.2.1) as well as aquatic vegetation and benthic invertebrates, as applicable to freshwater.

### 20.1.1 Influence of Engagement and Inuit, Indigenous, and Community Knowledge on the Assessment

West Kitikmeot Resources Corp. (WKR) continues to engage with Kitikmiut, other Indigenous groups, and other potentially affected communities about the Project. A summary of engagement activities conducted from 2016 to 2025 is presented in Volume 3, Section 6 (Public Engagement). In addition to these activities, WKR conducted community-based primary research with residents and organizations of the Kitikmeot communities of Cambridge Bay, Gjoa Haven, Kugaaruk, Kugluktuk, and Taloyoak, along with organizations in Yellowknife. Additionally, an Inuit Advisory Group (IAG) was established to advise WKR on potential environmental and socio-economic effects or concerns related to the Project, planned mitigation approaches, and aspects of the environmental assessment, including, but not limited to, baseline conditions, significance determination, and consideration and integration of Inuit and Community Knowledge. Members were selected by the Kitikmeot Inuit Association and WKR based on their knowledge of many aspects of the natural and human environment, including but not limited to wildlife, fish, climate, land use and access, archaeology, and water in the project area.

To further inform the Project design, a Project-specific Inuit Knowledge report titled *Kitikmeot Knowledge of the Proposed Kogloktoakyok (Grays Bay) Port and Road Project Final Report* (Banci and Spicker 2024) was commissioned by WKR. This report, based on Inuit Knowledge contained in the Naonaiyaotit Traditional Knowledge Project (NTKP), was made available to WKR through a licensing agreement with the Kitikmeot Inuit Association.

In addition, publicly available sources of Inuit and Indigenous Knowledge were reviewed to provide further context about baseline conditions and how conditions are changing, as well as potential mitigation measures recommended on previous projects that could be considered for the Project. Results from monitoring studies and other community-based research were also reviewed.

Through the Project-specific engagement program, Inuit, other Indigenous groups, and other potentially affected communities shared comments, perspectives, concerns, and recommendations related to freshwater fish and fish habitat. Through reviewing the information, Inuit, Indigenous, and Community

Knowledge has influenced key components of the fish and fish habitat assessment. WKR commits to continued engagement during the advancement of Project design, planning, and monitoring, and throughout the life of the Project.

#### *20.1.1.1 Influence of Inuit, Indigenous, and Community Knowledge on Assessment Boundaries*

Inuit, Indigenous, and Community Knowledge was reviewed with consideration to the proposed spatial boundaries. Through the Project-specific Inuit Knowledge report, compiled from the NTKP database, Kitikmiut shared knowledge about gathering places (including hunting, and fishing camps, cabins, and ancient camps), travelways, harvesting areas, and resource habitats in the vicinity of the Project, including the mouth of Anialik, Tahikyoak (a lake at the end of Wentzel River), Haningayok, Burnside River (*Ayapakpaktokvik*), and Kennarctic River (Banci and Spicker 2024).

The Local Assessment Areas (LAA) represent the areas where there is a reasonable expectation that Project effects could be of concern including effects on species and harvesting areas of cultural importance to Kitikmiut, other Indigenous groups, and other potentially affected communities. The Regional Assessment Area (RAA) is larger and considers the area where effects from the Project in combination with other projects may be experienced, including additional locations of importance identified by Kitikmiut, other Indigenous groups, and other potentially affected communities (see Section 20.1.4).

#### *20.1.1.2 Influence of Inuit, Indigenous, and Community Knowledge on Baseline Conditions*

WKR collected baseline condition information by combining Inuit-led and collaborative knowledge gathering (including the Project-specific NTKP and IAG workshops), publicly available information from Indigenous groups considered in the context of the Project, and engagement feedback shared by Kitikmiut, other Indigenous groups, and other potentially affected communities with technical studies based on western scientific methods. Pertinent baseline information from Inuit, Indigenous, and Community Knowledge sources is not presented in Appendix 20A Fish and Fish Habitat Baseline Report; rather, this information has been considered and summarized in Section 20.2.2 and this includes information on key species, harvesting locations, and habitats of cultural importance.

#### *20.1.1.3 Influence of Inuit, Indigenous, and Community Knowledge on the Assessment of Project Effects*

WKR discussed with Kitikmiut, other Indigenous groups, and other potentially affected communities how project activities (e.g., clearing, blasting) and project infrastructure could affect culturally important interests including culturally important species and habitat within the Fish and Fish Habitat LAA. Through community meetings, IAG workshops, and public engagement opportunities, Kitikmiut, other Indigenous groups, and other potentially affected communities provided perspectives and values, which were considered and integrated into the potential effects to be considered. This includes perspectives about the quality and abundance of culturally important species and habitats. This input also helped guide planning for the Project's adaptive measures and long-term resilience. Feedback has been integrated in the assessment of project effects on fish and fish habitat, including potential effects to fish habitat and fish health, growth, or survival through changes in water quality, fishing pressures, fish passage (see Section 20.3).

#### *20.1.1.4 Influence of Inuit, Indigenous, and Community Knowledge on the Assessment of Cumulative Effects*

Through workshops and regional discussions, Kitikmiut Knowledge Holders, other Indigenous groups, and other potentially affected communities assisted WKR in identifying culturally important areas, species, and practices that may experience combined effects from the Project and other projects and activities in the Project's RAAs.

WKR wove Inuit, Indigenous, and Community perspectives with western science to develop a holistic view of how multiple changes could affect land-based livelihoods, cultural continuity, and environmental integrity over time. The analysis recognizes the importance of long-term monitoring, Inuit co-developed monitoring will track combined effects to inform adaptive management plans (see Section 20.4) (e.g., Fish Habitat Offsetting Plan).

#### *20.1.1.5 Influence of Inuit, Indigenous, and Community Knowledge on Assessing Significance of Effects*

Significance criteria were informed with input from Inuit, Indigenous, and Community Knowledge. Consideration of Inuit, Indigenous, and Community values and perspectives (see Volume 3) and information shared related to cultural relevance of species and locations, uniqueness of place, frequency of traditional use, and the role an area plays in community history and exchange supported WKR's consideration of how the Project may result in an unavoidable alteration, disruption, or destruction of fish habitat or effects on fish that result in a measurable change in the sustainability or productivity of relevant fish populations, including those of cultural or traditional importance. In addition, members of the IAG provided additional criteria to consider when identifying whether a project is likely to have significant or unacceptable effects (see Sections 20.1.6 and 20.5).

To be considered "non-significant" or acceptable, IAG members advised WKR to implement comprehensive measures and commitments that align with Inuit, Indigenous, and Community priorities and values.

- Proactive Protection Measures: WKR's commitment to avoiding or strictly mitigating known high-risk activities is crucial. This includes adhering to the *Fisheries Act*.
- Incorporation of Inuit, Indigenous, and Community Knowledge into Management: The commitment to incorporate Inuit, Indigenous, and Community Knowledge and Western Science in all assessment sections, as appropriate, from baseline to monitoring, fostered dialogue and an inclusive Project. The request for Inuit monitors to enforce mitigation measures in real-time shows that inclusion requires active Inuit participation in the Project's management (IAG 2025a, 2025b).

- Adaptive Management: The use of adaptive management plans that can be revised based on ongoing monitoring and the ongoing sharing of Inuit, Indigenous, and Community Knowledge is seen as essential for success and acceptability, given the unpredictable nature of climate (IAG 2025a, 2025b).
- Holistic Approach to Benefits: The Project's success is tied to its broader social and economic benefits, such as contributing to more resilient supply chains and providing job/training opportunities for Inuit and other Indigenous groups. The protection of all wildlife and water resources, beyond just caribou, was also a key part of the holistic equation for acceptability (IAG 2025b).

#### *20.1.1.6 Influence of Inuit, Indigenous, and Community Knowledge on the Development of Mitigation, Management, and Enhancement Measures*

Through engagement activities, community-based primary research, IAG workshops, and review of publicly available literature, measures to reduce negative effects from the Project and enhance benefits of the Project were identified. For example, during IAG workshops, participants stated that WKR should implement mitigation measures that have proven successful on other projects in Nunavut rather than inventing new measures (IAG 2025b). Feedback also helped focus the Project's design on sensitive timing and locations for monitoring and mitigation.

Proposed mitigation, management, and enhancement measures were discussed and reviewed with Inuit community representatives during IAG workshops and community meetings to confirm they align with community priorities. Adjustments were made as appropriate based on advice from IAG members and the Kitikmeot Inuit Association, in addition to Indigenous groups and other potentially affected communities through engagement. Information obtained through Inuit, Indigenous, and Community Knowledge emphasized the importance of some of the mitigation measures relevant to freshwater fish and fish habitat listed in Sections 20.3.2.3 and 20.3.3.3. Inuit co-developed monitoring and reporting were incorporated to support ongoing involvement and accountability. The Project will apply adaptive management strategies (see Section 20.5.3).

Inuit, Indigenous, and Community Knowledge informed the development of practical, culturally responsive mitigation and monitoring measures. IAG members emphasized the importance of protecting water and resources (IAG 2025a, 2025b) and the following monitoring measures are planned:

- Water quality and quantity monitoring, including turbidity monitoring during instream works
- Routine inspections of watercourse crossing during operations and maintenance to determine if they are functioning as per design (e.g., fish passage) and identify potential evidence of erosion and sedimentation. If issues are identified, corrective actions will be taken to address the issues.

#### *20.1.1.7 Influence of Inuit, Indigenous, and Community Knowledge on Transboundary Effects*

WKR engaged with and received feedback from Indigenous groups and other potentially affected communities, governments, and organizations in regions outside of the Kitikmeot Region to understand if project activities could affect socio-economic conditions, resources, wildlife, or culturally important areas shared between regions. This feedback has been integrated into the transboundary effects assessment (Volume 10, Section 33) and is not discussed further in this section.

### 20.1.2 Regulatory and Policy Setting

The assessment of potential effects on freshwater fish and fish habitat is guided by the *Guidelines for the Preparation of an Impact Statement for West Kitikmeot Resources Corp's Grays Bay Road and Port Proposal* (NIRB File No.: 24XN038; NIRB 2026; the IS Guidelines; Section 8.1.9), federal legislation, policies, and frameworks. Regulatory requirements include the *Fisheries Act*, including its policy statements and guidance documents, and the *Species at Risk Act*.

**Table 20.1 Summary of Key Legislation and Policies for Freshwater Fish and Fish Habitat**

| Regulation or Policy | Description |
|---|---|
| **Federal** | |
| *Fisheries Act* | • Section 34.3 provides provisions for maintaining adequate passage and flow for fish<br>• Subsection 34.4(1) prohibits the death of fish by any means other than fishing<br>• Subsection 35(1) prohibits the carrying on of any work, undertaking, or activity that results in harmful alteration, disruption, or destruction (HADD) of fish habitat<br>• Subsection 36(3) prohibits the introduction of deleterious substances of any type in waters frequented by fish or in any place under any conditions where the deleterious substances or any other deleterious substance may enter such water<br>• The *Fisheries Act* requires that works, undertakings, and activities avoid the death of fish and HADD of fish habitat, unless authorized by DFO under paragraph 34.4(2)(b) and paragraph 35(2)(b), respectively. Projects with the potential to modify flow, obstruct fish passage, or result in the entrapment of fish may also qualify as a HADD of fish habitat and may require authorization.<br>• The Fish and Fish Habitat Protection Policy Statement (DFO 2019) provides guidance on how DFO interprets and implements the fish and fish habitat protection provisions under the Fisheries Act. The Policy describes how avoidance, mitigation measures, and offsetting form a hierarchy of measures to minimize impacts to fish and fish habitat. It emphasizes that efforts should be made first to avoid and then mitigate harmful impacts to fish and fish habitat with offsetting being the last resort when HADD of fish habitat or the death of fish cannot be entirely avoided.<br>• DFO's Measures to Protect Fish and Fish Habitat (DFO 2025a) provides a list of measures that "break" the pathways listed above, or reduce the risk to fish and fish habitat, to comply with the provisions of the Fisheries Act |

| Regulation or Policy | Description |
|---|---|
| *Fisheries Act* (cont'd) | • DFO has developed Codes of Practice (CoPs) and standards to provide guidance on effective application of mitigation and avoidance measures for routine activities. Works that meet the definitions outlined in these CoPs and standards, adhere to the conditions, and implement the applicable measures are considered to comply with the fish and fish habitat protection provisions of the Act and may proceed without review by DFO. The following CoPs and standards have been reviewed and incorporated where applicable in this assessment:<br>– Code of practice: clear span bridges (DFO 2023a)<br>– Code of practice: temporary fords (DFO 2023b)<br>– Code of practice: ice bridges and snow fills (DFO 2023c)<br>– Interim standard: in-water site isolation (DFO 2023d)<br>– Code of practice: culvert maintenance (DFO 2023e)<br>– Interim code of practice: bridge repair and maintenance (DFO 2023f)<br>– Interim code of practice: end-of-pipe fish protection screens for small water intakes in freshwater (DFO 2020)<br>• The Policy for Applying Measures to Offset Harmful Impacts to Fish and Fish Habitat (DFO 2025b) provides guidance to DFO and proponents on the use of offsetting measures to counterbalance harmful impacts to fish and fish habitat. It also provides guidance for the development of offsetting plans when seeking an authorization under paragraph 34.4(2)(b) for the death of fish and/or paragraph 35(2)(b) for the HADD of fish habitat, or for the development of project conservation plans for habitat banks. |
| *Species at Risk Act* | • Provides protection and mandates recovery strategies and action plans for extirpated, threatened, or endangered species in Canada, and manages species listed as special concern from further declines.<br>• The SARA is administered by ECCC and delegates management of aquatic species listed on Schedule 1 of the SARA to DFO. Species at risk (SAR) are added to Schedule 1, the official list of SAR, through a federal government process after receiving scientific information and recommendations from the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).<br>• SAR and their habitats are protected under SARA, which prohibits the killing, harassing, and harming of threatened or endangered SAR (section 32 and 36); and the destruction of critical habitat of a threatened or endangered SAR (section 58, 60, and 61). Species listed as special concern are not afforded legal protection under the SARA |

#### *20.1.2.1 Other Relevant Guidance*

Federal and territorial policies, frameworks, and guidelines that were also considered in this assessment include:

- *Framework for Assessing the Ecological Flow Requirements to Support Fisheries in Canada* (DFO 2013a)
- DFO *Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut* (DFO 2010)
- Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Freshwater Aquatic Life (WQG-FAL; CCME 2025)
- *Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters* (Wright and Hopky 1998)
- *Consolidation of Environmental Protection Act*, R.S.N.W.T. 1988, c.E-7
- Nunavut Land Claims Agreement

In addition, the assessment is guided by Inuit, Indigenous and Community Knowledge (as outlined in Section 25.1.1 and defined in Volume 3). Inuit Knowledge may also be referred to as Inuit *Qaujimaningit*, which encompasses “Inuit traditional knowledge (and variations thereof or Inuit *Qaujimajatuqangit*), local and community-based knowledge, as well as Inuit epistemology as it relates to Inuit Societal Values and Inuit Knowledge (both traditional and contemporary)” (NIRB 2018). Inuit Societal Values, including traditional values, beliefs, and principles are referred to as Inuit *Qaujimajatuqangit* principles (NIRB 2018). The Kitikmeot Inuit Association recommended use of the term Inuit Knowledge in the IS. WKR has adopted this terminology and understands Inuit Knowledge encompasses Inuit *Qaujimajatuqangit* principles, which have been incorporated into the assessment of effects on food security and food sovereignty. The Inuit *Qaujimajatuqangit* principles have been incorporated into the assessment of effects on freshwater fish and fish habitat.

### 20.1.3 Potential Effects, Pathways, and Measurable Parameters

Project activities, including site preparation, clearing and construction, and operations and maintenance of the Project have the potential to affect freshwater fish and fish habitat, resulting in:

- Change in fish habitat
- Change in fish health, growth, or survival

Table 20.2 summarizes the potential effects of the Project on fish and fish habitat, effect pathways, and measurable parameters. These potential effects and measurable parameters were selected based on professional judgement, understanding of the Project, recent environmental assessments for linear projects in Canada, and comments provided during engagement.

**Table 20.2 Potential Effects, Effects Pathways and Measurable Parameters for Freshwater Fish & Fish Habitat**

| Potential Effect | Effect Pathway | Measurable Parameters and Units of Measurement |
|---|---|---|
| Change in Fish Habitat | • Destruction of instream and riparian habitat due to direct placement of infrastructure in or near watercourses (e.g., footprint impacts at the port site and road crossing locations)<br>• Alteration, disruption, or destruction of instream and/or riparian habitat due to clearing, physical work in or near watercourses, or sediment deposition.<br>• Alteration of quantity or quality of instream habitat due to temporary water diversion or withdrawal and/or change in stream flow or lake levels that impair fish habitat use (e.g., spawning).<br>• Creation of barriers to fish passage from culvert installation and temporary isolations. | • Areal extent of altered instream or riparian habitat (square metre [$m^2$]), by habitat type and/or fish species life stage (e.g., spawning habitat).<br>• Duration and timing of instream or riparian habitat alteration<br>• Change in stream flow (cubic metre per second; % change from baseline).<br>• Change in stream and lake levels (metres above sea level; % change from baseline). |
| Change in Fish Health, Growth, or Survival | • Surface water quality changes due to introduction of hydrocarbons, sediment, or other contaminants from road dust and vehicle use that can accumulate, runoff, and cause acute or chronic toxicological effects.<br>• Surface water quality changes due to interactions with potential metal leaching or acid rock drainage (ML/ARD) prone rock.<br>• Mortality of fish and/or fish eggs due to instream work causing physical injury, stranding and/or sedimentation.<br>• Impingement and entrainment of fish at water intakes used for temporary water withdrawals.<br>• Injury or mortality of fish due to sound over-pressures during blasting in or near a fish-bearing watercourse.<br>• Introduction of aquatic invasive species and disease.<br>• Increased fishing pressure. | • Anticipated numbers of fish and/or egg mortalities.<br>• Total suspended solid (TSS) concentrations (milligrams per litre [mg/L]) or turbidity (Nephelometric Turbidity Units)<br>• Change in water quality parameters beyond the capacity for fish to survive or maintain current levels of productivity (e.g., CCME WQG-FAL).<br>• Sound overpressure (decibels) and peak particle velocity (metre per second [m/s]). |

Where possible, the assessment of potential effects on freshwater fish and fish habitat used measurable parameters that were quantifiable (e.g., area of instream or riparian habitat loss); however, not all potential effects could be quantified (e.g., number of potential fish mortalities). Therefore, some effects were assessed qualitatively using an understanding of existing conditions, results from recent all-season road construction projects in Nunavut and Northwest Territories (NT), and professional judgement based on similar project experience.

### 20.1.4 Boundaries

#### *20.1.4.1 Spatial Boundaries*

Spatial boundaries for the assessment of potential effects on Freshwater Fish and Fish Habitat considered the geographic extent over which Project activities could affect freshwater fish and their habitat, as well as consideration of Inuit, Indigenous, and Community Knowledge. The spatial boundaries encompass the areas where the Project is expected to interact with fish and fish habitat, including those that are relevant to culturally and ecologically important to Inuit and their food security (described in Section 20.1.1.1). Each spatial boundary represents the anticipated extent of different interactions with the Project. Spatial boundaries, including the Project Development Area (PDA), the LAAs and RAAs are shown in Figure 20.1 and Figure 20.2, with a description of these areas presented in following sections.

**Project Development Area**

The PDA encompasses the physical footprint of all Project components, including both permanent and temporary disturbances (e.g., extent of Project infrastructure, planned clearing, and laydown areas). The PDA includes six sub-areas based on the types of components to be developed: the Port (which is further divided into marine and landside infrastructure), Road, Aerodrome, Jericho Station, and Winter Road PDAs. The boundaries of the PDAs were created by applying buffers around where the Project components will be sited, and varies by each of the sub-areas depending on necessary flexibility for final siting of certain Project components based on conditions on the ground. For the Road PDA and Winter Road PDA, a 75 m buffer was applied to the roads centreline, for the Port PDA and the Aerodrome PDA, the areas were subdivided based on the conceptual Project component locations and then buffered approximately 1,000 m for the landside Port PDA, approximately 300 m for the marine Port PDA, and 500 m for the Aerodrome PDA. The Jericho Station PDA was buffered based on the existing development from the old Jericho Mine site that will be used for the Project and the need for additional space to accommodate the Project components that will be developed as part of the Project for this location. The Winter Road PDA will only exist annually between the beginning of February and end of March, will be built on land where the existing Jericho Station road ends, at the southeastern portion of Jericho Station, to the shoreline of Contwoyto Lake where it will connect to the Tibbitt to Contwoyto Winter Road. For the purposes of the impact assessment, the PDA is the same as the Site Study Area identified in the IS Guidelines (Figure 20.1 and Figure 20.2).



Local Assessment Area (LAA)
Regional Assessment Area (RAA)
Project Development Area (PDA)
Aerodrome
Port (Landside Infrastructure)
Port (Marine-based Infrastructure)
Grays Bay Road

0 2 4 Kilometres
(At original document size of 11x17) 1:160,000

N

***Notes***
**1.** Coordinate System: WGS 1984 UTM Zone 12N
**2.** Data Sources: Government of Canada, Stantec, Vantor, Earthstar Geographics

NUNAMI STANTEC LIMITED
WEST KITIKMEOT RESOURCES CORP

*Project Location*
West Kitikmeot Region
Nunavut

Prepared by DS on 2026-02-02
TR by SL on 2026-02-02

*Client/Project*
123514868_098
West Kitikmeot Resources Corp
Grays Bay Road and Port

*Figure No.*
**20-1**

*Title*
**Freshwater Fish and Fish Habitat Assessment Areas - Grays Bay Road**

\\CA0002-PPFSS05\GEOMATICS\Clients\Nunami_Stantec\GBRP\Figures\123514868_098_Fisheries_Port_LSA_RSA Revised: 2026-02-12 By: slemay



Local Assessment Area (LAA)
Regional Assessment Area (RAA)
Grays Bay Port
Tibbitt to Contwoyto Winter Road
Watercourse

0 10 20 Kilometres
(At original document size of 11x17)
1:1,280,000

N

NUNAMI STANTEC LIMITED
WEST KITIKMEOT RESOURCES CORP

*Notes*
**1.** Coordinate System: WGS 1984 UTM Zone 12N
**2.** Data Sources: Government of Canada, Stantec, Earthstar Geographics

*Project Location*
West Kitikmeot Region
Nunavut

Prepared by DS on 2026-02-02
TR by SL on 2026-02-02

*Client/Project*
123514868_099
West Kitikmeot Resources Corp
Grays Bay Road and Port

*Figure No.*
**20-2**

*Title*
**Freshwater Fish and Fish Habitat Assessment Areas - Grays Bay Port**

\\CA0002-PPFSS05\GEOMATICS\Clients\Nunami_Stantec\GBRP\Figures\123514868_099_Fisheries_Road_LSA_RSA.pagx Revised: 2026-02-12 By: slemay

### Local Assessment Area

The LAA was developed to include the areas in which Project-related effects can be predicted or measured with a level of confidence that allows for the assessment wherein there is a reasonable expectation that those effects could be of concern including effects on species and harvesting areas of cultural importance to Kitikmiut, other Indigenous groups, and other potentially affected communities. The LAA developed for the assessment of effects on freshwater fish and fish habitat include:

- The Port portion of the LAA encompasses the area that will be directly disturbed by construction and operation activities, including all Port Landside infrastructure and Aerodrome (e.g., airstrip, laydown and storage areas, landfill, administration offices and accommodations) and includes a 100-metre (m) buffer around the Port and Aerodrome PDA, plus an extension to the northwest side of the Kennarctic River west of the Aerodrome PDA (Figure 20.1).
- The Road portion of the LAA encompasses the Road PDA and includes the area extending 100 m upstream and downstream of the centerline (i.e., the Road PDA plus 25 m) and 100 m buffer around the Jericho Station PDA (Figure 20.2).

### Regional Assessment Area

The RAA was developed to include the area that establishes the context for the determination of significance of Project-related effects, including effects on species and harvesting areas of cultural importance to Kitikmiut, other Indigenous groups, and other potentially affected communities, and encompasses the area in within which Project-specific effects may overlap with effects of other past, present, reasonably foreseeable, and reasonably foreseeable induced projects. The RAA developed for the assessment of effects on freshwater fish and fish habitat include:

- The Port portion of the RAA includes a 10-kilometre (km) land-based buffer around the Port and Aerodrome PDA (Figure 20.1).
- The Road portion of the RAA includes a 10-km buffer around the PDA for southern watersheds, and the entirety of the Arctic and Kennarctic watersheds at the north end of the PDA (Figure 20.2).
- Jericho Station portion of the RAA includes a 10-km buffer around the PDA.

