Appendix A to Denison's Response to FIRT Round 4 Wheeler River Project EIS Comments

October 18, 2024

IR-12

- Department: ECCC
- Project Effects Link: Change to an environmental component due to hazardous contaminants
- Reference to EIS, appendices, or supporting documentation: Section 2.2.3, Project Description

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, July 9, 2024)	IR (ROUND 4, Sept.6, 2024)	Denison Response (ROUND 4, Sept. 16, 2024)
IR-12	-	Context: There is not enough information provided within the draft EIS and site water infrastructure designs to determine if the infrastructure will sufficiently contain mine site contact and noncontact water runoff. It is unclear how water management will occur during all proposed Project stages at the Project airstrip, which is located away from the main Project site. No information has been provided regarding water that may come into contact with fuels and oils from machinery on the air strip, how and where that contaminated water will be treated, and how surface runoff around the airstrip will be managed. Additionally, it is unclear if contaminants from heavy machinery on roads have been considered during runoff collection plans throughout the mine Project site. Water management at the airstrip and roads can have impacts on surface water quality and sediment quality and contaminants (e.g., Hydrocarbons) from these sources should be considered in overall site water management plans. In Section 2.2.3.1 a site drainage plan for contact and non-contact water has been provided in Figure 2.2-17, and water balances have been provided for the different Project phases in Figures 2.2-14 to 2.2- 16. In Section 2.2.3.4 a volume of 30,000m3 for the process water pond is provided, and it is stated that the process water pond has the capacity to contain Probable Maximum Precipitation (PMP) event estimated to be 483.3mm while allowing for 1.0m of freeboard. However, there are no estimates on the total volume of water that may be drained from the overall site infrastructure (i.e., the well field, processing areas, etc.) during a 24-hr PMP event. Additionally, in Figure 2.2.17 culvert locations are provided, however there is no further information on culvert designs, flow ratings and capacity for PMP events. Rationale: In order to be able to understand	1. Provide information on how contact and non-contact water from the site airstrip will be managed. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment. 2. Provide further information on how potential contaminants in runoff from roads have been considered in the site water management. Include information on potential contaminant characterization and loadings and an assessment of risk to the environment. 3. Provide estimated volumes of water to be drained from overall site infrastructure (such as the mine terrace, airstrip, camp area etc.), during a 24-hr PMP event. 4. Provide additional information on culvert designs and conveyance capacity for PMP events.	1. and 2. Denison's approach to site water management is keep non-contact water "clean" – that is, the management approach provides that non-contact water does not come into contact with site aspects that may impart constituents/contaminants of concern and that non-contact water mingles with contact water. Contact water is water expected at the wellfield and processing plant terrace (refer to runoff collection arrows shown in draft EIS Figure 2.2-17), and also includes leachate collected from landfills. As such, runoff from the airstrip and site roads is considered non-contact water and will not be actively managed. However, should a spill occur, the spill response plan will be followed. Details of Denison's response plans will be developed to support licensing as part of the Waste Management and Emergency Management and Fire Protection programs. By following best practice and mitigation measures outlined in the EIS, Denison does not anticipate a need to continually manage water at the airstrip or along site roads as the water here will be clean, non-contact runoff. Examples of relevant mitigation measures include: • Project components including equipment and machinery will be regularly maintained and inspected to make sure they are in good working order. • Fuel storage and distribution infrastructure will be constructed in accordance with applicable legislation requirements. • Fuels will be stored in approved, above-ground, double-walled storage tank(s) equipped with secondary containment in accordance with provincial regulations and standards. • A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants. Refer to Section 14 of the draft EIS for the screening and evaluation of various accident and malfunction scenarios. Should unplanned events or conditions occur, it will be important for Denison to address and respond in an appropriate manner. Details of Denison's response plans will be developed to support licensing as part of the Waste Management and Emergency Management and Fire Protection programs. Additionally, should unexpected water pooling be observed at the airstrip or site roads during Operation, temporary water removal means such as vac trucks or sump pumps could be employed and the areas would be re-graded to minimize water accumulation. 3. As indicated in the response to IR-12, points 1 and 2 above, Denison expects contact water requiring management is at the wellfield and processing plant terrace (refer to runoff collection arrows shown in draft EIS Figure 2.2-17). For this area, the volume of water expected during a 24-hour PMP of 493 mm is approximately 37,240 m3. The wellfield runoff pond has been sized appropriately (38,200 m3 with 1 m of freeboard) to contain this volume of water. 4. Details related to culvert design and conveyance capacity are being developed as part of ongoing	This response has not been accepted, for the following reasons (numbers correspond with original IR): 1-2. In Figure 2.2-17 (Site Drainage Plan with Flow Direction and Culvert Locations) of EIS, site drainage or water management layout is not included for the access road to the airport and the airport area although they constitute part of the Project site. Although surface run off from airstrip or site road are mainly expected to be clean or non-contact water, CNSC expects Denison to provide information on water management system to mitigate risk of flooding and erosion at the airport and the access road. In addition, the access road connecting the mining site with airport crosses two streams (Kratchkowsky Creek and Hart Creek) that flow into Whitefish Lake, CNSC staff expects Denison to ascertain that culverts or crossings will be designed in such a manner that the flood hazard does not increase. Therefore, CNSC staff request that Decision provide information on how the surface runoff generated at airstrip and airport access road would be managed. 3. CNSC accepts estimated total volume of runoff from the wellfield area to Wellfield Pond however the PMP value of 489.3mm is obtained from 1999 study [A.1], based on historical rainfall data pre-1998, which appears to require updated PMP value. CNSC requests that Denison use a PMP value that is estimated using historical rainfall data that includes the most up to date meteorological data or provide justification on the validity of the current PMP. Further, the site infrastructure runoff water has not been considered in the water management infrastructure. Site water management planning should consider the capture of noncontact water to understand the potential effects of contaminants from non-contact water on the surrounding environment. Please also see follow-up IR-12-R1A and IR-12-R1B, related to this IR. Reference: [A.1] Atmospheric & Hydrologic Sciences Division – Atmospheric Environment Branch. 1999. Environment Canada Prairie & Northern Region – Point Probable Maximum Precipitation for the Prairie Provinces. Regina, Saskatchewan. Report No. AHSD – R99 – 01.	1-2. The water management design information presented in the draft EIS is considered appropriate at the EA stage and for this stage of the Project and fit-for-purpose to support the assessment of potential effects. The detailed design information on site water management infrastructure and runoff management requested in this IR and related IRs (i.e., IR-12-R1A and IR-12-R1B) will be provided to the CNSC and province as part of licensing and permitting. Nevertheless, and building on information provided previously, additional information and context regarding site water management and design concepts is provided as follows: • Conceptual site drainage maps spanning the full Project Area scale has been provided in Attachment IR-12 to this IR response table as context for the reviewer. • Design for the access roads and airstrip will in general be such that runoff will be encouraged through appropriate grading to drain away and not pond on or near the road or airstrip. • The overall vision for non-contact water along the access roads and airstrip is to use shallow ditching to dissipate the energy of runoff, to promote settling of suspended solids and allow the runoff to report to ground via natural grades that flow away from the infrastructure and into the natural drainage systems. • The condition of the airstrip and roads would be inspected and maintained routinely. For example, should unexpected water pooling be observed at the airstrip or site roads during Operation, temporary water removal means such as vac trucks or sump pumps could be employed, and the areas would be re-graded to minimize water accumulation. • Infrastructure features that are within 50 to 100 m (depending on grade) of waterbodies and that are associated with cleared land where there is no vegetated buffer may require additional erosion management / controls to ensure protection of the waterbodies from unmitigated suspended solids inputs. A map showing the distance of Project components to waterbodies is available in Attachment IR-12 as context for the reviewer. The map shows for example, that four waterbodies (waterbody numbers 1, 16, 23, and 86) are within 100 m of the Project footprint where potential erosion protection measures may be employed. The details of erosion control measures at these locations will be outlined in the Environmental Management System to support licensing. • Conceptually, minimizing changes in surface drainage patterns and watersheds is an important mitigation measure in the surface water quantity assessment. Collecting and managing non-contact water along roads and at the airstrip would result in a larger potential Project effect on surface water quantity associated with changes in surface drainage patterns and is not preferred. • As described in the draft EIS, the proposed crossings at Kratchkowsky Creek and Hart Creek are not culverts, but clear span bridges. Clear span bridges are designed to completely span	Item one of the IR has been accepted, but a follow-up item of advice can be found within the Advice to the Proponent table [reference to come]. There is outstanding information required to resolve item two. The Proponent did provide the requested proposed water management structures in Attachment IR-12; however, for the road to airstrip and the airstrip, the water management strategy does not include any containment structures or information about runoff quality. Contaminants may be contained in non-contact water from all site infrastructure, including the airstrip, roads, and the camp area. This information is required in order to make a determination on significant adverse effects, as it relates to potential impacts to water quality and fish, which are assessed as part of the EA process. The Proponent should confirm that the proposed water management structures, for the roads, camp pad, operation, substation and airstrip, will be included in the Final EIS. The Proponent should also describe how quality of runoff from infrastructure will be monitored, and what proposed mitigation and management measures will be taken if necessary. *With regards to items three and four, these have been accepted for the purposes of the current EA process, and the outstanding issues below will be further assessed as part of licensing technical reviews, prior to the granting of a license.* Denison is expected to address the following: 3. From FIRT's Information Request Rationale (2023-12-05): CNSC requests that Denison use a PMP value that is estimated using historical rainfall data that includes the most up to date meteorological data or provide justification on the validity of the current PMP. 4. From Denison submission of responses to IRs (2023-08-18): Details related to culvert design and conveyance capacity are being developed as part of ongoing engineering activities. Culverts will be a designed with a sufficient size and length to convey water around the site during a PMP event.	Refer to Attachment IR-12, IR-12-R1A, and IR-112-R1B (Round 3) below.	In a supplementary submission provided by Denison on July 9th, 2024, much of the information requested has been provided. Table 1 of round 3 attachment IR-12 is a screening of constituents of potential concern (COPCs) in water catchments. For the "Camp" catchment, risks to the aquatic environment from nutrients is described as "*None expected.*" However, sewage spills occur occasionally at camps and would release nutrients which could reach the aquatic environment. Also in Table 1, a management/mitigation often referred to is, "*A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.*" No further details were found on how wash bay water will be handled such that it does not pose a risk to the aquatic environment. The Proponent is relying on its spill response plan to handle any spills from the freeze plant and substation as well as the camp. Section 14 of the EIS, Accidents and Malfunctions, does not discuss these hazards. Given the stated reliance on the spill response plan for brine and sewage spills on site, it will be important that the plan explicitly address brine and sewage spills. In order to resolve this IR, Denison are expected to: • Include nutrients from sewage as a contaminant of potential concern for the Camp Watershed in Table 1 of round 3 attachment IR-12 or provide justification why there are no risks to the aquatic environment from nutrients from the camp. • Clarify how wash bay water will be handled, given that it may potentially contain contaminants. The following will be assessed during licensing: Denison will be expected to incorporate information provided in this supplementary submission in the Spill Response Plan.	In response to this IR, the Site Water Management Plan has been updated using track changes; see Attachment IR-12, IR-12-R1A, and IR-112-R1B (Round 3) below. Briefly for context, nutrients as a COPC related to sewage in the Camp Watershed have been incorporated into Table 1, and clarification with respect to the wash bay water management has been provided. In addition, responses to the CNSC's round 4 comment related to nutrients, the wash bay, and commitments for the Spill Response Plan are also provided here. **Nutrients:** The domestic wastewater treatment plant pond stores treated domestic wastewater prior to conveyance to the process water pond that reports to the industrial wastewater treatment plant (IWWTP). To clarify, the accidents and malfunctions assessment (EIS Section 14) considered four scenarios that could introduce COPCs to the environment from site "ponds and retention berms" (see Table 3-13, Appendix A or EIS Appendix 14-A), including overtopping, flooding and containment failure – the domestic wastewater treatment plant pond would fall into this generic "ponds and retention berms" category. The "ponds and retention berms" scenarios were deemed low risk or risks were deemed to be as low as reasonably practical (ALARP), given design and other mitigations. **Wash Bay:** Described in Section 2 of the EIS, a wash bay is proposed as part of the Wheeler River Project infrastructure. The wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants. The wash bay area will have an impermeable floor and a lined water collection sump. Rinse water from the wash bay sump will be routed to the wellfield runoff pond or directly to the process water pond. It will be subsequently conveyed as a component of the influent stream to the IWWTP where it will be treated. Treated effluent would be discharged to Whitefish Lake once deemed suitable for release. For the purpose of the site water management strategy, water derived