#### *20.1.4.2 Temporal Boundaries*

Temporal boundaries identify when an environmental effect is evaluated in relation to specific Project phases and activities. Temporal boundaries were based on the timing and duration of Project activities and the nature of their interactions with freshwater fish and fish habitat. Based on the current Project schedule, the temporal boundaries for this assessment are:

- **Construction phase:** anticipated to occur in December 2029 and will extend for approximately five years, though geographically limited at different times within the year (e.g., certain activities may only occur during open water season or during frozen conditions).
- **Operations and maintenance phase:** the Operations and Maintenance phase of the Project will start in 2035 and will continue in perpetuity.

A closure and reclamation phase is not applicable to the Project as the Project is intended to be permanent infrastructure. Closure and reclamation of temporary workspaces used for construction are included within the Construction phase.

### 20.1.5 Residual Effects Characterization

Descriptions and quantitative measures or qualitative definitions for the criteria used to characterize potential residual effects on freshwater fish and fish habitat are provided in Table 20.3.

**Table 20.3 Characterization of Residual Effects on Freshwater Fish & Fish Habitat**

| Characterization | Description | Quantitative Measure or Definition of Qualitative Categories |
|---|---|---|
| Direction | The long-term trend of the residual effect | **Positive** – a residual effect that moves measurable parameters in a direction beneficial to fish and fish habitat relative to baseline.<br>**Negative** – a residual effect that moves measurable parameters in a direction detrimental to fish and fish habitat relative to baseline.<br>**Neutral** – no net change in measurable parameters for fish and fish habitat relative to baseline. |
| Magnitude | The extent of a change in measurable parameters or the VC from baseline conditions. | **Negligible** – no measurable change in fish habitat or fish health, growth, or survival is expected to occur.<br>**Low** – a measurable change in fish habitat or fish health, growth, or survival but is within the range of natural variability (e.g., juvenile fish sizes, functional types of riparian habitat), does not exceed applicable guidelines, and/or federal and territorial management objectives, and is unlikely to affect the sustainability and productivity of fish populations.<br>**Moderate** – a measurable change in fish habitat or fish health, growth, or survival that is not within the range of natural variability (e.g., juvenile fish sizes, functional types of riparian habitat), and exceeds applicable guidelines, and/or federal and territorial management objectives but is unlikely to affect the sustainability and productivity of fish populations.<br>**High** – a measurable change in fish habitat or fish health, growth, or survival that is not within the range of natural variability (e.g., juvenile fish sizes, functional types of riparian habitat), exceeds applicable guidelines, and/or federal and territorial management objectives, and is likely to affect the sustainability and productivity of fish populations. |
| Geographic Extent | The geographic area in which an effect is predicted to be detectable. | **PDA** – residual effects are restricted to the PDA<br>**LAA** – residual effects extend into the LAA<br>**RAA** – residual effects interact with those of other projects in the RAA |

| Characterization | Description | Quantitative Measure or Definition of Qualitative Categories |
|---|---|---|
| Timing | Considers when a residual effect is predicted to occur, where relevant to the VC. | **No sensitivity** - Effect does not occur during a sensitive life stage (e.g., outside fish spawning or egg incubation for fish) or timing does not directly affect the VC.<br>**Moderate sensitivity** - Effect may occur during a less critical period of a sensitive life stage; for many species this is the start or end of the sensitive period (e.g., fish spawning or egg incubation for fish).<br>**High sensitivity** - Effect occurs during a sensitive life stage (e.g., fish spawning or egg incubation for fish). |
| Duration | The time required until the measurable parameter or the VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived. | **Short-term** – the residual effect is restricted to the construction phase.<br>**Long-term** – the residual effect extends beyond the construction phase and into the operations and maintenance phase of the Project. |
| Frequency | How often a residual effect is predicted to occur during the Project or specific Project phase. | **Single event** – occurs only once.<br>**Multiple irregular event** – occurs multiple times at no set schedule<br>**Multiple regular event** – occurs multiple times at regular intervals<br>**Continuous** – occurs continuously |
| Reversibility | The degree to which a measurable parameter or the VC can be returned to baseline conditions or other established reference point after relevant activities have ceased. | **Reversible** – the residual effect is likely to be reversed after completion of the activity causing the residual effect<br>**Irreversible** – the residual effect is unlikely to be reversed after activity completion and reclamation. |

### 20.1.6 Significance Definition

For this assessment, a significant adverse residual effect on freshwater fish and fish habitat is defined as one that, following the application of avoidance and mitigation measures, results in an alteration, disruption, or destruction of fish habitat or a change in fish health, growth, or survival that is likely to cause a measurable change in the productivity of relevant fish populations, including those of cultural or traditional importance.

During the September 2025 IAG workshop, participants discussed significance, with the goal of identifying effects that are considered acceptable or unacceptable to members. Through the discussion, a holistic suite of considerations that must be integrated into the Project’s social, environmental, and economic plans emerged. With respect to fish and fish habitat, feedback received from IAG members (IAG 2025b) identified the following priorities, when considering unacceptable changes as a result of the Project:

- That Inuit perspectives are considered and addressed in Project design,
- That the Project does not negatively affect peoples’ ability to put food on the table, and
- That water and wildlife are protected.

The significance of residual adverse effects on fish and fish habitat is summarized in Section 20.5.

# 20.2 Baseline Conditions

## 20.2.1 Methods

### *20.2.1.1 Desktop Review Methods*

Desktop review of freshwater environment historical reports and information within the RAA and LAA from studies conducted in the Kitikmeot Region between 2004 and 2017, such as the High Lake Project (Wolfden 2006), Izok Mine and Road Corridor Project (GLL 2008; RC Bio 2012; Golder 2013; MMG 2013; NHC 2013), Grays Bay Road and Port Project – Jericho Connection (GBEEC 2017 a,b), Canadian Science Advisory Secretariat Publications, IK (Banci and Spicker 2024), Scientific peer-reviewed literature, and publicly available online information was completed. Baseline conditions were characterized within the LAA by:

- Identifying watercourses and waterbodies that provide fish habitat within the LAA, including critical habitat of aquatic species at risk (SAR) (DFO 2025a).
- Identifying fish species present or potentially present in watercourses and waterbodies within the LAA, including aquatic SAR.
- Reviewing species presence and connectivity corridors within the RAA to provide regional context for fish species and habitat present in the LAA.
- Summarizing habitat requirements for each fish species present, as well as species significant to ecological functions, and Kitikmiut and other Indigenous groups' life and culture.
- Summarizing physical characteristics of watercourses within the LAA, including barriers to fish movement and aquatic and riparian vegetation.
- Summarizing habitat quality and seasonal use of fish habitat within the LAA.

Historical watercourse data (i.e., fish habitat, fish presence, and fish community) for known watercourse crossings within the LAA along the road route were compiled into a master watercourse crossing table, fish collection dataset, stream measurements dataset, and water quality dataset (Appendix 20A). This information provided a greater temporal range for baseline conditions, characterizing fish habitat, fish presence, and fish community for the years between 2006 and 2013. The baseline information presented here provides an overview of fish and fish habitat; for additional information on the assessment of baseline conditions, refer to the Grays Bay Road and Port Project: Freshwater Fish and Fish Habitat Baseline Report (Appendix 20A).

#### *20.2.1.2 Field Methods*

Field surveys were conducted historically between 2004 and 2017 to support various projects in the vicinity of the Project including the High Lake Project, Izok Mine and Road Corridor Project, and earlier routings of the Grays Bay Road and Port Project and the Jericho Connection. Field surveys for these projects included assessments of fish habitat (e.g., stream morphology, habitat quality, riparian vegetation, and hydrology), fish community sampling (e.g., presence/absence sampling, fish population assessments, and fish health assessments), and trophic system assessments (e.g., benthic invertebrates, plankton, and phytoplankton) to characterize fish food web components.

In 2024, Stantec developed a fish and fish habitat field program to address spatial and temporal gaps in field data pertaining to the proposed Project's footprint and specifically the Port portion of the LAA, which was not previously surveyed. Field sampling for fish and fish habitat was completed by Stantec in August 2024 focusing on two main areas within the Port portion of the LAA: the Port PDA and the proposed water intake lake location PWI-1. Field sampling completed by Stantec in July and August 2025 focused on the Road LAA and new areas within the Port LAA (i.e., Aerodrome PDA and second intake lake location PWI-2).

Habitat assessment methods were aligned with previous fish and fish habitat assessment methods to allow for data compilation and comparability. Previous baseline survey methods characterized stream habitat by identifying substrate composition, gradient, and riparian vegetation cover, and characterized lake habitat via the substrate, riparian composition, and bathymetry. Assessment methods also included fish presence and relative abundance, collection of life history information such as species, sex, maturity, fork length, weight, age, stomach contents, condition, and fish tissue metal concentrations.

The fish and fish habitat assessment of watercourse crossings that are within the LAA were completed using a field protocol based on the British Columbia (BC) Reconnaissance (1:20,000) Fish and Fish Habitat: Stream Inventory Standards and Procedures method (BC FISB 2001). There is no territorial or federally developed protocol for watercourse assessments and therefore the BC procedure was selected as it is robust and well accepted as appropriate in a variety of conditions and provides measurement or classification methods for all stream morphology components. Data collected included channel morphology, stream geometry, stream gradient, dominant and subdominant substrates, bank composition and texture, dominant and subdominant cover for fish, riparian vegetation type and maturity, and in-situ water quality measurements. For more detailed information on data collection methods, refer to Table 3.1 in the Grays Bay Road and Port Project Fish and Fish Habitat Baseline Report (Appendix 20A).

Watercourses were assigned a stream class following the field assessment. The BC standard was not used for stream class determination as the classes are not as representative of northern stream morphology; instead, stream class definitions were developed based on the *Alberta Public Lands Glossary of Terms* (GOA 2025), aligning with classification methods used in previous studies, with the addition of ephemeral and boulder field categories. Definitions used are:

- Ephemeral – Linear depression or gully feature that has no defined bed or banks and is often vegetated by terrestrial plant species. Flow source is run-off from snow melt or rainfall. Flow may occur for several months each year (i.e., during or after precipitation events) but seldom occurs during the dry season.

- Intermittent – Small stream channels where small springs are the main source of water outside periods of spring runoff and heavy rainfall. Distinct channel development is usually lacking terrestrial vegetation; usually some bank development; channel width is less than 0.7 m.
- Small Permanent – Permanent streams, often small valley bottoms; bench floodplain development. Banks and channels have well-defined channel widths from greater than 0.7 m to 5 m.
- Large Permanent – Major streams or rivers; well-defined flood plains; often wide valley bottoms. Non-vegetated channel width exceeds 5 m.
- Boulder field – stream channels with no distinct defined bank structure. Flow through coarse substrates (cobble to boulder) in undefined flow paths. Typically, large channels but can also occur in small and mid-sized channels. Typically, low gradient channels connecting ponds/lakes.

The majority of watercourses were classified as primary watercourse crossings. However, some watercourses may have braided channels and/or are crossed multiple times by the Project; these additional crossings were classified as secondary watercourse crossings to allow for calculation of both the number of watercourses which interact with the project and the number of crossing structures which will be required.

Fish habitat mapping for lakes was completed following the BC Reconnaissance (1:20,000) Fish and Fish Habitat: Lake Inventory Standards and Procedures methods (BC FISB 2001) to quantify and qualify existing fish habitat in the potential water intake lake locations, PWI-1 in August 2024 and PWI-2 in July 2025. Data collected during the habitat assessment included descriptions of surrounding terrain, shoreline characteristics, lake access, inlet and outlet streams, aquatic vegetation and wildlife observations, and photographs of physical and biological features of the lake. Further details on the methods used for fish habitat assessment are presented in Table 3.2 in the Grays Bay Road and Port Project Fish and Fish Habitat Baseline Report (Appendix 20A).

### Fish Community Assessment

Fish community surveys were conducted in August 2024 and July and August 2025 to determine the presence of fish species and life stages in watercourses within the Port and Road LAA, and to evaluate fish species presence and life stage in one of the potential water intake lakes (PWI-1). Depending on habitat and flow conditions, fish sampling in watercourses consisted of a backpack electrofisher and baited minnow traps. Sampling distance and start and end times were recorded so that catch-per-unit-effort (CPUE) could be calculated. CPUE provides estimates of relative abundance by standardizing catch data by fishing effort.

Fish sampling in the lake consisted of backpack electrofishing sections of the shoreline, and minnow trapping, angling, and gillnetting throughout the lake. Captured fish were identified to species and measured for fork length or total length. Lengths were recorded for up to 10 individuals per fish species. Total CPUE was calculated for each fishing method to provide a measure of relative abundance of fish in PWI-1 and to standardize results for use in comparisons with other locations.

## 20.2.2 Overview

To inform understanding of the freshwater fish and fish habitat setting, multiple sources of information were considered, including Inuit, Indigenous, and Community Knowledge perspectives and engagement feedback, historical reports, and field surveys in 2024 and 2025.

### *20.2.2.1 Inuit, Indigenous, and Community Knowledge and Engagement Feedback*

Through the Project-specific engagement program delivered from 2016 to 2025, including community meetings, workshops, community-based primary research, the Project-specific Inuit Knowledge report compiled from the NTKP database, and through a review of publicly available information, Kitikmiut, other Indigenous groups, and other potentially affected communities shared information, expressed concerns, and provided recommendations related to freshwater fish and fish habitat. This feedback has been considered and summarized in and where applicable, has been integrated into the assessment of potential effects on freshwater fish and fish habitat that follows.

**Table 20.4 Summary of Inuit, Indigenous, and Community Knowledge and Engagement Feedback on Freshwater Fish and Fish Habitat**

| Comment | Source | WKR Response | Where Addressed |
|---|---|---|---|
| NTKP consultants shared knowledge about culturally important species, including Arctic char (*ehokketak*), Arctic grayling (*ihulukpaukkait/ hulukpaugan*), lake trout (*ihuuqit*), whitefish, burbot (*tiktalik*), sculpin (*kanayuk*), longnose sucker (*milugiak*), northern pike, and stickleback (*kakilongnak*) distributions and behaviours of the species, and harvesting practices.<br>Consultants shared knowledge about fish habitat, fish harvesting areas, and fishing camps, including the Project, including the mouth of Anialik, Tahikyoak (a lake at the end of Wentzel River), Haningayok, Burnside River (*Ayapakpaktokvik*), and Kennarctic River (Banci and Spicker 2024). | Banci and Spicker 2024 | WKR has reviewed the Inuit, Indigenous, and Community Knowledge shared by Kitikmiut, other Indigenous groups, and other potentially affected communities and has incorporated information relevant to this assessment into the baseline conditions section.<br>Known areas of importance for these culturally important species to Kitikmiut, and other Indigenous groups, and possibly affect communities will be avoided where practical.<br>WKR commits to continued engagement on fish and other topics as applicable during the advancement of Project design, planning, and monitoring, throughout the life of the Project. | This information has been incorporated into the baseline conditions section (Section 20.2) and the assessment focused on the effects to culturally important species (Section 20.2.2.4), with the exception of northern pike as they have not been captured in the RAA. |

| Comment | Source | WKR Response | Where Addressed |
|---|---|---|---|
| During engagement on a previous project, community members from Cambridge Bay and Kugluktuk expressed concerns about effects on water quality from development, including mining, and the effects on fish and fish health. | NIRB 2004 | WKR has reviewed and considered comments focused on water quality and has considered this within the assessment of freshwater fish and fish habitat. WKR is committed to reducing the impacts on fish health through the implementation of avoidance and mitigation measures. | See Section 20.3.3.3 for the mitigation measures that will be implemented to address change in water quality and potential effects on fish health, growth, or survival.<br>See Sections 20.3.3.2 and 20.3.3.4 for the assessment of change in water quality and predicted effects on fish health, growth, or survival.<br>See Section 20.4.3 for the assessment of cumulative effects on fish and fish health. |
| During Project engagement, Taloyoak Hunters and Trappers Organization (HTO) expressed concerns about the Project providing access to areas previously isolated from people, increasing harvesting and fishing pressures on sensitive or ecologically important species. | GBRP 2025 | WKR has reviewed and considered comments focused on increased fishing pressure due to the Project creating access to previously inaccessible areas.<br>WKR is looking into restricting access, and support from the Kitikmeot in an access enforcement role. | See Sections 20.3.3.2 and 20.3.3.4 for the assessment of increased fishing pressures on fish health, growth, or survival.<br>See Section 20.4.3 for the assessment of cumulative effects on fish and fish health. |
| During a public scoping meeting for the NIRB, community members from Taloyoak expressed concern regarding Project effects to cod Arctic char, and sculpin. | NIRB 2025 | WKR is committed to reducing the Project's effects on fish habitat and fish health through the implementation of mitigation measures. | See Section 20.3.2 for the assessment of change in fish habitat, and Section 20.3.3 for the assessment of change in fish health, growth, or survival. |
| During a public scoping meeting for the NIRB, Taloyoak community members shared that if a bridge were to be constructed at Netsilik River, the river system would need to continue to support natural water movement and fish passage, including maintaining connectivity between the rivers and the ocean through suitable crossing designs such as culverts. | NIRB 2025 | WKR has reviewed comments focused on the change in fish habitat and has considered this within the assessment on freshwater fish and fish habitat.<br>WKR is committed to reducing the effects on fish habitat through the implementation of mitigation measures. | See Section 20.3.2 for the assessment of change in fish habitat. |

| Comment | Source | WKR Response | Where Addressed |
|---|---|---|---|
| During a public scoping meeting for the NIRB, community members from Gjoa Haven inquired if the Project would affect fish and their fishing ability. | NIRB 2025 | WKR is committed to reducing potential effects on fish and fish habitat through avoidance and mitigation measures. | See Section 20.3.2 for the assessment of change in fish habitat and Sections 20.3.2.3 and 20.3.3.3 for mitigation measures that will be implemented to address change in fish and fish habitat.<br>See also Volume 9, Section 24 (Traditional Land, Marine, and Resource Use) |
| During a public scoping meeting for the NIRB, community members from Kugluktuk shared that there are Arctic char near the Tree River area. Members expressed concern that the Project would affect the river. | NIRB 2025 | WKR is committed to reducing potential effects on fish and fish habitat through avoidance and mitigation measures. | See Section 20.3.2 for the assessment of change in fish habitat. |
| During a public scoping meeting for the NIRB, community members from Kugluktuk expressed concern regarding illegal fishing. | NIRB 2025 | WKR has reviewed and considered comments focused on increased fishing pressure due to the Project creating access to previously inaccessible areas.<br>WKR is looking into restricting access, and support from the Kitikmeot in an access enforcement role. | See Sections 20.3.3.2 and 20.3.3.4 for the assessment of increased fishing pressures on fish health, growth, or survival.<br>See Section 20.4.3 for the assessment of cumulative effects on fish and fish health.<br>See also Volume 9, Section 24 (Traditional Land, Marine, and Resource Use) |
| During a public scoping meeting for the NIRB, Cambridge Bay community members expressed concern that Project activities would affect fish spawning. | NIRB 2025 | WKR is committed to reducing potential effects on fish and fish habitat through avoidance and mitigation measures. | See Section 20.3.2 for the assessment of change in fish habitat and Sections 20.3.2.3 and 20.3.3.3 for mitigation measures that will be implemented to address change in fish and fish habitat. |
| IAG members expressed concerns about changes to fish habitat, including limiting crossing distances, reducing the amount of instream disturbance, and installing crossing structures to meet requirements for flow, fish passage, and fisheries protection. | GBEEC 2018 | WKR has reviewed comments focused on the change in fish habitat and has considered this within the assessment on freshwater fish and fish habitat.<br>WKR is committed to reducing the impacts on fish habitat through the implementation of mitigation measures. | See Section 20.3.2 for the assessment of change in fish habitat. |

| Comment | Source | WKR Response | Where Addressed |
|---|---|---|---|
| IAG members have expressed concerns about mitigation measures and potential habitat offsetting plans. | IAG 2025a | WKR is committed to reducing potential effects on fish and fish habitat through avoidance and mitigation measures.<br>WKR invited members to consider initiatives or community projects that could provide potential offsetting plans for fish habitat. | See Sections 20.3.2.3 and 20.3.3.3 for mitigation measures that will be implemented to address change in fish and fish habitat. |
| NTKP consultants and Kugaaruk Inuit have reported an increase in fish diseases and parasites, as well as pollution accumulating along their shorelines. | Banci and Spicker 2024; NIRB 2024 | WKR is committed to reducing the Project's effects on fish health through the implementation of mitigation measures. | See Section 20.3.3 for the assessment of change in fish health, growth, or survival. |
| During project engagement, the Taloyoak HTO asked about increased access to fishing areas and if enforcement would be present on the road. They also commented that Arctic char is an important species and emphasized the need for fish to be protected. Specifically, they noted Arctic char are pristine and they want to keep it that way. | GBRP 2025 | WKR has reviewed comments focused on fishing pressure and has considered this within the assessment of freshwater fish and fish habitat.<br>WKR is committed to reducing the Project's effects on fish health from increased fishing pressure through the implementation of mitigation measures. | See Sections 20.3.3.2 and 20.3.3.4 for the assessment of increased fishing pressure on fish health, growth, or survival, and mitigation measures that will be applied by the Project to reduce residual effects. |
| During project engagement, the Kugluktuk HTO commented that during a previous study for Arctic cod and Arctic char, they noticed the fish did not migrate upriver when vessel traffic increased. The Kugluktuk HTO recommended avoiding construction during the spring and fall when fish are in water courses. | GBRP 2025 | WKR is committed to reducing the Project's effect on fish and fish habitat from construction activities through the implementation of mitigation measures. | See Sections 20.3.3.3 and 20.3.3.4 for in-water construction activities and the mitigation measures for this occurring outside of the restricted activity timing windows for the protection of fish and fish habitat (DFO 2013b). |
| During engagement for a previous project, a Kugluktuk Elder expressed concern for disturbances to spawning areas and fish that travel upstream. | OZ Minerals 2008 | WKR has reviewed comments focused on fish passage and access to spawning habitat and has considered this within the assessment of freshwater fish and fish habitat.<br>WKR is committed to reducing the Project's effects on fish spawning through the implementation of avoidance and mitigation measures. | See Sections 20.3.2.2 and 20.3.2.4 for the assessment of change in fish passage, and mitigation measures that will be applied by the Project to reduce residual effects. |

| Comment | Source | WKR Response | Where Addressed |
|---|---|---|---|
| During engagement for a previous project, Inuvialuit Regional Corporation commented that during the development of the Inuvik-Tuktoyaktuk Highway, Inuvialuit identified the potential for increased access to nearby lakes, which could adversely affect fish stocks, habitat, and cultural activities that depend on them. At the time, Inuvialuit Regional Corporation recommended the creation of a monitoring program to help protect local waterbodies by engaging in public education, monitoring impacts to fishing and fish habitat, and collecting traditional and scientific data. | IRC 2024 | WKR has reviewed comments focused on fishing pressure and has considered this within the assessment of freshwater fish and fish habitat.<br>WKR is committed to reducing the Project's effects on fish health from increased fishing pressure through the implementation of avoidance and mitigation measures. | See Sections 20.3.3.2 and 20.3.3.4 for the assessment of increased fishing pressure on fish health, growth, or survival, and mitigation measures that will be applied by the Project to reduce residual effects. |
| During a public scoping meeting for the NIRB, community members in Inuvik commented that arctic char go to Kugluktuk for spawning | NIRB 2025 | WKR has reviewed the Inuit, Indigenous, and Community Knowledge shared by Kitikmiut, other Indigenous groups, and other potentially affected communities and has incorporated information relevant to this assessment into the baseline conditions section.<br>WKR commits to continued engagement on fish and other topics as applicable during the advancement of Project design, planning, and monitoring, throughout the life of the Project. | This information has been incorporated into the baseline conditions section (Section 20.2) and the assessment focused on the effects to culturally important species (Section 20.2.2.4). |
| During a public scoping meeting for the NIRB, community members in Inuvik expressed concern for potential impacts to fish and fish habitat from culverts and dredging. | NIRB 2025 | WKR has reviewed comments focused on the change in fish habitat and has considered this within the assessment on freshwater fish and fish habitat.<br>WKR is committed to reducing the impacts on fish habitat through the implementation of mitigation measures including maintaining fish passage. | See Section 20.3.2 for the assessment of change in fish habitat. |