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		site water management and flood risk potential, more information needs to be provided regarding the site water infrastructure designs and capture volumes during PMP events. This information will aid ECCC in understanding how contact and non-contact water will be conveyed throughout the site. Runoff from roads and the site airstrip will contain contaminants from vehicles, heavy machinery, aircrafts and de-icing practices. Additional information on the runoff collection systems and expected contaminant concentrations for the site airstrip and roads is needed to determine if the receiving environment and aquatic and terrestrial receptors are protected.		engineering activities. Culverts will be a designed with a sufficient size and length to convey water around the site during a PMP event.		a watercourse without interfering with the channel bed and banks. • As a reminder to ECCC that the road to the Project's proposed airstrip follows an existing, decommissioned road, the Fox Lake Road. • The Project is located within the Wheeler Upland Landscape Area of the Athabasca Plain Ecoregion within the Boreal Shield Ecozone of Saskatchewan. The area is characterized by Brunisolic soils which are typically sandy, well-drained soil. Standing water is not a common occurrence and the well-drained characteristics of the region support the plans to divert non-contact water to ground, and as noted made surfaces would be graded to promote drainage and discourage pooling. • Please refer to our initial response to IR-12 (refer to Annex 1, IR-12 on page 6/419) for additional context on best practice and mitigation measures related to water management and also the scoping and evaluation of accident and malfunction scenarios in the draft EIS. • Importantly, the conceptual management scheme outlined above for non-contact water runoff is consistent with other roads and airstrips in the region – that is, runoff is not currently captured from other roads and airstrips in the region as envisioned by the review comment. This includes infrastructure associated with Saskatchewan Ministry of Highways and Infrastructure, existing uranium mines and mills, and communities including First Nation communities. It is not practical to do so and collection of non-contact water is not needed based on risk and moreover as noted above is to be avoided so as not to necessarily affect water quantity in local drainages and sub-drainages. 3. The reviewer is referred to the response to IR-103 for a discussion regarding the PMP and its suitability and relevance given available data and different methods of calculation included that provided by CSA guidance. Notwithstanding the information provided in response to IR-103 Denison is committed to revisiting this issued as per CNSC's recommendations, as applicable, for the licensing phase of the Project. To reiterate, Denison believes it has fulfilled its information requirements for the EIS as outlined in the EA guidance provided by the province and federal government, including CEAA 2012, and that the FIRT has been provided with the appropriate level of detail on the water management topic for drawing conclusions on the EA process. Notwithstanding that, Denison recognizes that further information will be required as the Project moves past the EA and into the licensing and permitting phases. It is Denison's opinion that this comment is not an IR related to the EIS. A request for clarification or additional information on a detailed design aspect would need to be responded to by the Denison as part of the licensing process; however, this level of detail is not necessary for drawing conclusions on the EA process.				from the wash bay is by definition "contact water". **New Commitment:** Denison concurs that it will incorporate information provided in this supplementary submission in the Spill Response Plan during licensing. This commitment is reflected in the updated commitment register (see commitment 2-35) that is provided as part of the EIS submission.
n/a	IR-12-R1A	Context: Runoff water from site infrastructure such as the airstrip and roads may be categorized as non-contact water because it does not come into contact with contaminants of potential concern	*n/a*	*n/a*	1. Update site water management plans to include management of potentially deleterious substances contained in non-contact water from all site infrastructure. 2. Provide updated estimates of water volumes to be drained and managed from overall site infrastructure (including runoff	1 and 2. Denison understands the prohibition related to deleterious substances under Section 36 of the Fisheries Act and Denison affirms its commitment to ensuring no such events occur. However, in the context of this IR, we interpret ECCC is connecting the concept of deleterious substances under MDMER (those constituents identified in Part 1(3) i.e., arsenic; copper; cyanide;	The Proponent has not adequately answered either part of the IR. An updated site water management plan that includes the management of all water that has been in contact with project infrastructure and updated estimates of water volumes to	Refer to Attachment IR-12, IR-12-R1A, and IR-112-R1B below.		

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		(COPCs) directly from mining operations infrastructure. However, it still has the potential to contain deleterious substances from mine-related activities such as operation of vehicles, including heavy machinery and aircraft, spills, fire management practices, and snow removal practices. The Metal and Diamond Mining Effluent Regulations (MDMER) pursuant to the Fisheries Act requires all mine effluent and seepage from the mine site that contains deleterious substances be discharged through a final discharge point. This includes deleterious substances in non-contact water from all site infrastructure including the airstrip, roads, and camp area. Rationale: All mine effluent and seepage that contains deleterious substances must be discharged through a final discharge point. This includes site non-contact water which has the potential to contain deleterious substances such as those released from vehicles, machinery, aircrafts, spills, and de-icing practices. The Proponent has not included how non-contact water runoff from site infrastructure will be captured within site water management planning. To understand the potential effects of contaminants from non-contact water on the surrounding environment, site water management planning needs to be updated to include the capture of non-contact water.			from roads, airstrip, camp area, etc.) during the different Project phases. Include updated information on water treatment flows, capacity and effluent discharge during normal operations, and a 24-hr Probable Maximum Precipitation (PMP) Event.	lead; nickel; zinc; suspended solids; radium 226; and un-ionized ammonia.) with the general concept of deleterious substance per the Fisheries Act. Mine effluent associated with MDMER defined deleterious substances will be discharged through a final discharge point to Whitefish Lake, and this has been reflected in the water management information presented in the draft EIS, including Section 2.2.3. The IR is suggesting Denison collects runoff water from the airstrip and roads with the rationale that this is needed in order to collect potential contact water associated with hydrocarbons spills (the text in rationale notes: This includes site non-contact water which has the potential to contain deleterious substances such as those released from vehicles, machinery, aircrafts, spills, and de-icing practices). As indicated in the draft EIS and in our initial response to IR-12 (refer to Annex 1, IR-12 on page 6/419), should a spill occur, the spill response plan will be followed. The details of Denison's response plans will be developed to support licensing as part of the Waste Management and Emergency Management and Fire Protection programs. Importantly, hydrocarbons are not mine waste-related deleterious substances perm MDMER definition. Collecting and treating non-contact runoff throughout the life of the Project would mean Denison collects an extremely large volume of clean water to protect against infrequent hydrocarbon spills which will be cleaned up in the appropriately scaled process (spill response), in terms of cost and risk to the environment. No other roads or airstrips in the region (including those associated with uranium mine and mill operations) requires the collection and treatment of runoff water from infrastructure such as roads and airstrips. It is not practical to do so and based on risk, the collection of non-contact water is not required. The road or trail to the airstrip is currently an unmaintained road: the decommissioned Fox Lake Road. For road upgrades and airstrip construction, Denison will be using material from the borrow area. Borrow pit area selection was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples. As such, the material used to upgrade roads and construct the airstrip will not be a source of metals or ARD. Denison will implement erosion control measures at infrastructure locations within 50 to 100 m of a waterbody (refer to response to IR-12 above and to Attachment IR-12, Figure IR-12-5: Distance from Project Footprint to Waterbodies) where required (i.e., at locations where there is no vegetated buffer adjacent to the waterbodies). In consideration of the above, Denison maintains that the runoff at the airstrip and roads are non-contact water. The water management mandate for the Wheeler River Project is to keep clean water clean and minimize the total volume of water requiring management, treatment, and discharge. In the draft and revised draft EIS, Denison has evaluated potential Project effects on surface drainage in Section 8.1, as part of the Project-surface water quantity interaction of Project overprinting of drainage areas. As noted in the draft EIS, Section 8.4.1.4.2.1, this assessment was appropriately focused on areas of active water collection. It was noted that the road and airstrip were not considered to affect hydrology materially. Both may potentially redirect some flow and have a small influence on the timing of concentration of runoff and infiltration rates; however, in general, they are anticipated to have a very small influence and are not expected to change runoff volumes at assessment nodes.	be drained and managed from overall site infrastructure (including runoff from roads, airstrip, camp area, etc.) are required to understand the potential effects of contaminants on the surrounding environment. The Proponent should include updated information on water treatment, flows, capacity and effluent discharge during normal operations, and a 24-hr Probable Maximum Precipitation (PMP) Event.			