| Comment | Source | WKR Response | Where Addressed |
|---|---|---|---|
| During a public scoping meeting for the NIRB, community members in Inuvik commented that Inuvialuit communities share wildlife species with Kugluktuk and Cambridge Bay. | NIRB 2025 | WKR has reviewed the Inuit, Indigenous, and Community Knowledge shared by Kitikmiut, other Indigenous groups, and other potentially affected communities and has incorporated information relevant to this assessment into the baseline conditions section.<br>WKR commits to continued engagement on fish and other topics as applicable during the advancement of Project design, planning, and monitoring, throughout the life of the Project. | This information has been incorporated into the baseline conditions section (Section 20.2) and the assessment focused on the effects to culturally important species (Section 20.2.2.4). |
| During engagement on the Tłįchǫ All-Season Road project, the Tłįcho Government expressed concerns regarding increased fishing activities along bridges and water crossings, and the potential for construction activities to affect water flow and downstream habitats. The Tłįcho Government identified that the road may reduce fish stocks or the harvesting success of Tłįcho citizens; however, given the health of the fish stocks and low numbers of increased access and fishing, the Tłįcho Government reported the effect of the road on harvesting pressure would be low. | TG 2017 | WKR has reviewed comments focused on fish passage and alteration of habitat from change in water quantity, and fishing pressures and has considered this within the assessment of freshwater fish and fish habitat.<br>WKR is committed to reducing the Project's effects on fish habitat and health through the implementation of avoidance and mitigation measures. | See Sections 20.3.2.2 and 20.3.2.4 for the assessment of change in fish passage and mitigation measures that will be applied by the Project to reduce residual effects.<br>See Sections 20.3.2.2 and 20.3.2.4 for the assessment of alteration of water quantity on fish habitat, and mitigation measures to reduce residual effects.<br>See Sections 20.3.3.2 and 20.3.3.4 for the assessment of increased fishing pressure on fish health, growth, or survival, and mitigation measures that will be applied by the Project to reduce residual effects. |
| During engagement on the Tłįchǫ All-Season Road project, Yellowknives Dene First Nation commented that lake trout retreat to colder water during the warm summer months. They added that stratification of pit lakes correlated with potential water quality impacts to fish. | YKDFN 2017 | WKR has reviewed comments focused on water quality and has considered this within the assessment of freshwater fish and fish habitat. WKR is committed to reducing the impacts on fish health through the implementation of avoidance and mitigation measures. | See Sections 20.3.3.2 and 20.3.3.4 for the assessment of change in water quality and predicted effects on fish health, growth, or survival. |

| Comment | Source | WKR Response | Where Addressed |
|---|---|---|---|
| During engagement for a previous project, Yellowknives Dene First Nation recommended incorporating engagement and Indigenous Knowledge into the development of culturally acceptable criteria for water quality and an aquatic effects monitoring program. They added that a monitoring program would help support good water quality for fish and aquatic life and continued cultural use. In the event that fish habitat and aquatic life benchmarks were not met, Yellowknives Dene First Nation added that the proponent should engage Indigenous organizations to identify fish habitat offsetting options. | YKDFN 2019 | WKR has reviewed comments focused on water quality and has considered this within the assessment of freshwater fish and fish habitat. WKR commits to continued engagement on fish and other topics as applicable during the advancement of the Project's design, planning, and monitoring, throughout the life of the Project. | See Section 20.7 for Follow-up and Monitoring programs for the Project, including a Fish Habitat Offsetting Plan, as well as water quality and quantity monitoring as part of the Water Management Plan (WMP), Environmental Protection Plan (EPP) and Erosion and Sediment Control Plan (ESCP). |
| During engagement on a previous project, North Slave Métis Alliance expressed concern about introduced sediment affecting fish and fish habitat, stating that fish are sensitive and require clean water. | NSMA 2001 | WKR has reviewed comments focused on the potential for the Project to affect fish and fish habitat through changes in water quality.<br>WKR is committed to reducing the Project's effect on fish and fish habitat from changes in water quality through the implementation of mitigation measures. | See Sections 20.3.3.2 and 20.3.3.4 for the assessment of change in water quality on fish health, growth, or survival, and mitigation measures that will be applied by the Project to reduce residual effects. |
| During engagement for a previous project, North Slave Métis Alliance requested to be involved in fish monitoring efforts. | NSMA 2012 | WKR commits to continued engagement on fish and other topics as applicable during the advancement of the Project's design, planning, and monitoring, throughout the life of the Project. | N/A |
| During engagement for a previous project, North Slave Métis Alliance commented that shallow waters are prime habitat for minnows and fish spawning. They added that trout are a sensitive species that require clear water and they are usually the first fish to be adversely affected by development. North Slave Métis Alliance expressed concern for the health of trout and other fish species, especially from airborne dust and blasting. | NSMA 2001 | WKR has reviewed comments focused on fish habitat and fish health and has considered this within the assessment of freshwater fish and fish habitat.<br>WKR is committed to reducing the impacts on fish habitat and health through the implementation of avoidance and mitigation measures. | See Section 20.3.2 for the assessment of Project effects on change in fish habitat and Section 20.3.3 for assessment of change in fish health, growth, or survival, which includes the assessment of effects from airborne dust and blasting. |

| Comment | Source | WKR Response | Where Addressed |
|---|---|---|---|
| During engagement for a previous project, Northwest Territory Métis Nation expressed concern about effects on freshwater fish from changes to water quality and quantity. | NWTMN 2012 | WKR has reviewed comments focused on water quality and has considered this within the assessment of freshwater fish and fish habitat.<br>WKR is committed to reducing the impacts on fish health through the implementation of avoidance and mitigation measures. | See Section 20.3.3.3 for the mitigation measures that will be implemented to address change in water quality and potential effects on fish health, growth, or survival.<br>See Sections 20.3.3.2 and 20.3.3.4 for the assessment of change in water quality and predicted effects on fish health, growth, or survival. |

#### *20.2.2.2 Fish and Fish Habitat Overview*

The Grays Bay Road and Port Project Fish and Fish Habitat Baseline Report (Appendix 20A) summarizes information compiled from a desktop review of existing reports by external proponents, government databases, Inuit Knowledge, and a field program conducted by Stantec between 2024 and 2025. The information presented here provides an overview of fish and fish habitat baseline conditions from those sources with a focus on information for watercourses and waterbodies within the LAA. Refer to the Grays Bay Road and Port Project Fish and Fish Habitat Baseline Report (Appendix 20A) for detailed information on the results of baseline data collection.

A total of 150 watercourses have been identified across the five watersheds within the LAA; these were designated as primary watercourse crossings. However, some watercourses will require multiple (secondary) watercourse channel crossings resulting in a total of 171 watercourse crossings for the Project (Table 20.5). For example, the watercourse related to crossing IDs 92c, P020, and P020A includes two direct crossings of the same watercourse (92c: primary crossing, P020: secondary crossing) and a related ephemeral crossing (P020A) (Figure 20.3). The number of watercourses within each watershed varies, ranging from seven in the Arctic Ocean watershed to 62 in the Kennarctic River watershed. Stream classes of the watercourses included 19 large permanent, 20 small permanent, 94 ephemeral, nine intermittent, and eight boulder fields (Table 20.5). Stream classes also vary among the watersheds with large permanent and intermittent watercourses absent from the Arctic Ocean watershed and boulder fields only present within the Hood River watershed. Ephemeral is the dominant stream class with the greatest numbers present in the Kennarctic and Hood River watersheds.Eight fish species have been identified within the LAA, including lake trout/*ihuuqit*/*ihok*/ehok (*Salvelinus namaycush*), Arctic char/*iqalukpiit*/*ikalukpik*/*ekalukpik/ehokketak* (*Salvelinus alpinus*), Arctic grayling/*ihulukpaukkait*/*hulukpaugan* (*Thymallus arcticus*), burbot/*tiktalik* (*Lota lota*), round whitefish (*Prosopium cylindraceum*), slimy sculpin/*kanayuk* (*Cottus cognatus*), longnose sucker/*milugiak* (*Catostomus catostomus*), and ninespine stickleback (*Pungitius pungitius*). Fish species, presence, distribution and abundance varied between watersheds (Table 20.6). Lake trout, burbot, and slimy sculpin were captured in all five watersheds, whereas round whitefish and longnose sucker have only been captured in the Burnside River watershed. A summary of the fish bearing status for the watercourses is provided in Table 20.6. It is estimated that 91 of the Project watercourse crossings (primary and secondary) are potentially fish bearing. The Master Watercourse Table in Appendix A.1 in the Grays Bay Road and Port Project Fish and Fish Habitat Baseline Report (Appendix 20A) provides detailed rationale for each watercourse.

**Table 20.5 Summary of Stream Classes Present within the LAA Watersheds**

| Watershed | Stream Class[1] | | | | | |
|---|---|---|---|---|---|---|
| | Large Permanent | Small Permanent | Ephemeral | Intermittent | Boulder Field | Total |
| Arctic Ocean | 0 | 3 | 4 | 0 | 0 | 7 |
| Kennarctic River | 8 (4) | 8 | 43 (8) | 3 | 0 | 62 (12) |
| James River | 1 | 0 | 6 (1) | 2 | 0 | 9 (1) |
| Hood River | 4 | 5 (2) | 23 (5) | 1 | 8 | 41 (7) |
| Burnside River | 6 | 4 (1) | 18 | 3 | 0 | 31 (1) |
| **Total** | **19 (4)** | **20 (3)** | **94 (14)** | **9** | **8** | **150 (21)** |

Note:

1 Totals include primary and secondary watercourse channel crossing locations. Some watercourses will have multiple (secondary) watercourse channel crossings, which are shown in parentheses. For example, the total number of Project watercourse crossings is 150 primary crossings plus 21 secondary crossings for grand total of 171 crossings.

**Table 20.6 Summary of Fish Bearing Watercourse Crossings and Fish Species Present within the LAA Watersheds**

| Watershed | Stream Class[1,2] | | | | | | Fish Species |
|---|---|---|---|---|---|---|---|
| | Large Permanent | Small Permanent | Ephemeral | Intermittent | Boulder Field | Total | |
| Arctic Ocean | 0 | 3 | 0 | 0 | 0 | 3 | LKTR, ARCH, BURB, SLSC, NNST |
| Kennarctic River | 12 | 8 | 18 | 3 | 0 | 41 | LKTR, ARCH, BURB, SLSC, NNST |
| James River | 1 | 0 | 4 | 2 | 0 | 7 | LKTR, ARGR, BURB, SLSC |
| Hood River | 4 | 6 | 9 | 1 | 4 | 24 | LKTR, ARGR, BURB, SLSC |
| Burnside River | 6 | 5 | 3 | 2 | 0 | 16 | LKTR, ARCH, ARGR, BURB, SLSC, LNSC, RNWH, NNST |
| **Total** | **23** | **22** | **34** | **8** | **4** | **91** | **n/a** |

Notes:

1 Fish bearing status rationale provided in the Master Watercourse Table in Appendix A.1 in the Grays Bay Road and Port Project Fish and Fish Habitat Baseline Report (Appendix 20A).

2 Fish bearing watercourse totals include both primary and secondary watercourse crossings.

LKTR = lake trout; ARCH = Arctic char; BURB = burbot; ARGR = Arctic grayling; SLSC = slimy sculpin; NNST = ninespine stickleback; LNSC = longnose sucker; RNWH = round whitefish.

**Figure 20.3 Primary Watercourse Crossing for 92c (left), and Secondary Crossings for P020A (ephemeral; middle) and P020 (second crossing of same watercourse; right)**

#### *20.2.2.3 Fish Habitat*

### Port LAA

#### *Watercourse Crossings*

The watercourses assessed within the Port and Aerodrome PDAs are mainly low gradient streams in the tundra valleys and plains bordering the Arctic Ocean. A total of 11 watercourses and four waterbodies have been identified within the Port LAA: one large permanent, five small permanent, and five ephemeral. The average channel width ranged from 1.45 m to 75 m with average bankfull depths between 0.11 m and 0.9 m. Wetted widths averaged between 1.45 m and 70 m, with wetted depths less than 0.64 m. Flat was the predominant habitat type and dominant substrates are organics and fines, with some sand and cobble. Cover for fish was provided by instream vegetation and water visibility, with some small woody debris, boulders, and overhead vegetation (i.e., grasses and shrubs).

#### *Potential Lake Intake Locations*

Water needed during construction, and operations and maintenance may be obtained from several potential sources along the road route including two potential lake locations: North Intake Lake (PWI-1) and South Intake Lake (PWI-2).

##### *North Intake Lake (PWI-1)*

The potential water intake location PWI-1 has a lake surface area of 45.6 hectares (ha) and a perimeter length of 2.86 km. The lake shoreline is stable, and the riparian zone is predominantly rocky, with coarse substrates (i.e., cobble, boulder, and bedrock). Shrubs and grasses are the subdominant riparian cover types along the shoreline. Littoral overhead cover provided by riparian vegetation is sparse along the perimeter of the lake and a small amount of overhead cover is provided by shrubs.

##### *South Intake Lake (PWI-2)*

The potential water intake lake location PWI-2 has a surface area of 43.6 ha and a perimeter length of 4.1 km. The lake shoreline is stable, and the riparian zone is predominantly rocky with coarse substrates (i.e., boulder, bedrock, and cobble). Fine substrates are abundant throughout the boulder, bedrock, and cobble littoral zone with small sections of emergent and submerged aquatic vegetation. Shrubs and grasses are the subdominant riparian cover types along the shoreline. There is a small amount of littoral overhead cover along the perimeter of the lake, provided by shrubs and large boulders.

### Road LAA

A total of 140 primary watercourse crossings are along the Road LAA, of which 47 were assessed during the field survey: 18 large permanent, seven small permanent, 16 ephemeral, three intermittent, and three boulder fields.

Large permanent watercourses are present in all four watersheds along the Road LAA, with the greatest number present within the Kennarctic River (seven crossings) and Burnside River watersheds (six crossings). The mean channel widths range from 10.9 m (D42) to 67.4 m (62), with wetted widths from 9.8 m (133D) to 60 m (88). Mean bankfull depths of the assessed watercourses are lowest at watercourse 104 (0.5 m) and greatest at DM2 (1.9 m). Wetted depths average between 0.24 m (63) and 1.42 m (104). Riparian habitat is predominantly shrubs and bare (i.e., comprised of coarse substrates including cobble, boulder, and bedrock). Dominant habitat types present during the field survey at the large permanent watercourses vary between runs, cascade/rapids, and riffles. The dominant substrate across all large permanent watercourses surveyed is boulder, except for watercourses D14, 127A, and 105, which have dominant substrates of fines, cobbles, and organics, respectively. Cover for fish is provided predominantly by boulders, water visibility (i.e., turbidity), instream vegetation, and overhead vegetation (i.e., grasses and shrubs).

Small permanent watercourses were surveyed in the Arctic Ocean, Kennarctic River, and Hood River watersheds. The mean channel widths range from 0.57 m (92d) to 3.12 m (d20c), with wetted widths from 0.37 m (92d) to 2.90 m (81D). Mean bankfull depths of the assessed watercourses are lowest at 92d and 81C with mean depths of 0.20 m, and greatest at d20c with a mean depth of 0.59 m. Small permanent watercourses assessed in the field are typically shallow with mean wetted depths less than 0.22 m. Riparian habitat along the watercourses varies between grasses, shrubs, and wetlands. Dominant habitat types present during the field surveys are run and flat habitats except at 133B, which is predominately riffle habitat. Substrates are predominantly organics and fines at five of the seven small permanent watercourses surveyed; coarse substrates (i.e., gravel, cobble, and boulder) are the dominant substrates at 133B and 81D. Overall cover for fish is good among the small permanent watercourses, and is provided by overhead vegetation, instream vegetation, and boulders.

A total of 22 ephemeral, intermittent, and boulder fields were assessed within the Road LAA. Ephemeral, intermittent, and boulder fields typically have lower fish habitat quality compared to small and large permanent watercourses, however these stream classes contribute to fish and fish habitat in alternative ways. Ephemeral and intermittent watercourses can provide temporary habitat for fish during seasonal flows (e.g., migratory corridors between watercourses or waterbodies, high flow refugia). They also act as drainage systems to reduce flooding and provide nutrient inputs to fish and aquatic life in downstream fish-bearing receiving environments. Boulder fields can provide important foraging and refuge habitat for early life stages and fish species like sculpin with boulder substrates providing overhead/instream cover and attachments for algae and sessile invertebrates.

#### *20.2.2.4 Fish Community*

Fish community studies were completed within the Project RAA in 2001, 2007, 2008, 2012, and 2017 as part of the baseline studies for the High Lake Project, Izok Lake Project, and Grays Bay Road and Port Project (Wolfden 2006; GLL 2008; RC Bio 2012; Golder 2013; MMG 2013; NHC 2013; GBEEC 2017a, 2017b). The results of fish community sampling during field surveys completed in 2024 and 2025 are described in the Grays Bay Road and Port Project Fish and Fish Habitat Baseline Report (Appendix 20A).

Eight fish species have been identified within the LAA, including lake trout/*ihuuqit/ihok/ehok*, Arctic char/*iqalukpiit/ikalukpik/ekalukpik*, Arctic grayling/*ihulukpaukkait/hulukpaugan*, burbot/t*iktalik*, round whitefish, slimy sculpin/*kanayuk*, longnose sucker/*milugiak,* and ninespine stickleback. Fish species presence differs by watershed (Table 20.7). None of the fish species identified in the LAAs are listed as a SAR and no critical habitat is present within the PDAs, LAA or RAA (DFO 2025c; GOC 2025a).

**Table 20.7 Fish Species Found Within the Watershed Overlapping the LAA (2001-2012)**

| Family[1] | Common Name[1] | Inuit Name | Scientific Name[1] | Species Code[1] | Legislated Protection (SARA)[2] | Watershed |
|---|---|---|---|---|---|---|
| Catostomidae | Longnose sucker | *milugiak* | *Catostomus catostomus* | LNSC | Not listed | Burnside |
| Cottidae | Slimy sculpin | *kanayuk* | *Cottus cognatus* | SLSC | Not listed | Burnside, Hood, James, Kennarctic, Arctic |
| Gasterosteidae | Ninespine stickleback | - | *Pungitius pungitius* | NNST | Not listed | Burnside, Kennarctic, Arctic |
| Gadidae | Burbot | *tiktalik* | *Lota lota* | BURB | Not listed | Burnside, Hood, James, Kennarctic, Arctic |
| Salmonidae | Lake trout | *ihuuqit / ihok / ehok* | *Salvelinus namaycush* | LKTR | Not listed | Burnside, Hood, James, Kennarctic, Arctic |
| | Arctic char | *iqalukpiit / ikalukpik / ekalukpik (sea run) / ehokketak (land locked)* | *Salvelinus alpinus* | ARCH | Not listed | Kennarctic, Arctic, Burnside[3] |
| | Arctic grayling | *ihulukpaukkait/ hulukpaugan* | *Thymallus arcticus* | ARGR | Not listed | Burnside, Hood, James[3] |
| | Round whitefish | - | *Prosopium cylindraceum* | RNWH | Not listed | Burnside |

Notes:

[1] Page et al. (2023)

[2] Species at Risk Public Registry (GOC 2025a)

[3] Banci and Spicker (2024)

Fish are an important part of the Inuit diet (Banci and Spicker 2024) as they provide a subsistence food source, Arctic char in particular, and are harvested in nearly all Inuit communities (Priest and Usher 2004). Arctic char, Arctic grayling, lake trout, burbot and round whitefish are an important subsistence food source for Inuit communities, therefore these species have been identified as 'Species of Cultural Importance' for this VC and their distribution and habitat preferences are discussed in further detail in the following sections. Some species (e.g., Arctic char and lake trout) are important sources of food during winter months, as they overwinter in freshwater rivers, streams and lakes (Banci and Spicker 2024). Fish habitat usage varies depending on seasonal flow regimes, freshet timing, ice thickness, and water depths.

### Species of Cultural Importance to Kitikmiut, Other Indigenous Groups, and Other Potentially Affected Communities

The following were identified as harvested species within the RAA, contributing to food security for Kitikmiut, other Indigenous groups, and other potentially affected communities. Other species of cultural importance include sculpin (*kanayuk*), longnose sucker (*milugiak*), and stickleback (*kakilongnak*), and are discussed in further detail in the Grays Bay Road and Port Project Fish and Fish Habitat Baseline Report (Appendix 20A).

#### *Arctic Char (***Ehokketak** *[land locked] and* **Ekalukpik** *[sea run])*

Arctic char is a species of char within the Salmonidae family found throughout circumpolar regions of Northern Canada, Greenland, Iceland, Europe, Asia and Alaska (DFO 2016). There are both anadromous[1] and freshwater populations. Some freshwater populations live in landlocked lakes, and others live in lakes connected to the ocean, but do not migrate like their anadromous counterparts (Harris et al. 2022).

Anadromous Arctic char in northern Canada migrate to marine waters from the spring to fall, where they forage in shallow coastal and intertidal waters. They return to freshwater environments in the summer and early fall to spawn (COSEWIC 2010; MMG 2013). Arctic char spawn in September or October over gravel or rocky shoals in lakes or slow-moving pools in rivers at depths of 1.0 to 4.5 m (Scott and Crossman 1973) (Table 20.8). Eggs are buried in gravel and remain over winter and hatch the following spring around April. Emergence from gravel occurs following ice breakup around mid-July (Table 20.8). Juvenile Arctic char migrate downstream from rivers to marine waters to forage (Scott and Crossman 1973).

Arctic char are a valuable subsistence food source and resource for Inuit across the Canadian Arctic and are harvested for consumption in nearly all Inuit communities (Priest and Usher 2004). Arctic char are the most harvested fish recorded in the Kitikmeot Region (Priest and Usher 2004) and the second most consumed country food after caribou in Nunavut (ONCS WWF DUC 2018; Banci and Spicker 2024). The Kennarctic River is a major gathering place to fish for Arctic char (Banci and Spicker 2024). Arctic char have only been observed or captured in the RAA within the Kennarctic and Arctic watershed during previous surveys (Table 20.7), although landlocked Arctic char are known to be present within the Burnside River (Banci and Spicker 2024).

> *Usually land-locked fish are skinny, but sometimes you get land-locked charr that are fat just like the sea run charr… They could go right past Bloody Falls. There is a lake up there where they spend the winter. That is why those fish are really skinny in the spring.* (Banci and Spicker 2024)

Arctic char were the third most abundant species captured in the Kennarctic watershed during fish sampling programs between 2001 and 2012 (e.g., electrofishing CPUE of 1.25 fish/min).

[1] Anadromous fish hatch and rear in freshwater streams before migrating to the marine environment, where they spend most of their lives before returning to natal streams as adults to spawn.

**Table 20.8 Sensitive Life History Periods of Species of Importance**

| Common Name | Spawning | Hatching and Emergence | Migration | Overwintering |
|---|---|---|---|---|
| Arctic Char[1,2,3,4] | September to October | April to mid-July | Mid-May to October | November to April |
| Arctic Grayling[1,5,7] | April to June | Mid-April to June | Mid-August to October | November to April |
| Lake Trout[1,8,9] | September to October | March to June | April to September | November to April |
| Round Whitefish[1,10] | September to October | March to June | Late-August to September | November to April |
| Burbot[1,6] | January to March | Late-February to June | December to March | November to April |

Sources:

[1] Scott and Crossman (1973)
[2] COSEWIC (2010)
[3] MMG (2013)
[4] Banci and Spicker (2024)
[5] West et al. (1992)
[6] McPhail (1997)
[7] Ellenor (2020)
[8] Gunn (1995)
[9] GOC (2025b)
[10] Stewart et al. (2007)

### *Arctic Grayling (*Hulukpaugan*)*

Arctic grayling is a freshwater species in the Salmonidae family, which resides in northern freshwater drainages. In northern Canada, they are found throughout the Yukon and Northwest Territories (Scott and Crossman 1973). In Nunavut, they are found in the Kitikmeot and Kivalliq regions (excluding Arctic islands) (Larocque et al. 2014; Banci and Spicker 2024).

> *The grayling spawn in the rivers, in the shallow boulders, in really shallow boulder fields. They tend to stay in the shallows but once in a while I see the little grayling where there is a sandy bottom. You can see them working the silts at the bottoms of the rivers. Once in a while they are working the beddings… maybe the spawning beds. I think there are some grayling that spawn in the main lakes where there are lots of weeds and silt, even grassy bottoms, especially in the sandy bottom areas and where there are lots of weeds.* (Banci and Spicker 2024)

Arctic grayling spawning occurs from April to June during freshet and occurs over a variety of substrates that range from silt to cobbles and boulders, but most commonly over small, unembedded substrates (Scott and Crossman 1973; Larocque et al. 2014) (Table 20.8). Egg incubation time varies with temperature, and the young-of-year (YOY) remain in their natal streams until late summer and out-migrate to deeper overwintering habitats before freeze-up begins (Heim et al. 2015).