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	IR-12-R1B	Context: The Proponent has clarified that there is no infrastructure in place for management of non-contact water from site infrastructure that may contain COPCs, including but not limited to roads, the airstrip, and the campground. Rationale: To understand the potential effects of contaminants from non-contact water on the surrounding environment, site water management planning needs to be updated to include the type of infrastructure and its location for the capture of non-contact water	n/a	n/a	Provide a map marking the locations of proposed surface drainage structures for runoff collection including collection ditches, culverts, diversion ditches, perimeter berms, collection ponds and other similar structures.	It is Denison's opinion that this comment is not an IR related to the EIS. A request for clarification or additional information on a detailed design aspect would need to be responded to by Denison as part of the permitting and licensing process; however, this level of detail is not necessary for drawing conclusions on the EA process. In the draft and revised draft EIS, Denison has evaluated potential Project effects on surface drainage in Section 8.1, as part of the Project-surface water quantity interaction of Project overprinting of drainage areas. As noted in the draft EIS, Section 8.4.1.4.2.1, this assessment was appropriately focused on areas of active water collection. It was noted that the road and airstrip were not considered to affect hydrology materially. Both may potentially redirect some flow and have a small influence on the timing of concentration of runoff and infiltration rates; however, in general, they are anticipated to have a very small influence and are not expected to change runoff volumes at assessment nodes. Notwithstanding the above, Denson has provided the reviewer with additional, conceptual site drainage maps in Attachment IR-12, Figures IR-12-1, IR-12-2, IR-12-3, and IR-12-4; these are supplemental to the site drainage map provided in the draft EIS Figure 2.2-17.	n/a (accepted)	Refer to Attachment IR-12, IR-12-R1A, and IR-112-R1B below.		

ATTACHMENT IR-12 (included in Round 2 submission)