Arctic grayling are commonly harvested in Burnside and James River, within the LAAs (Banci and Spicker 2024), and have also been captured in the Hood River watershed (Table 20.7). They were the most abundant species captured in Burnside River watershed, with a total electrofishing CPUE of 3.03 fish/minute (MMG 2013).

### *Lake Trout (*Ehok*)*

Lake trout is a species of char in the Salmonidae family that is widely distributed throughout North America, ranging from the Laurentian Great Lakes to the Canadian Arctic (Scott and Crossman 1973). Lake trout prefer cold water (about 10 degrees Celsius (°C)) and primarily live in large, deep lakes but are occasionally found in large rivers and shallower bodies of water. Lake trout have been described as semi-anadromous in the West Kitikmeot Region of Nunavut, where they migrate from freshwater to brackish water for feeding in the summer (Swanson et al. 2010; Kissinger et al. 2016). Lake trout are harvested for consumption by Inuit in Nunavut (Harris et al. 2022; Banci and Spicker 2024).

> *Some lake trout stay around the mouths of the rivers where the river mouths are deep. Around the falls in the rivers, where the water is deeper, there are always fish during the winter. The smaller rivers dry up. The fish can't go up river or go downstream because the rivers are frozen.* (Banci and Spicker 2024)

In northern Canada, lake trout spawn in the fall from early September to October (Scott and Crossman 1973) (Table 20.8). They migrate to rocky shoals in nearshore areas of lakes (Gunn 1995) and eggs are deposited onto cobble substrate in the interstitial spaces – no spawning redds are constructed or maintained (Scott and Crossman 1973; Callaghan et al. 2016). The preferred spawning habitat for lake trout is generally found near exposed shorelines, islands, or shoals at depths typically less than 12 m (Martin and Olver 1980). Eggs remain in the rocky incubator for many months and typically hatch in

March or April but can be as late as June (Table 20.8). Within a month of hatching, lake trout will move deeper to forage and avoid predation, but lake trout can stay in inshore waters for months or even years in the Arctic (Scott and Crossman 1973).

Lake trout have been observed or captured in all five watersheds (Table 20.7). Lake trout were most abundant in the Burnside and Kennarctic River watersheds, with a total CPUE of 0.39 fish/minute and 0.27 fish/min, respectively (Appendix 20A). Lake trout were also the most abundant species in the Kennarctic River watershed captured using gillnetting, with a mean CPUE of 40.9 fish/100 square metres ($m^2$) per 12 hours for gillnetting (MMG 2013; Appendix 20A).

### *Round Whitefish*

Round whitefish is a freshwater species in the Salmonidae family that is found widespread across North America and northeastern Asia (Scott and Crossman 1973). In Canada, round whitefish can be found throughout southern Ontario, northern New Brunswick, and most of northwestern Canada from Nunavut to British Columbia and Yukon (Scott and Crossman 1973).

Round whitefish can be found in lakes and streams across their distribution range. Seasonal migration to spawning sites is known to occur; however, the timing is variable and has been recorded in October in the Northwest Territories, or later at lower latitudes (Scott and Crossman 1973) (Table 20.8). Spawning occurs over gravel in lake shallows, mouths of rivers, or in shallow river tributaries (Scott and Crossman 1973; Stewart et al. 2007). Spawning substrate is variable and can range from cobble, gravel, and sand over a range of depths (Scott and Crossman 1973). Peak fry emergence occurs in late April but begins as early as March (Scott and Crossman 1973) (Table 20.8).

Round whitefish have only been observed or captured in the Burnside River watershed and at relatively low abundances (Table 20.7; Appendix 20A).

### *Burbot (***Tiktalik***)*

Burbot is a freshwater cod species in the Gadidae family and is widely distributed throughout the northern hemisphere. Their wide distribution throughout the Holarctic region is a unique characteristic of their species (McPhail 1997). Juvenile burbot are found in the lower-velocity areas of main channels, side channels, and lakes in shallow littoral areas with rocks, weeds, and debris used for instream cover while adults are typically encountered in deep lakes, rivers, and reservoirs (McPhail 1997).

Spawning occurs in both lakes and rivers in the winter from January to March (Scott and Crossman 1973; McPhail 1997) (Table 20.8). In lakes, spawning typically occurs in shallow near-shore areas in substrates comprised of sand, gravels, and cobbles that do not contain fines or silt. In rivers, burbot spawn in low velocity areas in main channels and inside channels in small gravel, sand, and silt substrates (McPhail 1997). Eggs hatch in a month, and YOY appear from late February to June (Scott and Crossman 1973).

Burbot have been observed or captured in all five watersheds, but in lower abundances than other fish species (Table 20.7; Appendix 20A). NTKP consultants reported harvesting them within the LAA.

> *Anywhere on the land I've caught them (tiktalik). We have caught many of them in Contwoyto, Pellatt Lake… People do eat them.* (Banci and Spicker 2024)

# 20.3 Assessment of Project Effects on Freshwater Fish & Fish Habitat

## 20.3.1 Project Interactions with Freshwater Fish & Fish Habitat

Table 20.9 identifies, for each potential effect, the Project activities that might interact with freshwater fish and fish habitat and result in the identified effect. These interactions are indicated by a check mark (potential interaction) or a dash (no interaction) and are discussed in detail in the following sections, in the context of effects pathways, standard and Project-specific mitigation measures, and residual effects. A justification for activities not expected to interact with freshwater fish and fish habitat is provided below.

Project schedules and activities for the construction phase and operations and maintenance phase are discussed in detail in Section 2.3.

**Table 20.9 Project Interactions with Freshwater Fish & Fish Habitat**

| Project Activities | Effects | |
|---|---|---|
| | **Change in Fish Habitat** | **Change in Fish Health, Growth, or Survival** |
| **Construction** | | |
| Mobilization/demobilization of machinery/equipment, vehicles, materials, and fuel (e.g., by barge, sea lift, boat, or road) | – | ✓ |
| Staging and storage of materials, fuel, equipment and pre-fabricated components | – | ✓ |
| Chemical and hazardous material transport, storage and management (including explosives) | – | – |
| Establishment and operation of camps (e.g., mobile camps and permanent accommodations), maintenance yards, and laydowns | ✓ | ✓ |
| Machinery/equipment and vehicle refuelling / fuel storage handling | – | ✓ |
| Site preparation and earthworks of disturbance area (e.g., vegetation clearing, stripping and stockpiling of organic and overburden materials, grading, blasting, drilling) | ✓ | ✓ |
| Construction of port landside facilities, aerodrome, road, and Jericho Station (e.g., buildings/facilities, fuel storage, laydown areas; public use area; access roads; water intake; power generation - diesel [may include wind turbine or solar array]; all-season gravel airstrip) | ✓ | ✓ |
| Borrow source and quarry development (e.g., blasting, crushing, sorting, stockpiling of temporary and permanent areas) | – | ✓ |
| Water withdrawal to support construction activities (e.g., winter road construction, dust control, material compaction) | ✓ | ✓ |

| Project Activities | Effects | |
|---|---|---|
| | **Change in Fish Habitat** | **Change in Fish Health, Growth, or Survival** |
| Watercourse crossing construction (e.g., bridge and culvert installation) | ✓ | ✓ |
| Ground based transportation (e.g., workforce, materials, supplies) | – | ✓ |
| Air transport (e.g., personnel transport, resupply) | ✓ | ✓ |
| Waste management and sewage facilities (e.g., development and use of a permanent waste management facility and on-site landfill; handling and storage of hazardous and non-hazardous waste; incineration of domestic waste; open air burning; management of black and grey water) | – | – |
| Construction of Marine-based infrastructure (e.g., construction of large vessel wharves, medium vessel wharf, small craft harbour, barge landing area, desalination line, vessel refuelling line / fuel line to bulk fuel storage, including nearshore dredging, infilling, pile driving) | – | – |
| Taxes, Contracts, Purchases (e.g., procurement of goods and services; employment of workers) | – | – |
| Closure and reclamation of temporary borrow sources/quarries, camps, workspaces, laydowns (e.g., erosion stabilization, revegetation, restoration of natural drainage patterns, prevention of future vehicular access) | ✓ | ✓ |
| **Operations and Maintenance** | | |
| Port landside operations (e.g., use and maintenance of accommodations, borrows, roads, power generation; aerodrome operations including use and maintenance of airstrip and facilities; and Jericho Station operation and maintenance). | – | ✓ |
| Marine port use and operations (e.g., vessels and cargo loading/unloading, barge landing operations, small craft harbour operations) | – | – |
| Borrow source and quarry operations (e.g., blasting, crushing, sorting, and stockpiling of permanent areas) | – | ✓ |
| Desalination Operation and Wastewater Treatment (e.g., marine water use and effluent discharge) | – | – |
| Water withdrawal / use (e.g., potable water, dust control, maintenance) | ✓ | ✓ |
| Road maintenance / use (e.g., transport of equipment, workers, and supplies; maintenance of bridge/culverts; snow clearing; grading and gravel replacement; dust control) | ✓ | ✓ |
| Bulk Fuel Storage (e.g., operation of permanent fuel facilities) | – | – |
| Vessel Fuel Line / Refuelling (e.g., directly offloading from east wharf or use of floating fuel pipeline; above ground insulated pipeline to bulk fuel storage tanks) | – | – |
| Equipment maintenance | – | – |
| Chemical and hazardous material transport, storage and management (including explosives) | – | – |
| Winter road construction and use (e.g., annual winter road construction and maintenance) | ✓ | ✓ |
| Air transport (e.g., personnel transport, resupply) | – | ✓ |

| Project Activities | Effects | |
|---|---|---|
| | Change in Fish Habitat | Change in Fish Health, Growth, or Survival |
| Waste management (e.g., use of a permanent waste management facility and on-site landfill; handling and storage of hazardous and non-hazardous waste; incineration of domestic waste; open air burning; management of black and grey water) | – | – |
| Taxes, Contracts, Purchases (e.g., procurement of goods and services; employment of workers) | – | – |

Notes:
✓ = Potential interaction
– = No interaction

Activities during Project phases that will not interact with fish and fish habitat include:

- Waste management and sewage facilities and chemical and hazardous material transport, storage and management during all phases will not interact with fish or fish habitat because they will occur on land and, except in the case of an accident or malfunction, will not occur near water, require water, or have the potential to produce run-off that may contaminate any fish-bearing or non-fish-bearing watercourse or waterbody.
- Bulk fuel storage, vessel fuel line/refueling, and equipment maintenance during operations and maintenance will not interact with fish or fish habitat because they will occur on land and will not result in the discharge of contaminants to water unless a result of an accident or malfunction.
- Taxes, contracts, purchases in all phases do not interact with freshwater fish or fish habitat
- Activities occurring in the marine environment will not interact with freshwater fish or fish habitat and include:
  - Construction of marine-based infrastructure (i.e., nearshore dredging, infilling, wharf construction, pile driving)
  - Marine port use and operations (i.e., boats, barges offloading)
  - Desalination operation

A summary of key feedback shared by Kitikmiut, other Indigenous groups, and other potentially affected communities relevant to fish and fish habitat and available at the time of filing is consolidated in Table 20.4 and integrated into the assessment of potential effects on fish and fish habitat where applicable. WKR will continue to respond to questions and concerns from Kitikmiut, other Indigenous groups, and other potentially affected communities through its ongoing engagement efforts and information provided following submission of the IS will be reviewed in the context of the IS and for incorporation into Project planning, as appropriate.

## 20.3.2 Change in Fish Habitat

### *20.3.2.1 Analytical Assessment Techniques*

Project activities that could interact with fish habitat were compared to Fisheries and Oceans Canada's (DFO) pathways of effects (PoE) diagrams (DFO 2024a) to identify peer-reviewed mechanisms by which changes in measurable parameters (e.g., timing, duration, and extent of altered instream or riparian areas, change in flow rates, or presence of obstructions) could lead to a change in fish habitat.

For example, vegetation clearing during construction of a road crossing alters riparian cover, which can result in a change in habitat through the loss of cover for fish, increase water temperatures and nutrient inputs, decrease bank stability and alter water levels and flows.

The potential effect (change in fish habitat) used in this assessment (see Table 20.2) captures the pressures described in DFO's PoE diagrams that could result from the Project (DFO 2024a). Once a pathway has been identified, best management practices (BMP) and mitigation can be applied to reduce or eliminate a potential effect. Where BMPs and mitigation cannot reduce or eliminate a change in a measurable parameter (see Table 20.2), residual effects are identified. The characterization of the Project's residual effects (see Table 20.3) was based on a change in measurable parameters after considering site-specific fish habitat data and presence of spawning habitat, construction methods and timing, and planned mitigation.

Project-related effects on freshwater fish habitat were assessed quantitatively when numerical data (e.g., geographic information system [GIS]) and model results were available or qualitatively when numerical data was not available. Quantitative assessment methods included spatial (GIS) analysis of the PDAs overlain on habitat maps of fish-bearing and non-fish-bearing watercourses and waterbodies to delineate and calculate potential habitat changes where the Project's footprint overlaps fish habitat, including vegetation clearing in riparian habitats.

Qualitative assessment methods were conducted using a weight-of-evidence approach, which entailed the use of professional judgement based on an understanding of the potential effect, the habitat preferences and life histories of potentially affected fish species in the LAA, and the effectiveness of mitigation measures. This is supported by scientific literature, grey literature for all-season road construction projects in Nunavut and Northwest Territories, industry BMPs, and regulatory guidelines, as available.

### *20.3.2.2 Project Effects Pathways*

Nine Project activities or components have the potential to affect fish habitat, which includes seven activities during construction and three during operations and maintenance (Table 20.9). Pathways include activities that require the removal of riparian vegetation, excavation and grading, diversion and storage of surface water, and construction, operation, and maintenance of permanent infrastructure (e.g., road crossings [bridges and culverts] and the aerodrome). These activities fall under the following DFO PoEs (DFO 2024a):

- Use of machinery on land / alteration of riparian vegetation

- Use of machinery in water
- Placement of materials in water
- Removal of materials and aquatic vegetation from water
- Water level/flow modification
- Water diversion
- Dewatering

These activities may also result in effects on important habitat and resources relied upon by Kitikmiut, Indigenous groups, and other potentially affected communities (Volume 9, Sections 24 and 25). Potential effects of these Project activities on fish habitat, prior to mitigation, are described in the sections below.

### Alteration, Disruption, or Destruction of Fish Habitat

The following sections describe the Project components and activities that could result in a change in riparian vegetation, change in fish habitat below the high water mark, or change in fish passage.

#### *Change in Riparian Vegetation*

Riparian vegetation provides several ecological benefits to fish and fish habitat, including soil and slope stability, sediment and erosion control, shelter and refuge for fish, shading, and nutrient inputs through leaf litter and falling insects. Alteration and loss of riparian vegetation can increase nutrient concentrations and water temperatures, alter surface water levels and flows, and reduce benthic invertebrate abundance (Broadmeadow and Nisbet 2004; DeWalle 2010; Wetzel 2001; Caissie 2006; Denbeste and McCart 1984; Johansen et al. 2005), which may reduce the productivity in fish populations that use the habitat for some or all of their life history. Riparian areas within the PDAs that require vegetation removal are expected to provide one or more of these functions with the greatest benefits from riparian vegetation/cover used by species whose life stages are more dependent on vegetated areas (e.g., larval and rearing juveniles, ninespine stickleback).

Removal of riparian vegetation will occur across the permanent width of the road (i.e., approximately 10 m wide) plus an additional of 20 m or more on each side for embankment slopes, at each watercourse crossing (for a total width of 50 m per crossing) (Figure 2.2 and Figure 2.3). Alteration and loss of riparian vegetation could also occur in the Port and Jericho Station PDAs, with the construction of associated infrastructure (e.g., airstrip, laydown and storage areas, landfill, administration offices and accommodations). The potential areal change in riparian habitat was calculated using a riparian area width of 15 m from the high water mark, on either side of a watercourse or waterbody, where it is overlapped by the Project PDA, which is consistent with DFO’s minimum setback standard (Chilibeck et al. 1993). As the riparian habitat is limited in the tundra (i.e., large trees absent, riparian habitat consists of grasses, shrubs, and rocky substrates [Appendix 20A]), a buffer of 5 m and 2 m was also applied for large permanent and all other watercourse crossings, respectively, to understand the potential effects to functional riparian habitat for fish (e.g., overhead cover, canopy cover, and shade).

During construction, operations and maintenance there is potential for dust from activities associated with drilling, blasting and quarrying activities, vehicle movement on unpaved roads at the port, road, and Jericho Station, as well as from the gravel airstrips. Dustfall from these activities can be deposited offsite and land on and smother nearby vegetation, reducing growth rates of vegetation, which may result in the alteration or loss of riparian vegetation.

### *Change in Habitat Below High Water Mark*

Alteration and loss of fish habitat below the high water mark will occur during the construction phase of the Project. Project activities including clearing, stripping, grading, excavation, dewatering and infilling of watercourses within the PDAs are required to build various Project components including watercourse crossings structures, the aerodrome components, Port infrastructure, and freshwater intakes.

Alteration or destruction of fish habitat could reduce the productivity of fish populations that use the habitat. A reduction or loss of wetted habitat can lead to lower amounts of area suitable for fish occupancy, growth, survival, and recruitment. Numerous scientific studies have established that fish population and carrying capacity are proportional to the size of the wetted area available to fish (Bradford et al. 2014).

The Project will require more than 171 watercourse crossings (both primary and secondary) along the PDA. It is anticipated that there will be 18 major crossings (i.e., greater than a 5 m structural span), which will include single or multi-span bridges. The major crossing bridge foundations will be made of piles. Four of these structures will require instream works to construct the piers (Burnside River/*Ayapakpaktokvik*, Kennarctic River/*Kogloktoakyok*, Crossing 68 unnamed). Additionally, 40 to 50 watercourse crossings will require bridge-sized closed or open-bottom culverts between 1.5 to 5 m diameter, and 74 minor crossings will also require small-diameter culverts less than 1.5 m in diameter. These watercourse crossings will result in the alteration and/or loss of fish habitat through the permanent infilling around culvert installations and bridge foundations (i.e., the pier piles). The placement of riprap along the banks of watercourses is required in some locations for bank stabilization and could result in the alteration of fish habitat.

Construction of the port landside facilities, aerodrome, and Jericho Station (e.g., buildings/facilities, laydown areas, water intake, and airstrip) will involve various activities below the high water mark, including dewatering, infilling, and water management, that will result in the permanent alteration and loss of fish habitat within the PDAs. These habitat losses could affect the productivity of surrounding fish populations by reducing available habitat for various life stages (e.g., rearing, spawning, or overwintering) and alter sediment transport, nutrients, and food supply to fish habitat downstream of the PDAs.

### *Change in Fish Passage*

A change in fish passage can occur through the improper installation of culverts, which can result in perched culverts or changes in stream flows that create a barrier to fish. Temporary isolations (dam and pump) used during instream construction (e.g., installation of culverts and non-clear-span bridges) and infilling for Project components can also cause a change in fish passage. Changes in upstream or downstream fish passage have the potential to restrict the timing, number, or ability of fish to access habitat, including habitat for their survival (e.g., overwintering), reproduction (e.g., spawning), growth (e.g., rearing, foraging), and redistribute populations within the watershed as habitat conditions change. During engagement for the Project and previous projects, community members expressed concerns regarding effects on fish passage from crossing structures and access to spawning habitat (GBEEC 2018; OZ Minerals 2008; TG 2017). During a public scoping meeting for the NIRB, community members in Inuvik expressed concern for potential impacts to fish and fish habitat from culverts and dredging (NIRB 2025).

The Project will construct approximately 40-50 watercourse crossings using culverts. At these watercourse crossings, structures will use either bridge-sized closed or open-bottom culverts. At minor crossings, small-diameter culverts will be used. Culvert designs will be site-specific and take into account the hydrotechnical, environmental, and geotechnical considerations at each location to meet requirements for flow and fish passage.

Knowledge of fish species swimming abilities is beneficial when assessing the potential for culverts to act as barriers to fish passage (Katopodis 1991; Wang 2008). Life stage, physiology, morphology, and size influence the swimming abilities of fish (Koehn and Crook 2013). Adult and large-bodied fish possess greater swimming abilities than juvenile and small-bodied fish as the larger fish have more muscle to propel them through the water (Domenici 2001; Rodgers et al. 2014; Tillinger and Stein 1996). Fish communities within the LAA include a variety of small-bodied fish (e.g., slimy sculpin, ninespine stickleback), large-bodied fish (e.g., lake trout), and life stages. It is anticipated that small-bodied fish and early life stages (e.g., fry, YOY) at these watercourse crossings will be more susceptible to potential adverse effects from the Project with respect to changes in fish passage.

### Alteration of Water Quantity

The Project has the potential to alter water quantity during all Project phases through changes in landcover, drainage patterns, and water withdrawals. Project activities that alter the landcover (e.g., vegetation clearing, soil and overburden material removal, grading, and blasting) have the potential to affect hydrological processes and could result in changes to drainage patterns, mean annual flow, high and low flows, and monthly distribution of flow. Construction of watercourse crossings could also influence streamflow where flow diversion around the instream work area is needed, or from improper installation of culverts and bridges.

Interactions between Project activities and surface water quantity could include changes in streamflow and changes in lake volume as a direct result of water withdrawals, or as an indirect result of withdrawals from an upstream waterbody. Project activities that may require water withdrawal from a waterbody or watercourse include construction (e.g., winter road construction), Port landside operations including aerodrome and Jericho Station, potable water, dust control, and road maintenance/use. Two lakes (North Intake Lake [PWI-1] and South Intake Lake [PWI-2]) in the Port vicinity have been identified as potential water sources, as well as an optional freshwater intake on Contwoyto Lake for Jericho Station operation. In addition to direct lake level reduction, withdrawal from North Intake Lake could reduce streamflow in the lake outlet stream and the Arctic Ocean watershed downstream of the lake, and withdrawal from South Intake Lake could reduce streamflow in the outlet stream and the Kennarctic River downstream of the lake.

Changes to the natural flow regime have the potential to affect fish habitat through physical changes to habitat structure, reduction in available habitat during historical low or high flow periods, alteration of the timing of access to habitat, or shifts in habitat types (e.g., turning a pool into a riffle). High flow can transport smaller organisms downstream and/or mobilize substrates, creating conditions that are unsuitable for some species (e.g., higher velocities prevent upstream movement for species or life stages with reduced swimming ability). Alternatively, low flow can reduce habitat availability by reducing water depths, creating fish barriers, increasing water temperatures, reducing oxygen levels, and potentially increasing stress on aquatic organisms (Hatfield et al. 2003). Changes in flow can alter available benthic invertebrate habitat between rocks through increased or decreased sedimentation (Hatfield et al. 2003). The timing of flow alteration could overlap with sensitive time periods (e.g., spawning, egg incubation or overwintering), which could prevent or limit fish from carrying out life history processes, impair egg incubation, or impair migration as it could prevent fish from moving between habitats or watercourses and waterbodies (Hatfield et al. 2003).

#### *20.3.2.3 Mitigation, Enhancement, and Management Measures*

Mitigation measures to avoid or reduce potential effects on fish habitat were selected based on engagement with Kitikmiut, other Indigenous groups, and other potentially affected communities, territorial and federal regulations and policies, BMPs and guidelines, and relevant peer-reviewed literature. Mitigation measures consider the following sources:

- Engagement with Kitikmiut, other Indigenous groups, and other potentially affected communities
- Measures to Protect Fish and Fish Habitat (DFO 2025a)
- Code of Practice: Clear Span Bridges (DFO 2023a)
- Code of Practice: Temporary Fords (DFO 2023b)
- Code of practice: Ice Bridges and Snow Fills (DFO 2023c)
- Interim Standard: In-water Site Isolation (DFO 2023d)
- Code of Practice: Culvert Maintenance (DFO 2023e)
- Interim Code of Practice: Bridge Repair and Maintenance (DFO 2023f)
- Framework for Assessing the Ecological Flow Requirements to Support Fisheries in Canada (DFO 2013a)
- DFO Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut (DFO 2010)

The Project followed a hierarchical approach to avoid and/or reduce a potential change in fish habitat as outlined by DFO's *Fish and Fish Habitat Protection Policy Statement* (DFO 2019). This approach involved implementing avoidance measures that eliminate potential change in fish habitat in space and time before applying mitigation measures to reduce remaining effects where possible.

Mitigation measures that will be implemented to avoid or reduce a potential change in fish habitat that could result from the Project include:

- The Project will use previously disturbed areas for project activities, project infrastructure, and workspaces, to the extent practical (e.g., use of Jericho Station).
- Riparian vegetation will be maintained where practicable.
- Watercourse crossings will be designed and constructed to maintain water flow, drainage patterns, and fish passage.
- Routine inspection of watercourse crossings will be conducted to determine if they are functioning as per design (e.g., allow fish passage) and identify potential evidence of erosion and sedimentation. If a barrier to fish passage or erosion and sedimentation issues are observed, corrective actions will be implemented.
- Isolate and dewater work areas when conducting in-water construction activities and maintain downstream flow in watercourses.
- Limit the grading of stream banks and riparian areas at watercourse crossing approaches where feasible.
- A Project-specific Environmental Protection Plan (EPP) will be developed wherein mitigation measures are stipulated for construction and operations and maintenance activities. As part of an adaptive management plan for follow-up and monitoring, these mitigation measures will be regularly reviewed and updated by WKR to verify and enhance their effectiveness. In the event that an unexpected deterioration of the environment is observed as part of follow-up and/or monitoring, intervention mechanisms will include the adaptive management process.
- Develop and implement an Erosion and Sediment Control Plan (ESCP), which will describe the measures and BMPs to be implemented to protect the environment through reduction of site erosion and protection of nearby watercourses and waterbodies from sedimentation.
- Erosion and sedimentation control measures will be regularly inspected to confirm they are performing as intended, repaired if damage occurs, and maintained until disturbed areas are revegetated or until such areas have been permanently stabilized by other effective measure.
- Develop and implement a Water Management Plan (WMP) to address stormwater and runoff management, and water diversion.
- A dust control program using water will be implemented during construction, operations, and maintenance. Dust suppression will follow Nunavut Environmental Guideline: Dust Suppressants
- Temporary crossings will follow DFO's Codes of Practice (CoP) for temporary fords (DFO 2023b) and ice bridges and snow fills (DFO 2023c).

- Water withdrawals will be within water license limits outlined in the license as issued by the Nunavut Water Board (NWB), and in accordance with Measures to Protect Fish and Fish Habitat (DFO 2025a).
- Under-ice withdrawals will follow the DFO Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut (DFO 2010).
- Temporary access roads, quarries, and workspaces not needed after construction will be closed and reclaimed.
- Banks will be restored to original condition or as design specifies.
- Rip rap will be free of silt and other debris.
- If DFO determines the Project will result in a harmful alteration, disruption, or destruction (HADD) of fish habitat, a Fish Habitat Offsetting Plan will be developed through engagement with DFO, Kitikmiut, and other potentially affected communities to counterbalance unavoidable HADD of fish habitat in the Project's footprint.

#### *20.3.2.4 Project Residual Effect*

### Alteration, Disruption, or Destruction of Fish Habitat

### *Change in Riparian Vegetation*

Riparian clearing is needed at watercourse crossings along the road and at watercourses within the Port and Jericho Station PDAs. The Project will limit riparian clearing to the extent practicable and reclaim and revegetate temporary access roads and workspaces following construction.

The Project will affect approximately 198,408 $m^2$ of riparian habitat and 33,017 $m^2$ of this will include functional riparian habitat at fish-bearing watercourses, many of which provide habitat to species of cultural importance to Kitikmiut, other Indigenous groups, and other potentially affected communities (Table 20.10). This will include:

- Riparian clearing around the Port infrastructure will result in the loss of approximately 2,479 $m^2$ of riparian habitat; 1,204 $m^2$ at WC-001 for the Landside Port and 1,275 $m^2$ at D2 for the solar panel infrastructure. The total functional riparian habitat loss at these two small permanent watercourses is approximately 330 $m^2$: 160 and 170 $m^2$, respectively.
- The Aerodrome PDA will require riparian clearing along the small permanent watercourse D6 for the airstrip and access roads.
  - The airstrip access road will result in the loss of approximately 1,429 $m^2$ of riparian habitat and 191 $m^2$ of this will include functional riparian habitat (Table 20.10). Similar to the road, these crossings will require riprap for bank stabilization and will result in the alteration of approximately 18 $m^2$ of riparian habitat.
  - The total and functional riparian loss along D6 for the construction of airstrip will be approximately 63,491 $m^2$ and 8,450 $m^2$, respectively.
- The Road alignment will result in the loss of approximately 118,500 $m^2$ for the 81 fish-bearing watercourse crossings (Table 20.10). The total functional riparian habitat lost for these

watercourse crossings is approximately 21,611 $m^2$: 9,000 $m^2$ at the 18 large permanent watercourses and 12,611 $m^2$ at the remaining 63 watercourse crossings.

- Alteration of riparian habitat will also occur at major (steel arch) and minor (closed bottom) crossings along the Road alignment for bank stabilization upstream and downstream of the culvert.
  - For major (steel arch) crossings, it is estimated that riprap armouring will extend 10 m beyond the culvert, resulting in approximately 480 $m^2$ of altered riparian habitat at the 24 crossings of fish-bearing watercourses.
  - For minor (closed bottom) crossings, it is estimated that the riprap armouring will extend 4.5 m on either end of the culvert, resulting in 369 $m^2$ of altered riparian habitat at the 41 crossings of fish-bearing watercourses.

- Vegetation clearing at Jericho Station will occur for workspaces and infrastructure, including riparian clearing along the northeast side of watercourse 49. It is conservatively estimated that clearing will occur along the entire length of this watercourse (approximately 775 m), for a total riparian and functional riparian loss of 11,625 $m^2$ and 1,550 $m^2$, respectively (Table 20.10).

**Table 20.10 Summary of Riparian Habitat Loss at Fish-Bearing Watercourses**

| Project Component | Watercourse Stream Class | # of Watercourses[1] | Total Riparian Habitat Impacted ($m^2$)[2] | | Total Functional Riparian Habitat Impacted ($m^2$)[2] | |
|---|---|---|---|---|---|---|
| | | | Destruction | Alteration | Destruction | Alteration |
| Port | Small Permanent | 2 | 2,479 | - | 330 | - |
| Aerodrome | Small Permanent | 1 | 1,429 | 18 | 191 | 18 |
| | | | 63,509 | - | 8,468 | - |
| Road | Large Permanent | 18 | 118,500 | 49 | 9,000 | 49 |
| | Small Permanent, Ephemeral, Intermittent, Boulder Fields | 63 | | 800 | 12,611 | 800 |
| Jericho Station | Intermittent | 1 | 11,625 | - | 1,550 | - |
| | | **Total ($m^2$)** | **197,541** | **867** | **32,150** | **867** |

Notes:

[1] Number of watercourses for each stream class are for fish-bearing watercourses only. Engineering designs are not available for all watercourses at this time.

[2] Buffers for total riparian areas on either side of a watercourse are 15 m for all watercourses (Chilibeck et al. 1993), functional riparian buffers are 5 m for large permanent and 2 m for all other stream classes.

The above estimates are conservative because vegetation clearing, and riprap armouring may not be required within the entire area of the estimated footprints. Many of the watercourses also have predominately rocky (i.e., boulder, cobble, and bedrock substrates) riparian habitats that will not require clearing and therefore will not impact the functional habitat for fish. Increased erosion and sedimentation at the watercourse crossings because of the loss of riparian habitat is not expected as the banks will be protected by riprap and ESC measures will be in place where soils are disturbed until the areas are stable. Riparian vegetation will be maintained where practicable, including in areas where there is no infrastructure. The Project will use previously disturbed areas for Project activities, infrastructure, and workspaces, to the extent practical. Following construction, temporary access roads, quarries, and other workspaces that will no longer be needed for the Project will be closed and reclaimed.

Changes to riparian vegetation could occur due to dustfall from construction and road use. Total particulate deposition (dustfall) was modelled as part of the assessment of the Air Quality VC (Section 11). British Columbia Environment and Parks (BC ENVP) has defined a pollution control objective (PCO) for dustfall (ENVP 2020), which was used in the Air Quality VC assessment to evaluate the magnitude and spatial extent of dustfall resulting from Project activities and report on potential impacts to soil, water, and vegetation. The maximum ambient concentrations for dustfall were predicted for the worst-case year of Project Construction Phase (Year 3) and Project Operations & Maintenance Phase (Year 11). As a conservative estimate of impacts, the model-predicted monthly average concentrations were based on the daily average emission rates that consider the actual operating hours per day for each construction activity. The maximum predicted Project Alone 30-day dustfall was predicted to be 0.54 milligrams per square decimetre per day (mg/dm$^2$/day), which is less than the PCO for residential/parkland areas (1.75 mg/dm$^2$/day) and industrial/other areas (2.9 mg/dm$^2$/day) (ENVP 2020). The cumulative (i.e., including background) 30-day dustfall was modelled to be 1.67 mg/dm$^2$/day, which is also less than both BC PCO values noted above, indicating that potential impacts to riparian vegetation are low and, by extension, alteration of fish habitat are not anticipated.

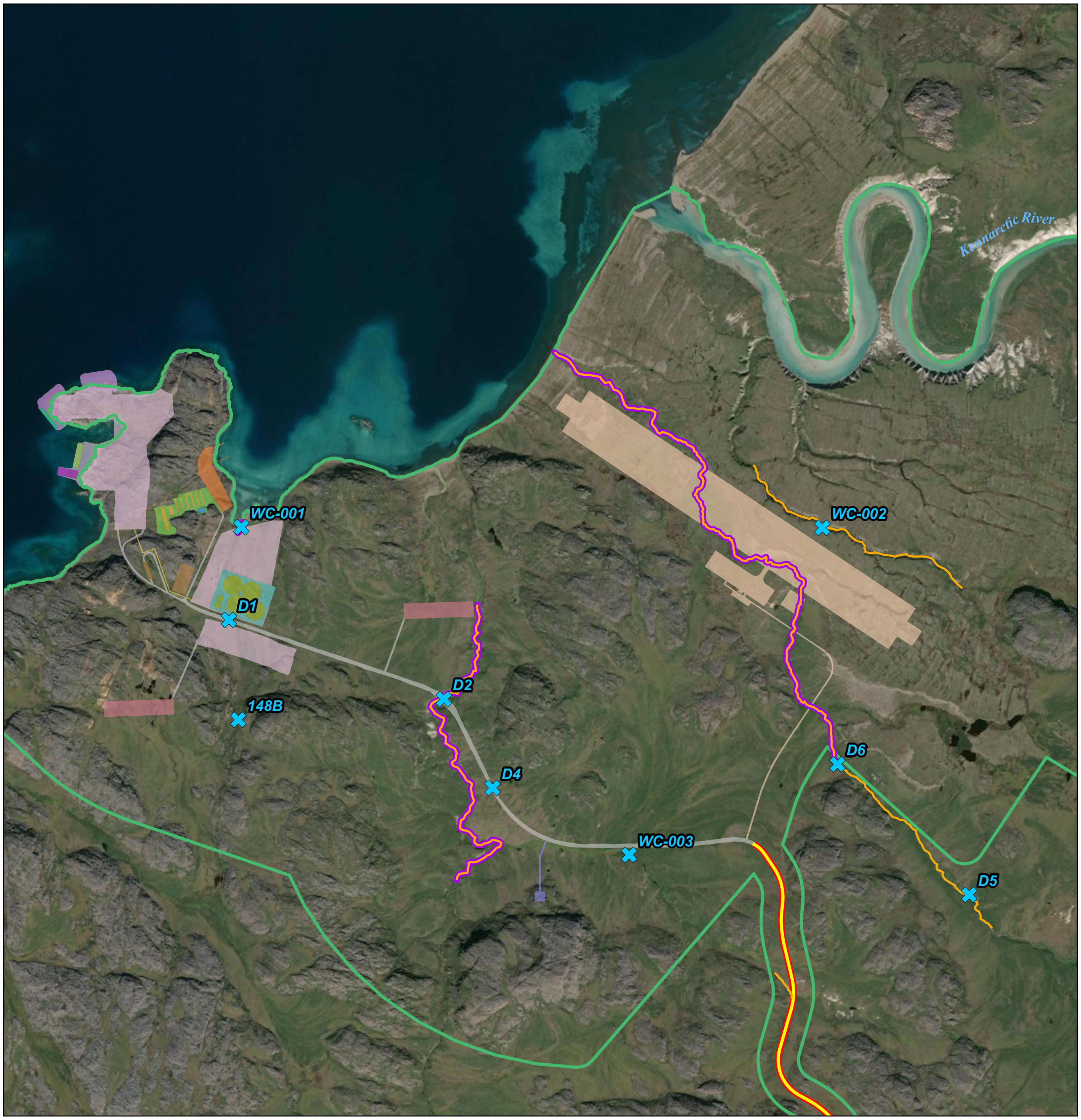
The loss and alteration of riparian habitat will occur because of the construction of permanent Project infrastructure including the Port, Aerodrome, Jericho Station, and watercourse crossings along the road. The residual effects resulting from alteration of riparian habitat are predicted to be low in magnitude, limited to the PDAs, long-term in duration, occur as multiple irregular events, and range from reversible (in areas that are reclaimed following construction) to irreversible (areas that will not be reclaimed). The residual effects are anticipated to have high sensitivity as riparian clearing may occur during a sensitive life stage (e.g., fish spawning or egg incubation).

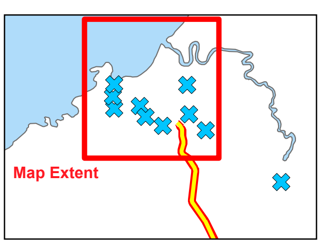
### *Change in Habitat Below High Water Mark*

Construction of Project components will require activities below the high water mark. Based on preliminary engineering design, the Project's footprint is expected to affect approximately 15,773 m$^2$ of freshwater fish habitat during construction. No destruction or alteration of habitat is anticipated during the operations and maintenance phase. Table 20.11 provides a breakdown of the anticipated areas of alteration or destruction of fish habitat below the high water mark by Project component.

- For the Port, infilling of WC-001 will be required to construct the Landside Port infrastructure (Figure 20.4). The Landside Port infrastructure overlaps approximately 40 m of WC-001, which has an average channel width of 1.45 m, resulting in an estimated total loss of 58 m$^2$ of fish habitat (Table 20.11).

- For the Aerodrome, instream works will be required at D6 for the construction of two watercourse crossings for the airstrip access road and infilling for the airstrip (Figure 20.4).
  - It is assumed the access road will construct minor (closed bottom) crossings that will also require riprap aprons that extend upstream and downstream of the culverts, resulting in the total alteration of 140 $m^2$ (70 $m^2$ per crossing) of fish habitat.
  - The airstrip overlaps a large portion of D6 (approximately 2.17 km), which will require infilling to construct the airstrip. Fish habitat that overlaps the airstrip, as well as the habitat downstream of it to the Arctic Ocean will be lost. It is estimated that approximately 1,880 $m^2$ of fish habitat will be lost directly from the airstrip footprint and 5,985 $m^2$ downstream of the airstrip, for a total of 7,865 $m^2$ of fish habitat lost (Table 20.11).
- For the Road, a total of 81 watercourse crossings will be constructed in fish-bearing watercourses affecting 7,710 $m^2$ of fish habitat.
  - 12 single-span bridges will be constructed at 11 large permanent watercourses and one boulder field. These structures will be built above the high water mark following the Code of Practice: Clear Span Bridges (DFO 2023a) and therefore will not alter or destroy fish habitat below the high water mark.
  - Four multi-span bridges will be constructed following applicable measures to protect fish and fish habitat (DFO 2025a), however these bridges will require instream construction of piers (2 m by 10 m in dimensions). A total of 11 piers will be constructed and result in a total loss of 220 $m^2$ of fish habitat at these crossings (Table 20.11).
  - 24 major (steel arch) crossings will be constructed; the edges of these culverts will be placed at the high water mark. However, these structures will have instream impacts. Riprap will be placed along the culvert (2 m along both sides of the culvert) as well upstream and downstream of the culvert (10 m aprons) to protect the culvert footing and provide bank stabilization. The riprap armouring at these crossings will result in the total alteration of 5,008 $m^2$ of fish habitat (Table 20.11).
  - 41 minor (closed bottom) crossings will be constructed; these crossings will alter habitat below the high water mark through installation of the culvert and riprap upstream and downstream of the culvert (4.5 m aprons). It is estimated that a total of 2,482 $m^2$ of fish habitat will be altered (Table 20.11).




- Watercourse Crossing
- Stream Habitat Profile
- Total Riparian Cleared
- Grays Bay Road
- Local Assessment Area
- Admin Office and Accommodation Area
- Admin Office and Accommodation Buildings
- Aerodrome
- Ancillary Support Area
- Barge Ramp
- Barge Wharf
- Explosives Storage
- Fuel Pipeline
- Fuel Storage
- Landside Port
- Large Vessel Wharf
- Medium Vessel Wharf
- Public Use Area
- Road
- Secondary Containment Area
- Service Vehicle Garage
- Solar Array

0 250 500 Metres

(At original document size of 8.5x11) 1:30,000

N

***Notes***
**1.** Coordinate System: WGS 1984 UTM Zone 12N
**2.** Data Sources: Government of Canada, Stantec, Earthstar Geographics

NUNAMI STANTEC LIMITED

WEST KITIKMEOT RESOURCES CORP

*Project Location*
West Kitikmeot Region
Nunavut

Prepared by DS on 2026-02-02
TR by SL on 2026-02-02

*Client/Project*
123514868_152
West Kitikmeot Resources Corp
Grays Bay Road and Port

*Figure No.*
**20.4**

*Title*
**Change in Freshwater Fish Habitat from Project Activities in the Port LAA**

\\\Ca0002-ppfs05\geomatics\Clients\Nunami_Stantec\GBRP\Figures\123514868_152_Fish_Habitat_Change.pagx Revised: 2026-02-02 By: dcspry

**Table 20.11 Summary of Habitat Alteration or Destruction of Fish Habitat**

| Project Component | Project Activity | # of Watercourses[1] | Instream Habitat ($m^2$) | |
|---|---|---|---|---|
| | | | Alteration | Destruction |
| Port | Infilling for infrastructure | 1 | - | 58 |
| Aerodrome | Access road crossing, minor culvert installation (closed bottom), instream riprap | 2 | 140 | - |
| | Infilling for airstrip | | - | 7,865 |
| Road | Single-span bridge | 12 | - | - |
| | Multi-span bridge, infilling for piers | 4 | - | 220 |
| | Major culvert installations (steel arch), instream riprap | 24 | 5,008 | - |
| | Minor culvert installation (closed bottom), instream riprap | 41 | 2,482 | - |
| | | **Total** | **7,630** | **8,143** |

Notes:
1 Number of watercourses for each stream class are for fish-bearing watercourses only. Engineering designs are not available for all watercourses at this time.

The severity of the effect on freshwater species resulting from the destruction or alteration of fish habitat depends on the type of habitat impacted, the availability of similar habitats nearby, and the ecological role played by the habitats to different species (e.g., spawning habitat). Construction activities below the high water mark will occur across a variety of habitat types (e.g., flats, runs, riffles, etc.) and substrates (e.g., coarse dominated [i.e., bedrock, boulder, cobble] to organics and fine-dominated substrates).

Alteration of habitat will occur at watercourse crossings that require culvert installation and riprap placement to prevent bank erosion. The alteration of habitat through instream riprap could enhance habitat complexity and potential for fish and aquatic life, especially in areas with fine-dominated substrates. The coarse substrates can act as attachment points for instream vegetation providing foraging and refuge for aquatic species, as well the spaces in between the riprap can provide additional flow refuge and cover for benthic invertebrates and small fish (Fischenich 2003). Alteration of fish habitat from the minor (closed bottom) culverts is anticipated to be minimal as these structures would only impact a small area at each crossing (i.e., the length of the road [16 m] by 1.5 to 3 m diameter culverts) relative to the overall amount of similar and undisturbed habitats available upstream and downstream of the culvert.

Destruction of habitat due to the installation of piles for the bridge piers is anticipated to be of low scale at the four large permanent watercourses due to the piles' limited footprints (i.e., three piers will be installed at 68 and 62 [Burnside] for a total loss of 60 $m^2$ at each watercourse, one pier at 1002 for a loss of 20 $m^2$, and four at D44 [Kennarctic] for a loss of 80 $m^2$), and construction methods following applicable measures to protect fish and fish habitat (DFO 2025a). The piers could also provide cover and act as attachment points for instream vegetation, enhancing foraging and rearing habitat.

Fish habitat destruction will occur within the footprint of WC-001 and D6, due to the infilling activities associated with the Port and Aerodrome. WC-001 is a small permanent watercourse downstream of a wetland feature that flows into the Arctic Ocean. The habitat that will be lost due to the Project is predominately flat habitat with some pools. The total length of the watercourse is 75 m with an average channel width of 1.45 m and bankfull maximum depth of 0.80 m. Substrates are predominately organics and fines with some gravel and cobble. Instream cover for fish is good and is provided by water visibility and instream vegetation. Small-bodied fish were observed during the field surveys. D6 is also a small permanent watercourse that flows into the Arctic Ocean. The habitat types within the Project's footprint are primarily flat with deep pools, and areas of run alternating with riffle-pool habitat. Channel widths range from 0.60 m to 12.3 m with bankfull maximum depths ranging from 0.40 m to 2.40 m. Substrates vary throughout the watercourse but are predominately organics, fines, and sand with some coarser substrates (i.e., gravel, cobble, boulder). Cover for fish is good and provided by water visibility, instream vegetation, small woody debris, and some boulders. Lake trout, a species of cultural importance to Kitikmiut, other Indigenous groups, and other potentially affected communities, were captured during the field surveys, and numerous small-bodied fish (slimy sculpin and ninespine stickleback) were observed throughout the assessment area. If DFO determines the habitat lost from these Project components constitutes a HADD of fish habitat, a Fish Habitat Offsetting Plan will be developed through engagement with DFO, Kitikmiut, and other potentially affected communities, to counterbalance unavoidable HADD of fish habitat in the Project's footprint. Therefore, measurable changes to long-term productivity or sustainability of relevant fish populations due to the change in fish habitat are not expected.

The alteration and destruction of fish habitat will occur because of the construction of permanent Project infrastructure and watercourse crossings along the road. Overall, the residual effects on fish habitat from the construction of watercourse crossings is predicted to be low in magnitude for the Road but of moderate magnitude for the construction of Port and Aerodrome components (i.e., infilling for the airstrip and Port infrastructure). The residual effects for the Road and temporary workspaces will be limited to the PDA, be short-term in duration, occur as multiple irregular events, and be reversible, whereas the residual effects associated with Port and Aerodrome components will be limited to the PDA, be long-term in duration, occur as multiple irregular events, and be irreversible. The residual effects for all components will not have sensitive timing as in-water works will be completed outside of the restricted timing windows or during winter when watercourses are expected to be frozen to the bottom with no fish presence.

### *Change in Fish Passage*

The Project has the potential to alter fish passage through the construction of watercourse crossings for the Road route and temporary access roads, temporary isolations used for instream construction, and infilling for Project infrastructure. Small-bodied fish and early life stages have weaker swimming abilities than larger fish (Katopodis 1991; Domenici 2001; Rodgers et al. 2014) and, therefore, are more susceptible to changes in flow that could be created by the Project.

Alteration of fish passage is not anticipated to result from the construction of the Project because:

- Watercourse crossings will be designed and constructed to maintain water flow, drainage patterns, and fish passage, and measures in DFO's CoP for Clear Span Bridges (DFO 2023a) will be implemented where applicable.

- Routine inspection of watercourse crossings will be conducted to determine if they are functioning as per design (e.g., allow fish passage). If a barrier to fish passage is observed, corrective actions will be implemented to correct the problem.
- Construction activities will follow the BMPs outlined in the EPP, including DFO's Measures to Protect Fish and Fish Habitat (DFO 2025a), as applicable.
- Construction of diversion channels to reroute the watercourses (i.e., WC-001 and D6) impacted by infilling activities associated with Project components.

### Alteration of Water Quantity

Alteration of surface water quantity could occur during all Project phases due to changes in landcover and drainage patterns, and water withdrawals. Residual effects on fish habitat from an alteration in water quantity due to changes in landcover and drainage patterns are not anticipated. This is because:

- A WMP will be developed and implemented to address stormwater and runoff management, and water diversions.
- An ESCP and EPP will be developed and implemented to limit site erosion and runoff and protect nearby watercourses and waterbodies.
- Watercourse crossings will be designed and constructed to maintain water flow, drainage patterns, and fish passage, and measures in DFO's CoP for Clear Span Bridges (DFO 2023a) will be implemented where applicable.
- Routine inspection of watercourse crossings will be conducted to determine if they are functioning as per design (e.g., allow fish passage). If a barrier to fish passage is observed, corrective actions would be implemented to correct the problem.
- Temporary access roads, quarries, and workspaces not needed after construction will be progressively reclaimed with drainage patterns restored according to the Follow-up and Adaptive Management Plan and the Closure and Reclamation Plan.