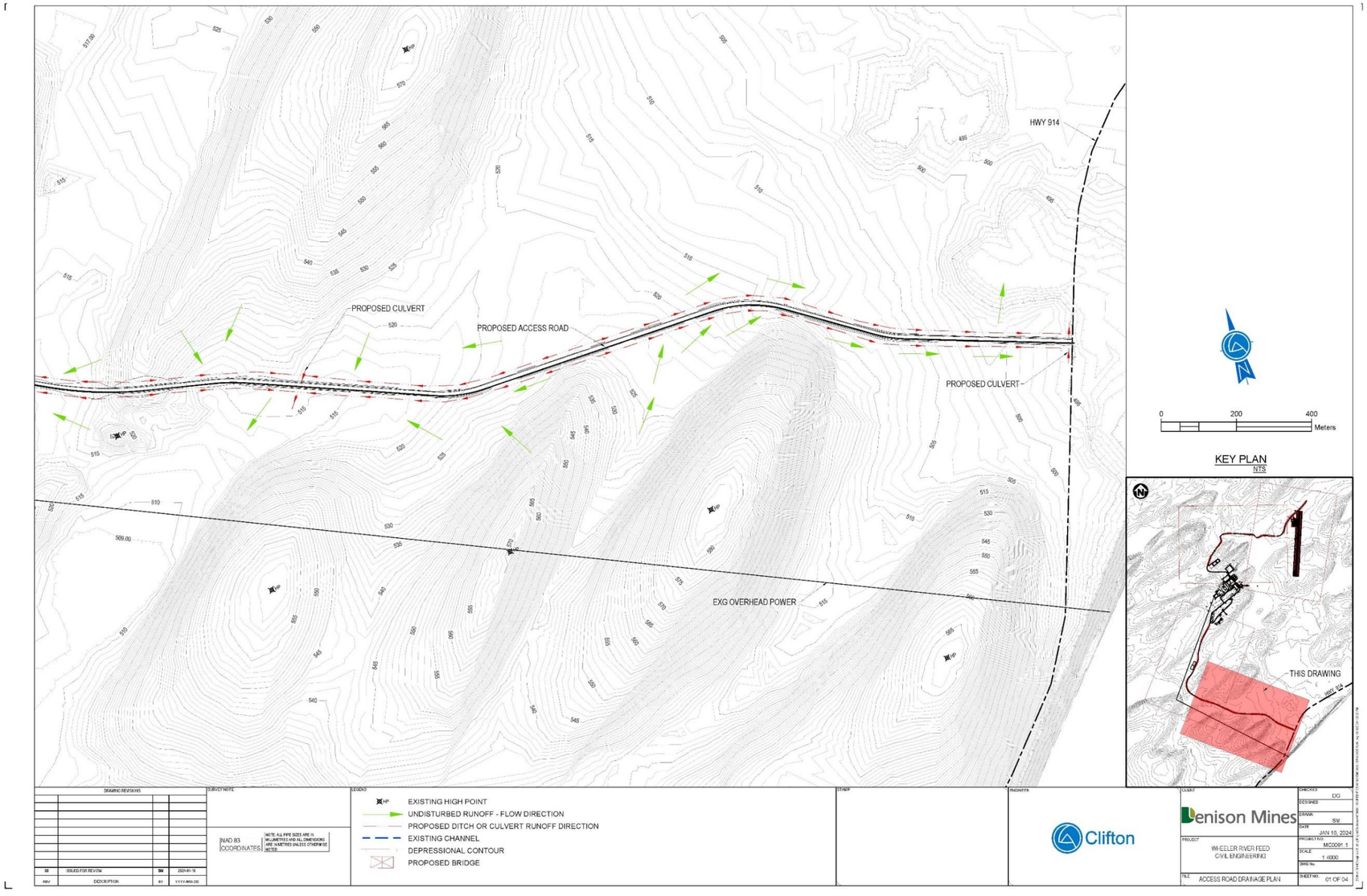


Figure IR-12- 1: Conceptual Site Drainage – Access Road (segment 1 of 2)

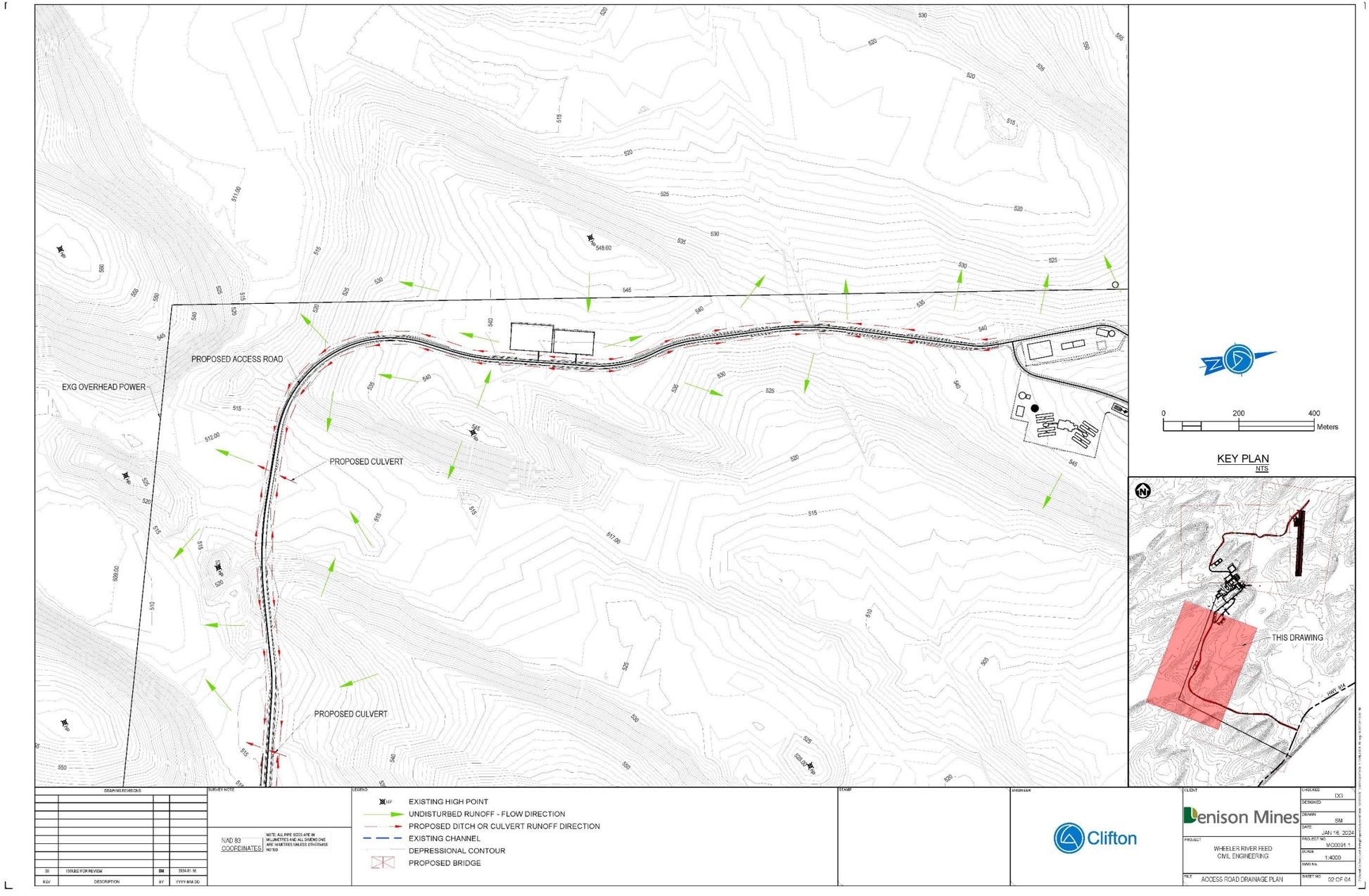


Figure IR-12- 2: Conceptual Site Drainage – Access Road (segment 2 of 2)