Water withdrawals for the Project will be regulated by the Nunavut Water Board and will require a water license under the Nunavut Waters Regulations. Adverse effects from water withdrawal will be mitigated by adhering to licensed volumes and conditions outlined in the license. The application will include a hydrological assessment and evaluation of environmental flow needs (EFN) and lake volume needs with respect to proposed water use volumes. In the absence of a territorial-specific EFN policy, the DFO Framework for Assessing the Ecological Flow Requirements to Support Fisheries in Canada will be followed (DFO 2013a). The DFO framework for EFN concludes that cumulative alterations to the natural flow of less than 10% have a low probability of detectable impacts to ecosystems that support fisheries, and cumulative (all water users) flow alterations that result in flows less than 30% of the mean annual discharge have a heightened risk of impacts to fisheries (DFO 2013a). For cumulative withdrawals less than 10% of instantaneous flow, projects can be assessed with "desktop" methodologies, and outside of this guideline, a more rigorous level of assessment is recommended (DFO 2013a). The DFO Protocol for *Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut* (DFO 2010) will also be implemented for water withdrawals from the North and South Intake Lakes, as well as Contwoyto Lake. By following DFO guidelines for water withdrawal, EFN are met and a measurable change in fish habitat is unlikely.

After the implementation of mitigation measures and BMPs, residual effects to fish habitat due to the alteration of water quantity are anticipated to result primarily from surface water withdrawals and to a lesser degree (not measurable) from runoff response and drainage pattern changes. The residual effects are anticipated to be low in magnitude as the water withdrawals will be within water license limits and in accordance with Measures to Protect Fish and Fish Habitat (DFO 2025a), limited to the LAA, long-term in duration, moderately sensitive to the timing of a critical life stage (e.g., fish spawning or over-wintering period), multiple irregular events, and reversible when surface water withdrawals cease.

## 20.3.3 Change in Fish Health, Growth, or Survival

### *20.3.3.1 Analytical Assessment Techniques*

Project activities that could interact with fish health, growth, or survival were compared to DFO's PoE diagrams (DFO 2024a) to identify peer-reviewed mechanisms by which changes in measurable parameters (e.g., change in water quality or sound overpressure during blasting in or near a watercourse) could lead to a change in fish health, growth, or survival.

For example, vegetation clearing during construction of a road crossing alters riparian cover, which can decrease bank stability and increase erosion potential resulting in a change in sediment concentrations (i.e., total suspended solids (TSS)). Increases in TSS could result in a change in fish health, growth, or survival.

The potential effect (change in fish health, growth, or survival) used in this assessment (see Table 20.2) captures the pressures described in DFO's PoE diagrams that could result from the Project (DFO 2024a). Once a pathway has been identified, BMPs and mitigation can be applied to reduce or eliminate a potential effect. Where BMPs and mitigation are not expected to reduce or eliminate a change in a measurable parameter (see Table 20.2), residual effects were identified. The characterization of the Project's residual effects (see Table 20.3) was based on a change in measurable parameters after considering site-specific fish presence data, the potential presence of eggs where spawning habitat was identified, construction methods and timing, and planned mitigation.

The *Fish and Fish Habitat Protection Policy Statement* (DFO 2019) indicates that for projects with a low likelihood of causing impacts to fish productivity or where impacts are relatively small, key impacts can be assessed qualitatively. Publicly available results from effects assessments of projects in Nunavut and NT with similar works, undertakings, and activities were reviewed to identify the potential scale of Project-related effects on fish health, growth, and survival. The review determined that a qualitative assessment approach was suitable for the Project.

Qualitative assessments were conducted using a weight-of-evidence approach for potential Project interactions with fish health, growth, or survival. This entailed the use of professional judgement based on an understanding of the potential effect, the habitat preferences and life histories of potentially affected fish species in the LAA, and the effectiveness of mitigation measures. This is supported by scientific literature, grey literature for all-season road construction projects in Nunavut and Northwest Territories, industry BMPs, and regulatory guidelines, as available.

#### *20.3.3.2 Project Effects Pathways*

Eighteen different Project components or activities have the potential to affect fish health, growth, or survival, which includes 12 activities during construction and six activities during operations and maintenance (Table 20.9). Pathways include activities that require the removal of vegetation, construction of facilities and infrastructure associated with the Port, Road, and Jericho Station, access roads, diversion and storage of surface water, drilling and blasting, road and runway maintenance, and the release of dust and other contaminants from vehicles. These activities fall under the following DFO PoEs (DFO 2024a):

- Use of machinery on land/alteration of riparian vegetation
- Use of machinery in water
- Placement of materials in water
- Removal of materials and aquatic vegetation from water
- Water level/flow modification
- Water diversion
- Dewatering
- Detonation in or near water
- Introduction of underwater noise

These activities may also result in effects on important habitat and resources relied upon by Kitikmiut, other Indigenous groups, and other potentially affected communities (Volume 9, Sections 24 and 25). Potential effects of these Project activities on fish health, growth, or survival, prior to mitigation, are described in the sections below.

**Change in Water Quality**

***Total Suspended Solids***

Increases in TSS resulting from Project activities could occur across all Project phases. Project activities and components that require in-water construction have the potential to directly increase TSS levels by disturbing and suspending sediment, specifically during the installation of watercourse crossings (i.e., culverts and bridges), infilling for Project infrastructure (e.g., airstrip, port landside facilities), and water intake systems. Site preparations and land-based activities (e.g., site clearing, excavation, grading, construction of airstrip and port infrastructure) also have the potential to indirectly increase TSS in the freshwater environment through erosion and site runoff. Dust deposited from road traffic and the airstrip could also indirectly introduce TSS into the freshwater environment during construction and operations and maintenance.

Exposure to elevated TSS can affect the health of fish and lower trophic level organisms (e.g., benthic invertebrates), with effects ranging from minor physiological stress to mortality. The nature and extent of adverse effects on fish and aquatic organisms resulting from increased TSS are influenced by the concentration of TSS, particle size, and length of exposure (Bash et al. 2001; Kjelland et al. 2015; Fondriest Environmental Inc. 2014). If TSS concentrations are elevated for an extended period of time, Increased TSS can result in adverse effects on fish and aquatic organisms including gill abrasion, feeding impairment, and avoidance of impacted areas (Newcomb 1994; Kjelland et al. 2015; Bash et al. 2001; Miner and Stein 1996). Increased TSS can also result in diminished water clarity and light attenuation, slowing growth rates and decreasing abundance of photosynthetic organisms (periphyton in streams, phytoplankton in lakes, and aquatic vegetation in both), which form the basis of the aquatic food-web and provide habitat for different fish species (e.g., juvenile burbot, ninespine stickleback) (Kjelland et al. 2015).

Suspended sediments may also affect fish and aquatic organisms when they settle out of suspension by physically covering streambed and lakebed substrates and submerged vegetation, and filling the interstitial spaces between coarse substrate particles. Deposited sediments can cause the death of fish eggs by smothering the eggs and preventing the exchange of gases between the fish membrane and water column. If the rate and/or level of sediment deposition is sufficient, it could cover attached algae (i.e., periphyton) and aquatic vegetation, impairing photosynthesis, which can reduce the food availability for benthic invertebrates and, subsequently, for fish that depend on benthic invertebrates or aquatic vegetation for food. Infilling of interstitial spaces with sediment can cause potential shifts in benthic invertebrate communities and decreased feeding rates (Newcombe 1994; Kjelland et al. 2015; Bash et al. 2001), and may be detrimental to the use of impacted habitat for spawning, rearing, and foraging by fish (Bash et al. 2001; Muck 2010). During a public scoping meeting for the NIRB, Cambridge Bay community members expressed concern that Project activities would affect fish spawning (NIRB 2025).

In recognition of the potentially harmful effects of increased TSS, the CCME WQG-FAL recommend that an increase in TSS for short-term exposure (i.e., 24 hours or less) should not exceed 25 milligrams per litre (mg/L) over background concentrations, and for longer-term exposure (i.e., 24 hours to 30 days) should not exceed 5 mg/L over background concentrations during clear flow (CCME 2025). For high flows, maximum TSS increases should not exceed 25 mg/L from background levels when background levels are between 25 to 250 mg/L and not increase more than 10% of background levels when background levels are greater than 250 mg/L (CCME 2025).

### *Surface Water Quality*

Changes in surface water quality could occur during all phases of the Project and could lead to acute or chronic toxicological effects to aquatic life and bioaccumulation of parameters of concern (e.g., metals). Road dust and vehicle use during construction and operations and maintenance could introduce hydrocarbons, sediment, and other contaminants through dust, runoff, and accidental spills into watercourses. The effects of spills are assessed in Section 33 (Accidents, Malfunctions, and Upset Events) and is not considered further in this assessment. During engagement for the Project and previous projects, community members expressed concerns regarding water quality from the development of the projects (NIRB 2004; YKDFN 2017, 2019; NSMA 2001; NWTMN 2012; NSMA 2001).

Changes to water quality could also arise from construction and operation of Project components, such as quarries, granular borrow sources, road cuts, rock stockpiles, and materials used for embankments and road bases, which have the potential to generate metal leaching (ML)/

acid rock drainage (ARD). Leachate from ML/ARD materials could enter nearby watercourses and waterbodies, potentially reducing water quality and negatively affecting the health, growth, or survival of aquatic organisms.

The Project is expected to use ammonium nitrate/fuel oil (ANFO) explosives for quarry and road construction. Ammonium nitrate, a key component, is highly soluble in water. If not fully detonated, residual nitrogen can leach from quarry sites into nearby watercourses and waterbodies, potentially releasing nitrogen compounds such as nitrate, nitrite, and ammonia into the aquatic environment.

An ecological risk assessment was completed as part of the Human Health and Ecological Risk Assessment Technical Data Report (Appendix 26A). The assessment reviewed Project-related emissions and considered how wildlife might be exposed to these emissions in the air, soil, water, and food. While some emissions are expected during Project construction and operation, these emissions are limited in magnitude and managed through standard controls and mitigation measures. Importantly, the assessment did not identify Project-related chemical contamination to the air, soil, and water. As a result, there are no exposure pathways by which wildlife would come into contact with Project-related emissions at concentrations that would constitute an ecological risk. The assessment concludes that Project-related emissions are likely to result in a negligible ecological risk to terrestrial wildlife (e.g., caribou, birds, other terrestrial animals) and aquatic wildlife (e.g., freshwater and marine fish, marine mammals, and other aquatic wildlife), and vegetation.

### Death of Fish

#### *Physical Injury or Stranding*

Project activities during the construction phase have the potential to increase the risk of death of fish or fish eggs from physical injury or stranding. These potential effects are expected to be localized to areas where in-water construction below the high-water mark needs to be conducted, including construction of watercourse crossings and the port landside facilities and aerodrome. These areas may require infilling, or isolation and dewatering to construct in the dry, and therefore fish present in these areas will be at risk of stranding, burial, or physical injury during isolation and dewatering activities. Sessile or slow-moving species (e.g., benthic invertebrates), larvae, and fish eggs of all species are at a greater risk of injury from these activities than adult fish due to their inability to move away from harmful activities.

In addition, inadequate culvert design could also lead to potential physical injury or stranding of fish. High water velocities in culverts can create turbulence, which can result in fish contacting the sides of culverts causing injury or mortality.

#### *Impingement and Entrainment*

Water withdrawal could occur during all Project phases for activities associated with water intakes and pumps to support construction activities (e.g., construction of watercourse crossings), freshwater intakes for camp use from the potential water intake lakes and Contwoyto Lake for Jericho Station, road maintenance, and dust suppression. Water withdrawals from fish-bearing watercourses and waterbodies have the potential to cause impingement and entrainment of fish that could result in injury or mortality to fish. Impingement occurs when a fish becomes trapped against an intake screen, and the fish is unable to free itself. Entrainment occurs when a fish is drawn through a screen into a water intake system and cannot escape.

The effects of impingement and entrainment are influenced by the location and flow rate of the intake (Fedorenko 1991). Survival from impingement if life stage and species specific, with physiological characteristics playing a key role (Hogan 2015). Planktonic species (e.g., fish eggs and larval fish) are particularly vulnerable to impingement and entrainment due to their lack of or limited swimming capabilities against the intake current (Fedorenko 1991). The likelihood of a fish becoming entrained or impinged depends on the flow rate through the intake screen, the size of the intake screen relative to the size of the fish, and the swimming capabilities of the fish.

To reduce the risk of impingement and entrainment, DFO has provided guidance in the Interim Code of Practice: End-Of-Pipe Fish Protection Screens for Small Water Intakes in Freshwater (DFO 2020). The interim CoP provides guidance on the design, installation, and maintenance of small end-of-pipe water intakes with withdrawal rates up to 0.150 cubic metres per second where no aquatic SAR are present in the affected area.

### *Production of Underwater Noise*

Project activities have the potential to produce underwater noise through drilling and blasting at the quarries during construction and operations and maintenance, as well as during embankment construction for watercourse crossings. Blasting produces high-velocity spherical shock waves as well as introducing high-intensity noise into the aquatic environment through the air and vibrations in the substrate that can affect fish species and their habitats (DFO 2006; Popper et al. 2014). Fish injury or mortality can occur due to shock waves (e.g., instantaneous pressure change) created by explosive detonations on land, which can rupture internal organs and damage swim bladders. Particle velocities resulting from blasting can also cause injury or death of fish eggs or larval fish. The range of potential effects on fish from blasting include physical injuries and mortality, temporary or permanent hearing loss, changes in behaviour, and mechanical shock to developing embryos (Popper et al. 2014).

The Project will construct approximately 40 quarries along the Project, located approximately 7 km apart and within 500 m of the road. It is anticipated that every third quarry (approximately 13 quarries in total) will be developed as a permanent quarry to be used in road surfacing and maintenance during operations. Drilling and blasting of rock will be required at these quarries and the explosives will primarily be ammonium nitrate and diesel fuel. Blasting may also be required during embankment construction at watercourse crossings to achieve engineering design gradients. Blasting activities for the Project could occur near fish-bearing watercourses and waterbodies during construction and operation of the Project and therefore has the potential to affect the health, growth, or survival of fish in surrounding freshwater environments.

### Introduction of Aquatic Invasive Species and Disease

Potential change in fish health, growth, or survival due to the introduction of aquatic invasive species and disease could occur during construction and operations and maintenance phases of the Project when equipment and machinery are brought on-site from other locations. If equipment and machinery are contaminated with sediment or soils containing fragments, seeds, spores, rhizomes, eggs, or individuals of aquatic invasive species or diseases prior to arrival on-site, and if this equipment or machinery enters watercourses or waterbodies within the PDA, aquatic invasive species or diseases could spread through the surrounding watersheds to the detriment of native algae, invertebrate, and fish populations.

Large amounts of dirt and plant material can accumulate in the tread of machinery and construction equipment if not properly cleaned and decontaminated between work areas. Additionally, construction of water diversions can connect watercourses and waterbodies, which can allow aquatic invasive species to move into new areas (DFO 2024b).

Aquatic invasive species can grow quickly once introduced as they often do not have natural predators in their new environment. As a result, invasive species can reduce biodiversity and habitat quality, prey on, outcompete, and harm native species, introduce pathogens and parasites, decrease water quality, reduce nutrient transportation, and increase eutrophication (DFO 2024b; Soka University 2024; Kiruba-Sankar et al. 2018). NTKP consultants and Kugaaruk Inuit have reported observing an increase in fish diseases and parasites along their shorelines (Banci and Spicker 2024; NIRB 2024).

### Increased Fishing Pressure

The Project will act as a 230 km all-season, multi-user road that connects the Arctic Ocean at Grays Bay to the already approved Tibbitt to Contwoyto Winter Road, providing road access from southern Canada to the Kitikmeot Region. Construction and operation of the Project provide new access to previously inaccessible areas and therefore has the potential to increase fishing pressure on local fish populations, which could affect fish health, growth, or survival. During engagement for the Project and previous projects, community members expressed concerns about the Project providing access to areas previously isolated from people, increasing fishing pressures on culturally important species (GBRP 2025; NIRB 2025; IRC 2004; TG 2017). This effect is more likely to occur at waterbodies and larger watercourses that support large-bodied fish populations (e.g., Burnside River, Kennarctic River). Fish species that are targeted by anglers in the RAA and are likely to be present in the Port and Road LAA include the species of cultural importance to Kitikmiut, other Indigenous groups, and other potentially affected communities (lake trout/*ehokketak*, Arctic char/*hulukpaugan,* Arctic grayling/*Ehok,* burbot/*tiktalik* and round whitefish). Most watercourses along the Project only support forage fish, which are typically not targeted by anglers and would not be subject to increased fishing pressure.

Sport fishing in Nunavut is regulated by the Northwest Territories Fishery Regulation under the *Fisheries Act*, which authorizes DFO to issue recreational fishing licences to resident and non-resident anglers. All recreational anglers are required to have an angling licence from DFO and follow regulations outlined in the Sport Fishing Guide (GN 2024). Season and catch limits, as well as catch and release rules are in force in Nunavut and restrict individual angler harvest and activity. The daily catch limits and possession limits are applied to the waterbodies and watercourses within the Project’s LAA and RAA. These limits include harvest restrictions for Arctic char, Arctic grayling, lake trout, and all whitefish species (GN 2024). Potential changes in fishing pressure and fish harvest in Nunavut would continue to be managed by DFO, which is the government agency responsible for managing fisheries resources.

#### *20.3.3.3 Mitigation, Management, and Enhancement Measures*

Mitigation measures to avoid or reduce potential effects on fish habitat were selected based on engagement with Kitikmiut, other Indigenous groups, and other potentially affected communities, territorial and federal regulations and policies, BMPs and guidelines, and relevant peer-reviewed literature. Mitigation measures consider the following sources:

- Engagement with Kitikmiut, other Indigenous groups, and other potentially affected communities
- Measures to Protect Fish and Fish Habitat (DFO 2025a)
- Code of Practice: Clear Span Bridges (DFO 2023a)
- Code of Practice: Temporary Fords (DFO 2023b)
- Code of Practice: Ice Bridges and Snow Fills (DFO 2023c)
- Interim Standard: In-water Site Isolation (DFO 2023d)
- Code of Practice: Culvert Maintenance (DFO 2023e)
- Interim Code of Practice: Bridge Repair and Maintenance (DFO 2023f)
- Interim Code of Practice: End-of-pipe Fish Protection Screens for Small Water Intakes in Freshwater (DFO 2020)
- DFO Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut (DFO 2010)
- CCME WQG-FAL (CCME 2025)
- Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (Wright and Hopky 1998)
- Land Development Guidelines for the Protection of Aquatic Habitat (Chilibeck et al. 1993)

The Project followed a hierarchical approach to avoid and/or reduce change in fish health, growth, or survival as outlined by DFO's Fish and Fish Habitat Protection Policy Statement (DFO 2019). This approach involved implementing avoidance measures that eliminate potential change in fish health, growth, or survival in space and time before applying mitigation measures to reduce remaining effects where possible.

The following mitigation measures have been incorporated into the design of the Project or are proposed to avoid or reduce Project-related effects on fish health, growth, or survival:

- Watercourse crossing structures (i.e., culverts and bridges) will be constructed in the winter, to the extent practicable, when many of the watercourses are anticipated to be frozen to the bottom, which avoids instream work.
- The Project will use previously disturbed areas for project activities, project infrastructure and workspaces, to the extent practical.
- Riparian vegetation will be maintained whenever practicable.
- Watercourse crossings will be designed and constructed to maintain water flow, drainage patterns, and fish passage.

- Routine inspection of watercourse crossings will be conducted to determine if they are functioning as per design (e.g., allow fish passage) and identify potential evidence of erosion and sedimentation. If a barrier to fish passage or erosion and sedimentation issues are observed, corrective actions will be implemented.
- Conduct in-water construction activities outside of the restricted activity timing windows for the protection of fish and fish habitat (DFO 2013b), as follows, unless otherwise approved by DFO:
  - May 1 to July 15, for spring spawning in Nunavut watercourses and waterbodies with Arctic grayling and other spring spawners present (e.g., longnose suckers, slimy sculpin).
  - August 15 to June 30, for fall spawning in Nunavut watercourses and waterbodies with Arctic char, lake trout, whitefish, and other fall spawners present.
- Isolate and dewater work areas within watercourses or waterbodies and maintain downstream flow when conducting in-water construction activities.
- Fish salvage will be directed by a qualified environmental professional prior to dewatering activities. Captured fish will be released to the same watercourse, outside of the work area, where suitable habitat exists or in accordance with conditions of appropriate permits.
- A Project-specific EPP will be developed wherein mitigation measures are stipulated for construction and operations and maintenance activities. As part of an adaptive management plan for follow-up and monitoring, these mitigation measures will be regularly reviewed and updated by WKR to verify and enhance their effectiveness. In the event that an unexpected deterioration of the environment is observed as part of follow-up and/or monitoring, intervention mechanisms will include the adaptive management process.
- Develop and implement an ESCP, which will describe the measures and BMPs to be implemented to protect the environment through reduction of site erosion and protection of nearby watercourses and waterbodies from sedimentation.
- Erosion and sedimentation control measures will be regularly inspected to confirm they are performing as intended, repaired if damage occurs, and maintained until disturbed areas are revegetated or until such areas have been permanently stabilized by other effective measure.
- Develop and implement a WMP to address stormwater and runoff management, and water diversions.
- Develop and implement a Road Management Plan that outlines access to the road that includes access for fishing.
- A dust control program that uses water will be implemented during construction and operations and maintenance. Where applicable, dust suppression will follow Nunavut Environmental Guideline: Dust Suppressants (GN 2023).
- Develop and implement a Spill Contingency Plan, which will describe the procedures to prevent and respond to spills.
- All equipment arriving at the PDA, whether from within or outside of Nunavut, will be cleaned and decontaminated prior to arrival to avoid introduction of invasive species or deleterious substances.

- Washing, refueling, and servicing machinery and storage of fuel and other materials for machinery will be conducted a minimum of 31 m from the high water mark and in a manner to prevent deleterious substances from entering the water.
- Design water intakes to reduce the disturbance of lake or stream beds and fit all intakes with screens that comply with the end-of-pipe fish protection screens requirements (DFO 2020).
- Water withdrawals will be within water license limits outlined in the license as issued by the NWB, and in accordance with Measures to Protect Fish and Fish Habitat (DFO 2025a).
- Under-ice withdrawals will follow the DFO Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut (DFO 2010).
- An Explosives Management Plan will be developed and will include control measures to prevent or reduce the mobilization of nitrogen compounds to the aquatic environment.
- Blasting will not occur within 100 m of freshwater fish-bearing waterbodies such that instantaneous pressure will be less than 50 kilopascals (kPa) where fish may be present and particle velocity will be less than 13 millimetres/second (mm/s) near a spawning bed where eggs or larval fish may be present.
- Where applicable, only material with low ARD and ML potential will be used for the Project.
- Temporary access roads, quarries, and workspaces not needed after construction will be closed and reclaimed.

#### *20.3.3.4 Project Residual Effect*

### Change in Water Quality

#### *Total Suspended Solids*

Increased TSS concentrations due to Project activities could occur during all Project phases. Potential residual effects are discussed by Project phase below.

*Construction*

Sediment mobilization to watercourses and waterbodies could occur during construction activities associated with watercourse crossings (e.g., bridge and culvert installation), the port landside facilities, aerodrome, road, and Jericho Station (e.g., buildings/facilities, fuel storage, laydown areas, access roads, water intake, all-season gravel airstrip), as well as run off from land-based site preparations (e.g., vegetation clearing, stripping and stockpiling of organic and overburden materials, grading, blasting, and drilling), and establishment and operation of camps, maintenance yards, and laydowns.

Erosion and sediment control measures will be implemented for various earthworks and construction activities including construction of the port landside facilities, aerodrome, road, and Jericho Station; vegetation clearing, stripping and stockpiling of organic and overburden materials, grading, blasting, and drilling; and watercourse crossings to reduce effects on fish health, growth, or survival. The erosion and sediment control mitigation measures (e.g., silt fences, temporary diversions berms, and sandbags) will be outlined in a Project-specific ESCP and EPP. The Project's footprint, including riparian vegetation clearing, will be limited to the extent practicable to reduce exposed soils and erosion potential. Erosion and sediment control measures will be inspected regularly to verify that control practices are functioning as intended. The Project is considered permanent infrastructure, however, areas required only for construction, including temporary workspaces, laydowns, access roads and facilities, camps and several borrow sources/quarries will be reclaimed and revegetated following construction to avoid and/or reduce the potential for erosion.

Fish will be salvaged where in-water construction activities are isolated in a fish-bearing watercourse or waterbody, reducing the potential for injury or direct mortality. In-water construction activities within a fish-bearing watercourse or waterbody will also occur outside of the DFO restricted activity timing window whenever possible (May 1 to July 15 for spring spawning and August 15 to June 30 for fall spawning in Nunavut; DFO 2013b).

Elevated concentrations of TSS are not anticipated due to the construction of watercourse crossings (e.g., culverts and bridges) with the use of the following mitigation and avoidance measures:

- Watercourse crossing structures (i.e., culverts and bridges) will be constructed in the winter to the extent practicable, when many of the watercourses are anticipated to be frozen to the bottom, which avoids instream work.
- Temporary watercourse crossings that use an ice bridge or snow fill will follow the applicable measures in DFO's Code of Practice: Ice Bridges and Snow Fills (DFO 2023c).
- Watercourse crossings will be designed and constructed to site-specific conditions to maintain water flow, drainage patterns, and prevent erosion and sedimentation.
- If in-water construction is required (e.g., installation of bridge piers), mitigation measures described above for completing a fish salvage and works outside of the DFO restricted activity timing window will be implemented.
- Equipment will be operated from land, except when fording a watercourse for access.
- If fording is required, applicable measures in DFO's Code of Practice: Temporary Fords (DFO 2023b) will be followed with one piece of equipment crossing the stream once (over and back) to support construction.
- All equipment, machinery, and vehicles will be clean and in good working order prior to mobilizing for work on the Project.
- Construction activities will follow the Project-specific ESCP and EPP to prevent the mobilization of sediment into the freshwater environment.

With the implementation of mitigation measures and BMPs to reduce the potential for introduction and suspension of sediment into the freshwater environment, TSS concentrations are not anticipated to exceed the CCME WQG-FAL during construction. Therefore, residual effects on fish health, growth, or survival resulting from an increase in TSS during construction of the Project are anticipated to be low in magnitude, limited to the LAA, short-term in duration, have no sensitivity for timing, occur as multiple irregular events, and be reversible.

### *Operations and Maintenance*

During operations and maintenance, the potential sources of elevated TSS concentrations include operations of the Port landside, including the aerodrome and Jericho Station, water withdrawals and use, and road maintenance and use. These activities have the potential to cause changes in natural erosion and sedimentation conditions in watercourses from alterations to their natural flow regimes, site runoff conditions, and dust from road traffic and the airstrip.

Watercourse crossings (e.g., culverts and bridge) will be designed to maintain flow, drainage patterns, fish passage, and prevent erosion and sedimentation. Routine inspections of watercourse crossings will be conducted during the operations and maintenance phase to confirm they are functioning as per design and not resulting in erosion and sedimentation. If erosion and sedimentation issues exist, measures will be taken to correct the problem(s). This could include de-icing culverts to maintain flow, removal of obstructions (e.g., debris), and repair or replacement of erosion control measures. Maintenance of watercourse crossings will follow applicable measures in DFO's CoPs: Culvert Maintenance (DFO 2023e) and Interim Code of Practice: Bridge Repair and Maintenance (DFO 2023f).

Erosion and sediment control measures will also be applied throughout operations and maintenance. These mitigation measures and BMPs will be outlined in the Project's EPP. Dust from road traffic and the airstrip will be mitigated through a dust control program, which will reduce the sediment and dust entering watercourses and waterbodies resulting from Project activities. The dust suppression methods will follow Nunavut Environmental Guideline: Dust Suppressants (GN 2023).

Following the implementation of mitigation measures and BMPs, an increase in TSS during operations and maintenance is predicted to result in residual effects on fish health, growth, or survival. Residual effects are predicted to be low in magnitude, long-term in duration, occur as multiple irregular events, are reversible, and will be limited to the LAA. As project activities during operations and maintenance will occur year-round, there is high sensitivity associated with the residual effects (i.e., occur during a critical life stage such as spawning or egg incubation).

### ***Surface Water Quality***

Changes to surface water quality could occur during all Project phases due to dustfall, release of nitrogen from blasting residues, and leachate from ML/ARD materials used for embankments and road bases.

Dustfall from vehicles and equipment use on the unpaved roads and airstrip will be mitigated through a dust control program. This program will be implemented throughout construction and operations and maintenance, and where applicable, will follow Nunavut Environmental Guideline: Dust Suppressants (GN 2023). Watering unpaved roads and exposed surfaces during dry or dusty conditions will help suppress the dust, thereby reducing dust inputs in watercourses and waterbodies.

Changes to surface water quality due to blasting activities at the quarries will be mitigated through the development of an Explosives Management Plan, which will include control measures to prevent or reduce the mobilization of nitrogen compounds to the aquatic environment. Examples of these mitigation measures include:

- Storage of explosives will be controlled and runoff from storage areas will be contained.
- To the extent possible, blasting activities will be completed during winter months to avoid freshet runoff.
- Blast holes will be kept free of water where possible to avoid the incomplete combustion of ANFO.
- Explosives will be sealed and kept dry to prevent the incomplete combustion of ANFO.
- The handling and transport of explosives will be carried out by the supplier and blasting contractor under a licence to conduct such work and according to the requirements of applicable regulations including the *Explosives Act*, *Transport of Dangerous Goods Act, 1992*, and National Fire Code of Canada.

The Project will develop an ML/ARD Management Plan to reduce the potential for contaminants to enter watercourse and waterbodies from acid rock drainage/metal leaching. This will include managing ML/ARD material exposure during construction by encapsulating ML/ARD material if encountered, conducting geochemical characterization by a qualified professional for ML/ARD potential in the bedrock, and only using material with low ML/ARD potential to the extent practicable.

With the implementation of mitigation measures and BMPs that reduce the potential for changes in surface water quality, the Project could result in adverse effects on fish health, growth, or survival. The residual effects are predicted to be low in magnitude, limited to the LAA, long-term in duration, occur as multiple irregular events, and be reversible. The Project will limit most activities that could affect surface water quality to winter months (e.g., blasting, construction of watercourse crossings); dustfall may be the only activity to occur year-round, and therefore, it is anticipated that the residual effects may have moderate sensitivity to a sensitive life stage (e.g., fish spawning period).

### Death of Fish

#### *Physical Injury or Stranding*

Project activities during the construction phase have the potential to increase the risk of fish and fish egg mortality from physical injury or stranding. Effects on fish health, growth, or survival could occur during any activity that requires work below the high-water mark, including construction of watercourse crossings and the port landside facilities and aerodrome. These residual effects on fish health, growth, or survival is expected to occur at fish-bearing watercourses that provide moderate to high spawning and rearing habitat potential (i.e., 69 of the 171 primary and secondary watercourse crossings).

Fish salvages will be completed within fish-bearing watercourses or waterbodies prior to any in-water construction activities. Fish salvages will relocate fish away from affected areas to avoid injury or mortality. Where possible, dewatering and in-water construction activities will occur outside of the DFO restricted activity timing windows (May 1 to July 15 for spring spawning and August 15 to June 30 for fall spawning in Nunavut; DFO 2013b). Limiting in-water activities to outside these sensitive times will reduce potential interactions between the Project and important biological activities and life stages occurring within these periods.

Injury and mortality of fish, including species of cultural importance to Kitikmiut, other Indigenous groups, and other potentially affected communities, will be avoided at watercourse crossings by implementing the following measures:

- Watercourse crossings will be designed and constructed to site-specific conditions to maintain water flow, drainage patterns, and fish passage.
- Permanent watercourse crossings will be constructed in the winter, to the extent practicable, when many of the watercourses are anticipated to be dry or frozen to the bottom, and construction of temporary crossings will follow DFO's Code of Practice: Ice Bridges and Snow Fills (DFO 2023c).
- If in-water construction is required (e.g., installation of bridge piers), a fish salvage will be conducted and works will be scheduled outside of the DFO restricted activity timing window, where practicable.
- Equipment will be operated from land, except where a one-time ford is needed for access.
- If fording is required, mitigation measures outlined in DFO's Code of Practice: Temporary Fords (DFO 2023b) will be followed with one piece of equipment crossing the stream once, over and back, to support construction.
- Maintenance of watercourse crossings will follow DFO's Code of Practice: Culvert Maintenance (DFO 2023e) and Interim Code of Practice: Bridge Repair and Maintenance (DFO 2023f).

With the implementation of mitigation measures and BMPs, residual effects to fish health, growth, or survival resulting from physical injury or stranding are predicted to be low in magnitude. The geographical extent of residual effects will be limited to the PDA, short-term in duration and occur as multiple irregular events. The residual effects will not have sensitive timing as in-water works will be completed outside of the restricted timing windows. The consequences of death of fish or fish eggs from stranding or physical injury is expected to be permanent at an individual level but reversible at the population level.

### *Impingement and Entrainment*

Project activities will require the use of temporary water intakes and pumps to support construction and maintenance activities (e.g., winter road construction, dust suppression along the road), as well as freshwater supply for camps during construction. Potential watercourses and waterbodies used for water withdrawals will include all major rivers and lakes approximately two km from the Road corridor, the two lakes (North Intake Lake and South Intake Lake) in the Port vicinity, and Contwoyto Lake.

Temporary water intakes required for the Project will have intake screens designed and installed in accordance with DFO's Interim Code of Practice: End-of-pipe Fish Protection Screens for Small Water Intakes in Freshwater (DFO 2020). Screens will be sized for the weakest swimming life stage of the weakest swimming fish species present in the affected area (e.g., for PWI-1 this is ninespine stickleback). To further mitigate the impacts of water withdrawal, intakes will be placed outside of spawning habitat to reduce impinging or entraining incubating eggs or emerging larval fish. At the Port Intake Lakes, Contwoyto Lake, and other waterbodies along the corridor, water withdrawals will also follow DFO's Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut (DFO 2010).

With the implementation of the mitigation measures and BMPs described above, residual effects to fish health, growth, or survival resulting from impingement or entrainment from Project activities are not expected.

### *Production of Underwater Noise*

Production of underwater noise from Project activities will occur from embankment construction, as well as drilling and blasting in the quarries during construction and operations and maintenance phases.

Blasting will follow the mitigation measures and BMPs outlined in the Explosives Management Plan. This plan will include consideration of DFO recommended measures to avoid causing harm to fish from the use of explosives near fish-bearing waters (e.g., Wright and Hopky 1998; DFO 2025a). The use of modified blasting techniques will also be considered to reduce noise, including:

- Use of electronic detonation instead of explosive detonation cord.
- Use of air decking, which involves the use of an inverted cone in the blasthole to constrain energy within the rock mass.
- Timing sequence to develop an echelon effect.
- Coordinating blast patterns towards a partially open face.

All blasting for the Project will occur on land and not take place within fish-bearing waterbodies or watercourses. Blasting will not occur within 100 m of fish-bearing waterbodies such that instantaneous pressure will be less than 50 kPa where fish may be present and particle velocity will be less than 13 mm/s near a spawning bed where eggs or larval fish may be present. Therefore, residual effects on the health, growth, or survival of fish due to production of underwater noise are anticipated to be low in magnitude, limited to the LAA, and occur as multiple irregular events. As a subset of the quarries will remain operational through the Project's lifetime and be used year-round for construction and maintenance, the residual effects will be long-term and have high sensitivity associated with the residual effects (i.e., occur during a sensitive life stage such as spawning or egg incubation).

### Introduction of Aquatic Invasive Species and Disease

The introduction of aquatic invasive species and disease during construction and operations and maintenance phases of the Project will be avoided with the implementation of mitigation measures and BMPs, including:

- Only clean machinery, equipment, and vehicles will be used in water. Any equipment arriving at the site in a dirty condition will be cleaned and re-inspected prior to use. Cleaning equipment before use around watercourses will help to remove hydrocarbons, aquatic invasive species, and pathogens potentially present on the equipment.

- Watercourse crossings will be constructed in the winter to the extent possible, when many watercourses are likely to be dry or frozen to bottom, reducing the need for in-water works and the potential for introduction of invasive species.
- Regular inspection will be undertaken to identify noxious/invasive weed occurrences during construction and apply weed management through mowing to reduce introduction and spread of weeds in the right-of-way and surrounding natural vegetation.
- The Project will implement a Road Management Plan that will control access to the road through user agreements with organizations and individuals, which will limit potential introduction of aquatic invasive species by third-party users.

With the implementation of the mitigation measures and BMPs described above, the risk of introducing invasive species during construction, operations and maintenance is expected to be negligible.

### Increased Fishing Pressure

A residual effect on fish health, growth, or survival could occur during construction, operations and maintenance of the Project due to increased access to fish-bearing waterbodies and watercourses. Most of the watercourses crossed by the Project do not provide fishing opportunities due to their small size and/or intermittent flow (e.g., ephemeral, boulder gardens) and fish species found in these watercourses are predominantly forage fish (e.g., slimy sculpin, ninespine stickleback). Therefore, increased fishing pressure is expected to occur at larger watercourses and waterbodies with fish species of cultural importance to Kitikmiut, other Indigenous groups, and other potentially affected communities during the open water season (June–September) of construction, operations and maintenance.

Fishing pressure may be reduced by avoiding construction of pullouts or laydown areas near watercourses containing large-bodied fish and educating users of the road on the importance of maintaining healthy fish stocks. Additionally, WKR will implement a Road Management Plan that will control access to the road through user agreements with organizations and individuals. It is expected that this will limit public access to most of the watercourses and waterbodies that contain large-bodied fish, avoiding or reducing increased fishing pressure on species of cultural importance to Kitikmiut, other Indigenous groups, and other potentially affected communities in the LAA during operations.

With the implementation of mitigation measures, residual effects on fish health, growth, or survival resulting from increased fishing pressure are anticipated to be low, limited to the LAA, and occur as multiple irregular events. As the residual effects are expected to occur during the open water season, there is a high sensitivity associated with the residual effects (i.e., occur during a sensitive life stage such as spawning period). Due to the nature of the Project being permanent infrastructure, the residual effects will be long-term and considered irreversible.

### 20.3.4 Summary of Project Residual Effects

A summary of the residual effects on Freshwater Fish and Fish Habitat is provided in Table 20.12. Change in fish habitat is expected to be driven by the alteration, disruption, or destruction of fish habitat and the alteration of water quantity. The residual effects resulting from change in fish habitat will be low to moderate in magnitude following the implementation of BMPs and mitigation measures. The duration of these effects will vary from short-term to long-term, occur as multiple irregular events, and be limited to the LAA. The likelihood to occur during sensitive life stages (e.g., spawning period) range from no sensitivity to high sensitivity. The residual effects are anticipated to be reversible in areas that are reclaimed (e.g., temporary workspaces or access roads) but irreversible for permanent Project components (e.g., airstrip, Road, Port infrastructure).

Changes in fish health, growth, or survival are expected to be driven by the potential effects of changes in water quality due to TSS and water quality chemistry, death of fish from injury or stranding, production of underwater noise, and increased fishing pressure. Following the implementation of mitigation measures these residual effects are considered low in magnitude, limited to the LAA, and will occur as multiple irregular events. The timing of these residual effects will vary from short-term (i.e., construction phase only) to long-term (i.e., extend throughout operations and maintenance), as well as their likelihood to occur during sensitive life stages (e.g., spawning period) ranging from no sensitivity to high sensitivity. The residual effects are anticipated to be reversible, with the exception of death of fish or fish eggs which would be permanent at an individual level but reversible at the population level.

**Table 20.12 Summary of Project Interactions with Freshwater Fish & Fish Habitat**

| Residual Effect | Residual Effects Characterization | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Project Phase | Direction | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility |
| Change in Fish Habitat | C, O | A | N-M | PDA, LAA | NS-HS | ST-LT | IR | R, I |
| Change in Fish Health, Growth, or Survival | C, O | A | N-L | PDA, LAA | NS-HS | ST-LT | IR | R, I |

**Key:**
See Table 20.3 for detailed definitions
***Project Phase:***
*C: Construction*
*O: Operation*
***Direction:***
*P: Positive*
*A: Adverse*
*N: Neutral*
***Magnitude:***
*N: Negligible*
*L: Low*
*M: Moderate*
*H: High*
***Geographic Extent:***
*PDA: Project Development Area*
*LAA: Local Assessment Area*
*RAA: Regional Assessment Area*
***Timing:***
*NS: No sensitivity*
*MS: Moderate sensitivity*
*HS: High sensitivity*
***Duration:***
*ST: Short-term*
*LT: Long-term*
***Frequency:***
*S: Single event*
*IR: Irregular event*
*R: Regular event*
*C: Continuous*
***Reversibility:***
*R: Reversible*
*I: Irreversible*

*N/A: Not applicable*

### 20.3.5 Transboundary Effects

An assessment of the potential for transboundary effects on freshwater fish and fish habitat is provided in Volume 10, Section 33 - Transboundary Effects Assessment.

### 20.3.6 Effects of Climate Change on Freshwater Fish & Fish Habitat

The Arctic is warming at a rate twice as fast as the rest of the planet, with an annual mean temperature increase of 2.3°C during the 1948 to 2016 period, the greatest increase has been observed in the winter season (4.3°C) (Cohen 2019). Arctic river and lake ecosystems will be impacted by climate change through changes in annual hydrological and thermal regimes, which will affect freshwater biodiversity (Poesch et al. 2016). Changes in hydrological and thermal regimes have already been documented by Inuit. Major changes in lake and sea ice have been documented, not only in increased melting time, but also in decreased ice quality (Banci and Spicker 2024). Decreased water levels and changes in water quality have also been observed in rivers and lakes due to less rain and snowfall, changes in weather, and melting of permafrost because of global warming (Banci and Spicker 2024).

Future climate conditions are presented in the Climate Profile TDR (Appendix 12A). Key findings from the TDR for predicted future annual climate conditions are:

- Annual mean temperature is projected to increase across all representative location emission scenarios, with increases up to +8.4°C and 7.7°C by the 2080s for Grays Bay and Jericho-Lupin under SSP5-8.5 (Shared Socioeconomic Pathway).
- Winter warming represents the largest change from seasonal baseline conditions, with increases up to +12.4°C by the 2080s for Grays Bay and Kugluktuk under SSP5-8.5.
- The number of freeze-thaw cycles, frost days, and ice days is projected to decrease with the lowest numbers by the 2080s under SSP5-8.5. In contrast, the number of growing days is expected to increase under all scenarios and timeframes.
- Annual precipitation is projected to increase by up to 35.6% by the 2080s under SSP5-8.5.
- Winter and spring will see the largest increases in snowfall, while summer and fall snowfall will decline.
- Historical wind speeds are moderate, with extreme gusts occasionally exceeding 100 kilometres per hour (km/h). Future projections suggest a 10% decrease in maximum wind gust intensity. However, the frequency of extreme gusts (≥90 km/h) may increase by 30 to 40% by the 2080s.
- Local and Indigenous people in the Kitikmeot Region have also observed changes in water levels in the rivers, which have been recorded as part of the NTKP (Banci and Spicker 2024). It was reported that the rivers around Bathurst Inlet and coast seem to be drying faster, and the rivers are a lot lower than they are supposed to be.

Arctic freshwater fish are winter specialists and exhibit adaptations for survival in low temperatures, light, and food levels; however, these adaptations leave many species vulnerable to climate change with the projected changes in meteorological conditions. Impacts from climate change may directly and indirectly affect abundances of local fish populations and could result in the potential introduction of new species as their distributions extend northward (Poesch et al. 2016). Many of these local fish populations are an important subsistence food source for Inuit (Banci and Spicker 2024) and changes in their distribution and abundance would greatly impact harvesting these species of Inuit importance. Changes in fish habitat for freshwater fish present in the RAA could be negatively impacted by a decrease of habitat availability due to the loss in coldwater refugia, reduction of southern distribution boundaries, alteration of spawning and migration timing, reduced summer flow levels, and the alteration or loss of habitats used for critical life stages (e.g., spawning, rearing) (Poesch et al. 2016; GOC 2024). Changes in fish health, growth, or survival for freshwater species present in the RAA could be impacted by the introduction of new species through increased competition for resources, disruption of predator-prey relationships (including timing and presence of invertebrate food sources), as well as introduction and spread of new diseases and parasites (Poesch et al. 2016). These effects could alter community composition and diversity of freshwater fish in the RAA.

The mitigation measures developed for the Project will continue to be effective under the various climate change prediction scenarios as they include measures to avoid changes to flow regimes (quantity and quality), and crossing structure design will enable fish passage at various flow levels (both low flow and high flow conditions). Project-related residual effects are not anticipated to change under a climate change scenario, but if issues arise, adaptive management will be used to develop solutions where possible.

## 20.4 Assessment of Cumulative Effects

The Project is anticipated to have adverse residual effects on fish habitat and fish health, growth, or survival and as such, there is potential for the residual effects of the Project to act cumulatively with residual effects of other past, present, or future physical activities.

### 20.4.1 Project Residual Effects Likely to Interact Cumulatively

Appendix 9A in Volume 4, Impact Assessment Methodology, presents the project inclusion list, which identifies other projects and physical activities that might act cumulatively with the Project. Where residual effects from the Project act cumulatively with residual effects from other projects and physical activities (Table 20.13), a cumulative effects assessment is carried out.

**Table 20.13 Interactions with the Potential to Contribute to Cumulative Effects**

| Physical Activities | Effects | |
|---|---|---|
| | Change in Fish Habitat | Change in Fish Health, Growth, Survival |
| **Past** | | |
| Bathurst Inlet | – | – |
| Omingmaktok | – | – |
| Snap Lake Mine | – | – |
| **Present** | | |
| Arcadia Bay Project | – | – |
| B2Gold George Property | – | – |
| B2Gold Marine Laydown Area | – | – |
| Bulk Carriers | – | – |
| Cambridge Bay | – | – |
| Chuk and Fire Shear Blocks | – | ✓ |
| Commercial Cargo | – | – |
| Commercial and Domestic Harvesting | – | ✓ |
| Coppermine Project | – | – |
| Coppermine River Project | – | – |
| Diavik Diamond Mine | – | – |
| Ekati Diamond Mine | – | – |
| Epworth Project | – | – |
| Fishing Vessels | – | – |
| Gahcho Kué Diamond Mine | – | – |
| Goose Mine | – | – |
| Hackett River Project | – | – |
| High Lake (Izok Corridor Project) | – | ✓ |
| High Lake East | – | – |
| Hood River Gold Project | – | ✓ |
| Hope Bay Project | – | – |
| Hydroelectric | – | – |
| Icebreakers | – | – |
| Itchen Lake Property | – | – |
| Izok Lake (Izok Corridor Project) | – | – |
| Jericho Mine | ✓ | ✓ |
| Kennady North - Exploration | – | – |
| Kugluktuk | – | – |
| Lupin Mine | – | – |
| Muskox Nickel Property | – | – |

| Physical Activities | Effects | |
|---|---|---|
| | Change in Fish Habitat | Change in Fish Health, Growth, Survival |
| Nunavut Community Infrastructure | – | – |
| NT Community Infrastructure | – | – |
| Overflights | – | – |
| Passenger Ships and Pleasure Craft | – | – |
| Pistol Lake Project | – | – |
| Rae Copper Exploration Project | – | – |
| Rockinghorse (Koamaogaktok) Project | – | ✓ |
| Roma Project | – | – |
| Scientific Research | – | ✓ |
| South Kitikmeot Gold Project | – | – |
| Tanker Ships | – | – |
| Tibbit to Contwoyto Winter Road | – | – |
| Tourism | – | ✓ |
| Tree River Lodge | – | – |
| TTMG Project | – | – |
| Tugs/Barges | – | – |
| Ulu Gold Project | – | ✓ |
| Wolf/Mistake Lake Property | – | – |
| Yellowknife City Gold Project | – | – |
| **Past and Reasonably Foreseeable** | | |
| Indin Lake Gold Project | – | – |
| Mon Mine | – | – |
| Yellowknife Gold Project | – | – |
| **Project-Related Physical Activities** | | |
| **Reasonably Foreseeable** | | |
| Arctic Economic and Security Corridor | – | ✓ |
| Courageous Lake Mine | – | – |
| NICO | – | – |
| **Reasonably Foreseeable Induced** | | |
| Grays Bay Road and Port: Bulk Fuel Storage Expansion, Grays Bay Port | – | ✓ |
| Grays Bay Road and Port: Bulk Fuel Storage Expansion: Jericho | – | ✓ |
| Grays Bay Road and Port: Airstrip Expansion | ✓ | ✓ |
| Grays Bay Road and Port: Road Traffic | – | ✓ |
| Grays Bay Road and Port: Port Traffic | – | – |
| Grays Bay Road and Port: Air Traffic | – | ✓ |

| Physical Activities | Effects | |
|---|---|---|
| | Change in Fish Habitat | Change in Fish Health, Growth, Survival |
| Grays Bay Road and Port Phase 2 – Jericho Mine to NT Border | ✓ | ✓ |
| Hackett River Project | – | – |
| Hackett and Back River Access Road | ✓ | ✓ |
| High Lake Mine (Izok Corridor Project) | ✓ | ✓ |
| Izok Lake Mine (Izok Corridor Project) | – | – |
| Izok Lake Access Road | ✓ | ✓ |

Notes:

✓ = Other projects and physical activities whose residual effects are likely to interact cumulatively with Project residual effects.

– = Interactions between the residual effects of other projects and residual effects of the Project are not expected.

Effects identified in Table 20.13 that are not likely to interact cumulatively with residual effects of other projects and physical activities (no check mark) are briefly discussed below. The assessment of the cumulative effects that are likely to result from the Project in combination with other projects and physical activities are discussed in subsequent sections.

Residual effects on Freshwater Fish and Fish Habitat VC are anticipated to be spatially restricted to LAA. Physical activities, including marine transportation and traffic, community infrastructure, mineral exploration, proposed mines, and active mines located outside the RAA are not anticipated to have effects that interact cumulatively with those of the Project.

## 20.4.2 Change in Fish Habitat

### *20.4.2.1 Cumulative Effect Pathways*

Potential cumulative effects on fish habitat arising from past, present and reasonably foreseeable induced physical activities have the same effect pathways as those identified for the Project, and, therefore, could act cumulatively with residual Project effects. Reasonably foreseeable induced physical activities could alter fish habitat through direct alteration or loss of habitat (riparian and below the high water mark), alteration of fish passage, and alteration of water quantity (Section 20.3.2.2).

For the assessment of cumulative effects to change in fish habitat, spatial and temporal overlaps of Project-specific habitat alteration or loss with those of other projects or activities listed in Table 20.13 must occur. The present and reasonably foreseeable induced projects that have the potential to alter or destroy fish habitat within the Project RAA include Jericho Mine, Grays Bay Road and Port: Airstrip Expansion, High Lake, Grays Bay Road Phase 2 – Jericho Mine to NT Border, Hackett and Back River Access Road, Izok Lake Mine (Izok Corridor Project), and Izok Lake Access Road. No reasonably foreseeable physical activities are expected to contribute to effects on fish habitat within the RAA.

#### *20.4.2.2 Mitigation, Management, and Enhancement Measures for Cumulative Effects*

Future physical activities will require territorial and federal approvals and permitting and/or environmental impact assessments. These processes require future proponents to identify and assess potential effects to fish and fish habitat and identify and implement appropriate mitigation measures. It is expected that proponents of present and future projects will implement similar mitigation measures as those applied to the Project (Section 20.3.2.3) to reduce their contributions to cumulative effects on fish and fish habitat. These include adherence to federal requirements and guidelines such as the DFO's CoPs and DFO Measures to Protect Fish and Fish Habitat (DFO 2025a), and Policy for Applying Measures to Offset Harmful Impacts to Fish and Fish Habitat (DFO 2025b). Mitigation measures proposed in Section 20.3.2.3 will reduce the Project's effects and as such reduce the Project's contribution to cumulative effects to fish habitat, therefore, no additional mitigation measures are proposed.

#### *20.4.2.3 Cumulative Effects*

Existing environmental conditions reflect cumulative effects on the environment from past and present physical activities. The majority of aquatic habitats in the RAA are relatively undisturbed or greenfield in nature. The anthropogenic disturbances that do exist are primarily related to exploration mining and winter access roads. Reasonably foreseeable induced physical activities may contribute to further changes in fish habitat in the RAA. Some physical activities may result in temporary disturbances to fish habitat during construction but are reversible following reclamation (e.g., temporary workspaces, watercourse crossings), while others may result in long-term changes (e.g., mining, all-season roads).

It is assumed that the Grays Bay Road Phase 2 – Jericho Mine to NT Border, Hackett and Back River Access Road, Izok Lake Mine (Izok Corridor Project), and Izok Lake Access Road will have similar types of effects on fish habitat to the Project as they are also linear road developments. These projects will have localized residual effects on fish habitat through alteration or loss of fish habitat. For watercourse crossings along these projects, alteration or loss of fish habitat may result from the installation of bridges, culverts and riprap (e.g., infilling on the sides of culverts, bank stabilization at the aprons of culverts). The loss of riparian habitat at watercourse crossings could affect the quality of fish habitat by increasing water temperature and nutrient inputs relative to baseline conditions and altering habitat structure and cover.

The High Lake Project is proposed as a future base metal (zinc/copper) mining project located approximately 2 km west of the Project. While the timing of the proposed development of High Lake Mine, 2 km west of the Project, is unknown, it is assumed to require project components that may similarly result in the alteration or loss of riparian habitat (e.g., clearing for workspaces and roads) and fish habitat below the high water mark (e.g., infilling, riprap, culverts).

Grays Bay Road and Port: Airstrip Expansion is a proposed expansion of the currently proposed gravel airstrip up to an additional 2,000 ft (609 m) to accommodate larger aircraft. This would likely require additional riparian clearing and instream works (i.e., dewatering, infilling) at fish-bearing watercourses (e.g., WC-002) that may overlap with the expanded airstrip footprint.

Fish habitat offsetting may be required if DFO determines the habitat lost from Project components constitutes a HADD of fish habitat. A Fish Habitat Offsetting Plan will be developed through engagement with DFO, Kitikmiut, and other potentially affected communities to counterbalance unavoidable HADD of fish habitat in the Project footprint and provide additional benefits to the aquatic ecosystem. The reasonably foreseeable induced projects listed in Table 20.13 are similarly expected to be required to implement potential habitat offsetting programs for residual effects to fish habitat.

With the implementation of Measures to Protect Fish and Fish Habitat (DFO 2025a) and mitigation measures, the residual cumulative effects on fish habitat with the RAA are expected to be adverse, moderate in magnitude, long-term in duration, occur as multiple irregular events. Some of the residual effects are reversible following reclamation (e.g., temporary workspaces, watercourse crossings), while others may be irreversible (i.e., permanent infrastructure that overlaps fish habitat).

### 20.4.3 Change in Fish Health, Growth, or Survival

#### *20.4.3.1 Cumulative Effect Pathways*

Potential cumulative effects on fish health, growth, or survival arising from past, present, reasonably foreseeable, and reasonably foreseeable induced physical activities have the same effect pathways as those resulting from the Project (Section 20.3.3.2), and, therefore, could act cumulatively with residual Project effects. These physical activities could affect fish health, growth, or survival through change in water quality (TSS and water quality chemistry), death of fish and fish eggs (physical injury or stranding, impingement and entrainment, production of underwater noise), introduction of aquatic invasive species or disease, or increased fishing pressure. Community members from Cambridge Bay and Kugluktuk have expressed concerns about the cumulative effects of water quality from development of projects, including mining, and the effects on fish and fish health (NIRB 2004).

#### *20.4.3.2 Mitigation, Management, and Enhancement Measures for Cumulative Effects*

Proponents of other projects are expected to implement similar mitigation measures and be required to follow the same regulations as those described in Section 20.3.3.3. These mitigation measures will limit the changes in water quality, reduce fishing pressure, death of fish and fish eggs, and introduction of aquatic invasive species and disease, which will limit the potential spatial overlap of cumulative effects from multiple projects. Mitigation measures proposed in Section 20.3.3.3 will reduce the Project's effects and as such reduce the potential cumulative effects to fish health, growth, or survival, therefore, no additional mitigation measures are proposed.

#### *20.4.3.3 Cumulative Effects*

Construction activities associated with the present and development of High Lake Mine (Izok Corridor Project), Hood River Gold Project, Jericho Mine, Rockinghorse (Koamaogaktok) Project, Ulu Gold Project, Grays Bay Road Phase 2 – Jericho Mine to NT Border, Arctic Economic & Security Corridor, Grays Bay Road and Port: Bulk Fuel Storage Expansion (Grays Bay Port and Jericho), Airstrip Expansion, and Air Traffic, the Hackett and Back River Access Road, and the Izok Lake Access Road are expected to have the potential to change water quality through increased concentration of TSS, runoff, and dustfall leading to potential acute or chronic toxicological effects to aquatic life. Infilling of habitat, instream works, water withdrawals, and blasting may also be required for construction of watercourse crossings or other project components, which could lead to death of fish. These projects are expected to implement similar mitigation measures as those applied to the Project and will be subject to the same regulatory guidelines to protect fish and fish habitat, which will limit the potential for these effects to act cumulatively.

The Project also has the potential to act cumulatively with existing activities that have the potential to cause death of fish, including domestic harvesting, and tourism activities (e.g., sport fishing, outpost camps, etc.). The Project will create new access for fishing in previously inaccessible areas and connect to other projects, specifically other corridor projects, in the RAA (Table 20.13) which may result in increased fishing pressure of some fish populations, including the species of cultural importance to Kitikmiut, other Indigenous groups, and other potentially affected communities, and increased potential risk of introducing aquatic invasive species and disease. Increased fishing pressure or introduction of aquatic invasive species can result in negative effects on fish populations in the RAA. The application of mitigation measures, including implementation of the Project-specific Road Management Plan, will reduce the cumulative effects to fish health, growth, or survival from increased fishing pressure but will not negate them.

In consideration of this, it is anticipated that the Project will act cumulatively with other projects through potential increases in fishing pressures and to a lesser extent through other pathways to result in residual cumulative effects to fish health, growth, or survival. Residual cumulative effects to change in fish health, growth, or survival from increased fishing pressure in the RAA is considered low in magnitude, long-term in duration, will occur as multiple irregular events, and will be irreversible.

### 20.4.4 Summary of Cumulative Effects

Table 20.14 summarizes cumulative effects on Freshwater Fish and Fish Habitat.

Cumulative effects on freshwater fish and fish habitat are anticipated between the Project and certain identified physical activities in the RAA (Table 20.13). Cumulative effects with ‘Reasonably Foreseeable Induced’ physical activities will not occur if the Project does not occur; however, potential effects on the freshwater environment from ‘Present’ and ‘Reasonably Foreseeable’ physical activities may occur regardless of the Project, with the characterization of effects (e.g., extent or magnitude) potentially influenced by the Project. Overall, the cumulative effects are predicted to be low in magnitude for change in fish health, growth, or survival from increased fishing pressure and changes in water quality and moderate in magnitude for change in fish habitat from the loss of habitat below the high water mark and riparian clearing. The geographic extent of the direct effects will be the RAA but localized to the physical activities’ local areas. The potential residual cumulative effects will be long-term in duration because of their long operating life and will occur as irregular events, and range from reversible (e.g., temporary workspaces, watercourse crossings on fish habitat) to irreversible (e.g., permanent infrastructure that overlaps fish habitat).

**Table 20.14 Residual Cumulative Effects on Freshwater Fish & Fish Habitat**

| Residual Cumulative Effect | Residual Cumulative Effects Characterization | | | | | | |
|---|---|---|---|---|---|---|---|
| | Direction | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility |
| Change in Fish Habitat | A | M | RAA | HS | LT | IR | R-I |
| Contribution from the Project to Residual Cumulative Effect | The Project will affect approximately 214,181 $m^2$ of fish habitat (198,408 $m^2$ of riparian habitat and 15,773 $m^2$ of habitat below the high water mark). Although the Project will result in permanent change in fish habitat, fish habitat offsetting may be required if DFO determines the habitat loss from project components constitutes a HADD of fish habitat. A Fish Habitat Offsetting Plan will be developed to counterbalance unavoidable HADD of fish habitat within the PDA and therefore the Project overall will have a low contribution to residual cumulative effects on fish habitat. | | | | | | |
| Change in Fish Health, Growth, or Survival | A | L | RAA | HS | LT | IR | I |
| Contribution from the Project to Residual Cumulative Effect | The Project will create new access to previously inaccessible areas and its connection with other projects, specifically other corridor projects, in the RAA can be expected to result in increased fishing opportunities, which could result in pressure on some fish populations. The Project will implement the Project-specific Road Management Plan to reduce effects. Therefore, the Project has a low contribution to residual cumulative effects on fish health, growth, or survival. | | | | | | |

Notes:
See Table 20.3 for detailed definitions

***Direction:***
*P: Positive*
*A: Adverse*
*N: Neutral*
***Magnitude:***
*N: Negligible*
*L: Low*
*M: Moderate*
*H: High*
***Geographic Extent:***
*PDA: Project Development Area*
*LAA: Local Assessment Area*
*RAA: Regional Assessment Area*

***Timing:***
*NS: No sensitivity*
*MS: Moderate sensitivity*
*HS: High sensitivity*
***Duration:***
*ST: Short-term*
*LT: Long-term*

***Frequency:***
*S: Single event*
*IR: Irregular event*
*R: Regular event*
*C: Continuous*
***Reversibility:***
*R: Reversible*
*I: Irreversible*

*N/A: Not applicable*

## 20.5 Significance of Effects

### 20.5.1 Significance of Project Residual Effects

A summary of the Project's residual effects is described in Section 20.3.4. Adverse effects to fish and fish habitat are predicted to occur within the LAA from the construction, operation, and maintenance of the Project. These effects are predicted to occur from the loss of habitat (riparian and below the high water mark), changes in water quality (TSS and water quality chemistry), death of fish from physical injury or stranding, production of underwater noise, and increased fishing pressure. The Project will implement avoidance and mitigation measures, including offsetting measures if DFO determines the habitat loss from Project components constitutes a HADD of fish habitat to counterbalance these unavoidable effects. As such, the residual effects to fish and fish habitat are not anticipated to cause a measurable change in the productivity of relevant fish populations, including those of cultural or traditional importance to Kitikmiut, other Indigenous groups, or other potentially affected communities, and therefore are predicted to be not significant.

### 20.5.2 Significance of Cumulative Effects

A summary of the Project's cumulative effects is described in Section 20.4.4. If all reasonably foreseeable, and reasonably foreseeable induced projects proceed, in combination with the Project and past and present activities, they could result in change in fish habitat or change in fish health, growth, or survival. It is reasonable to assume that past, present, reasonably foreseeable, and reasonably foreseeable induced projects have been and will be required to implement mitigation measures and habitat offsetting, where authorized, to maintain the sustainability of fisheries. As such, these cumulative residual effects to fish are not anticipated to cause a measurable change in the productivity of relevant fish populations, including those of cultural or traditional importance to Kitikmiut, other Indigenous groups, or other potentially affected communities, and therefore are predicted to be not significant.

### 20.5.3 Summary of Mitigation, Management, and Enhancement Measures

To manage potential impacts on freshwater fish and fish habitat, a comprehensive set of mitigation measures and management strategies will be implemented (Table 20.15). These mitigation measures are based on applicable regulations, BMPs and CoPs, engagement with Kitikmiut, other Indigenous groups, or other potentially affected communities, and follow a mitigation hierarchy that prioritizes avoidance, reduction, and restoration. These measures will be detailed in multiple management plans and are expected to be effective when properly implemented, monitored, and adaptively managed. Management plans that will be in place to mitigate potential effects on freshwater fish and fish habitat include:

- Construction Environmental Management Plan
- Erosion and Sediment Control Plan
- Water Management Plan
- Fish Habitat Offsetting Plan (if required by DFO)
- Road Management Plan
- Explosives Management Plan

- Borrow Pits and Quarry Management Plan
- Noise and Vibration Abatement Plan
- Follow-up and Adaptive Management Plan
- Closure and Reclamation Plan
- ML/ARD Management Plan
- Spill Contingency Plan

**Table 20.15 Summary of Mitigation, Management, and Enhancement Measures for the Assessment of Freshwater Fish and Fish Habitat**

| Mitigation Measure | Potential Effects | |
|---|---|---|
| | Change in Fish Habitat | Change in Fish Health, Growth, or Survival |
| The Project will use previously disturbed areas for project activities, project infrastructure and workspaces, to the extent practical. | ✓ | ✓ |
| Riparian vegetation will be maintained where practicable. | ✓ | ✓ |
| Watercourse crossings will be designed and constructed to maintain water flow, drainage patterns, and fish passage. | ✓ | ✓ |
| Watercourse crossing structures (i.e., culverts and bridges) will be constructed in the winter to the extent practicable, when many of the watercourses are anticipated to be frozen to the bottom, which avoids instream works. | – | ✓ |
| Conduct in-water construction activities outside of the restricted activity timing windows for the protection of fish and fish habitat (DFO 2013b), as follows, unless otherwise approved by DFO:<br>• May 1 to July 15, for spring spawning in Nunavut watercourses and waterbodies with Arctic grayling and other spring spawners present (e.g., longnose suckers, slimy sculpin).<br>• August 15 to June 30, for fall spawning in Nunavut watercourses and waterbodies with Arctic char, lake trout, whitefish and other fall spawners present. | – | ✓ |
| Isolate and dewater work areas when conducting in-water construction activities, and maintain downstream flow in watercourses. | ✓ | ✓ |
| Fish salvage will be completed by a qualified environmental professional prior to dewatering activities. Captured fish will be released to the same watercourse, outside of the work area, where suitable habitat exists or in accordance with conditions of appropriate permits. | – | ✓ |
| Routine inspection of watercourse crossings will be conducted to determine if they are functioning as per design (e.g., allow fish passage) and identify potential evidence of erosion and sedimentation. If a barrier to fish passage or erosion and sedimentation issues are observed, corrective actions will be implemented. | ✓ | ✓ |
| Limit the grading of stream banks and riparian areas at watercourse crossing approaches where feasible. | ✓ | – |

| Mitigation Measure | Potential Effects | |
|---|---|---|
| | Change in Fish Habitat | Change in Fish Health, Growth, or Survival |
| A Project-specific EPP will be developed wherein mitigation measures are stipulated for Construction activities and Operating Plans (Road Management Plan, Port Operations Plan) for the Operations and Maintenance activities. As part of an adaptive management plan for follow-up and monitoring, these mitigation measures will be regularly reviewed and updated by WKR to verify and enhance their effectiveness. In the event that an unexpected deterioration of the environment is observed as part of follow-up and/or monitoring, intervention mechanisms will include the adaptive management process. | ✓ | ✓ |
| Develop and implement an ESCP, which will describe the measures and BMPs to be implemented to protect the environment through reduction of site erosion and protection of nearby watercourses and waterbodies from sedimentation. | ✓ | ✓ |
| Erosion and sedimentation control measures will be regularly inspected to confirm they are performing as intended, repaired if damage occurs, and maintained until disturbed areas are revegetated or until such areas have been permanently stabilized by other effective measure. | ✓ | ✓ |
| Develop and implement a WMP to address stormwater and runoff management, and water diversions. | ✓ | ✓ |
| Develop and implement a Road Management Plan that controls access to the road through user agreements with organizations and individuals. | – | ✓ |
| Develop and implement a Spill Contingency Plan, which will describe the procedures to prevent and respond to spills. | – | ✓ |
| A dust control program that uses water will be implemented during construction, and operations and maintenance. Where applicable, dust suppression will follow Nunavut Environmental Guideline: Dust Suppressants (GN 2023). | ✓ | ✓ |
| All temporary crossings will follow DFO's CoPs for temporary fords (DFO 2023b) and ice bridges and snow fills (DFO 2023c). | ✓ | ✓ |
| Water withdrawals will be within water license limits and in accordance with Measures to Protect Fish and Fish Habitat (DFO 2025a). | ✓ | ✓ |
| Under-ice withdrawals will follow the DFO Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut (DFO 2010). | ✓ | ✓ |
| Banks will be restored to original condition or as design specifies. | ✓ | – |
| Rip rap will be free of silt and other debris. | ✓ | ✓ |
| Temporary access roads, quarries, and workspaces not needed after construction will be closed and reclaimed. | ✓ | ✓ |
| If DFO determines the Project will result in a HADD of fish habitat, develop a Fish Habitat Offsetting Plan through engagement with DFO, Kitikmiut, and other potentially affected communities to counterbalance unavoidable HADD of fish habitat in the Project's footprint. | ✓ | – |
| Require machinery, equipment, and vehicles to be clean (i.e., decontaminated) and in good working order prior to mobilizing for work on the Project. | – | ✓ |

| Mitigation Measure | Potential Effects | |
|---|---|---|
| | Change in Fish Habitat | Change in Fish Health, Growth, or Survival |
| Any equipment arriving at site in a dirty condition will be cleaned and re-inspected prior to use. Cleaning equipment before use around watercourses will help to remove hydrocarbons, aquatic invasive species, and pathogens potentially present on the equipment. | – | ✓ |
| Regular inspection will be undertaken to identify noxious/invasive weed occurrences during construction and apply weed management through mowing to reduce introduction and spread of weeds in the ROW and surrounding natural vegetation. | – | ✓ |
| Washing, refueling, and servicing machinery and storage of fuel and other materials for machinery will be conducted a minimum of 31 m from the high water mark and in a manner to prevent deleterious substances from entering the water. | – | ✓ |
| Design water intakes to reduce the disturbance of lake or stream beds and fit all intakes with screens that comply with the end-of-pipe fish protection screens requirements (DFO 2020). | – | ✓ |
| An Explosives Management Plan will be developed and will include control measures to prevent or reduce the mobilization of nitrogen compounds to the aquatic environment. This plan will include consideration of the Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (Wright and Hopky 1998). | – | ✓ |
| Blasting will not occur within 100 m of fish-bearing waterbodies such that instantaneous pressure will be less than 50 kPa where fish may be present and particle velocity will be less than 13 mm/s near a spawning bed where eggs or larval fish may be present. | – | ✓ |
| Equipment will be operated from land, except when fording a watercourse for access. | – | ✓ |
| If fording is required, applicable measures in DFO's CoP: Temporary Fords (DFO 2023b) will be followed with one piece of equipment crossing the stream once (over and back) to support construction. | – | ✓ |
| The Project will develop an ML/ARD Management Plan to reduce the potential for contaminants to enter watercourse and waterbodies from acid rock drainage/metal leaching. This will include managing ML/ARD material exposure during construction by encapsulating ML/ARD material if encountered, conducting geochemical characterization by a qualified professional for ML/ARD potential in the bedrock, and only using material with low ML/ARD potential. | – | ✓ |
| The use of modified blasting techniques will also be considered to reduce noise, including:<br>• Use of electronic detonation instead of explosive detonation cord.<br>• Use of air decking, that involves the use of an inverted cone in the blasthole to constrain energy within the rock mass.<br>• Timing sequence to develop an echelon effect.<br>• Coordinating blast patterns towards a partially open face. | – | ✓ |

## 20.6 Prediction Confidence and Uncertainty

The predicted confidence for the assessment of residual effects and residual cumulative effects on freshwater fish and fish habitat is moderate for change in fish habitat. This prediction for change in fish habitat is based on the accuracy of the project design information, fish and fish habitat data, and the known effectiveness for mitigation measures and BMPs to be used during the Project. Aerial imagery of the watercourse crossings and the Project components footprint was used to calculate the area of alteration and loss of fish habitat. Understanding of the fish community in the Project PDA was based on multi-year sampling collected for Project specific surveys in 2024 and 2025, as well as historical data collected in 2001 to 2008, 2012 (MMG 2013), and 2017 (GBEEC 2017a, 2017b). The mitigation measures that will be implemented for the Project are industry standard techniques with a high-level of success at reducing impacts to fish habitat.

Confidence in the assessment of predicted effects of the Project on fish health, growth, or survival is high with the successful implementation of proposed mitigation measures. This is because mitigation measures proposed for the Project are well-established, widely understood, and based on BMPs and standards. These mitigation measures are designed to protect fish and address key sources of potential effects (e.g., surface water quality changes and mortality due to instream work).

WKR will continue to respond to questions and concerns from Kitikmiut, other Indigenous groups, and other potentially affected communities through its ongoing engagement efforts and information provided following submission of the IS will be reviewed in the context of the IS and for incorporation into Project planning, as appropriate.

## 20.7 Follow-up and Monitoring

The Project will implement follow-up and monitoring programs to verify the accuracy of effects and to evaluate the effectiveness of mitigation measures, the results of which will be used to identify and implement adaptive management measures, as appropriate. As it relates to fish and fish habitat, follow-up and monitoring measures will be implemented to monitor offsetting efforts (if required by DFO) through the Fish Habitat Offsetting Plan. Water quality and quantity monitoring will also be undertaken as part of the WMP, EPP, and ESCP, including turbidity monitoring during instream works. During operations and maintenance, monitoring will include routine inspections of watercourse crossings to determine if they are functioning as per design (e.g., fish passage) and identify potential evidence of erosion and sedimentation. If issues are identified, corrective actions will be taken to address the issues.

WKR will continue to respond to questions and concerns from Kitikmiut, other Indigenous groups, and other potentially affected communities through its ongoing engagement efforts and information provided following submission of the IS will be reviewed in the context of the IS and for incorporation into Project planning, including adaptive management and monitoring, as appropriate.

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