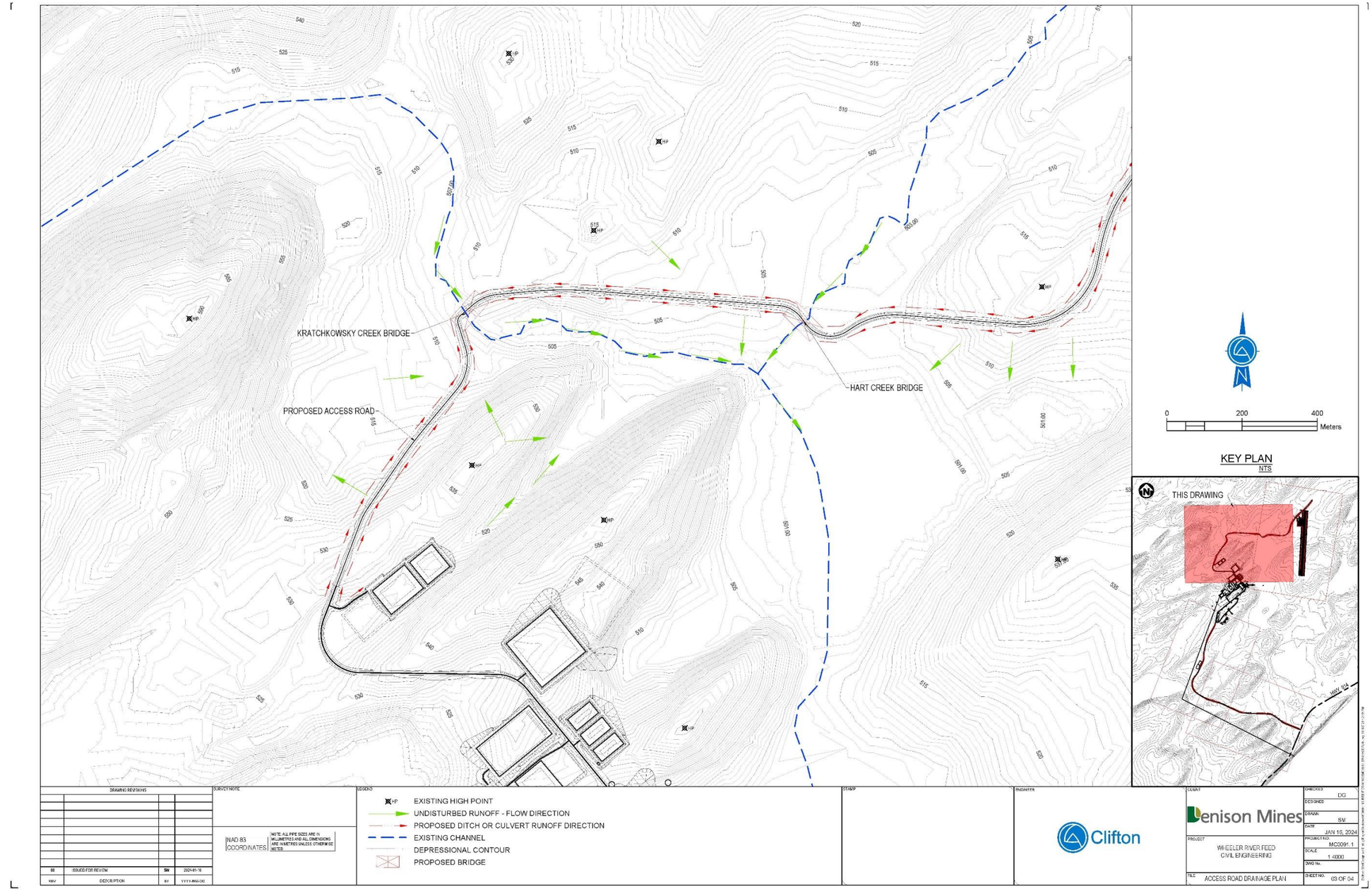


Figure IR-12- 3: Conceptual Site Drainage – Road to Airstrip

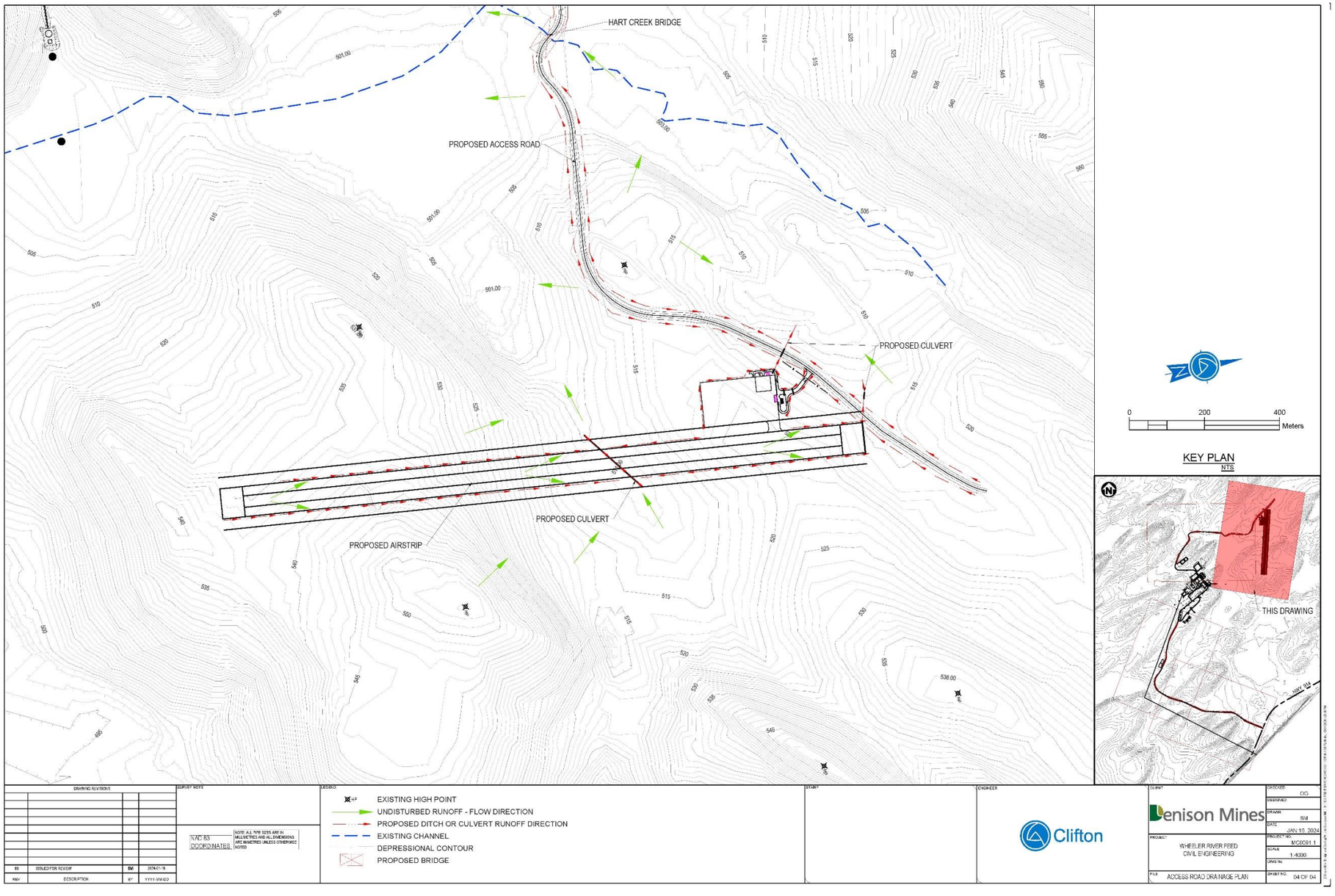


Figure IR-12- 4: Conceptual Site Drainage – Near Airstrip

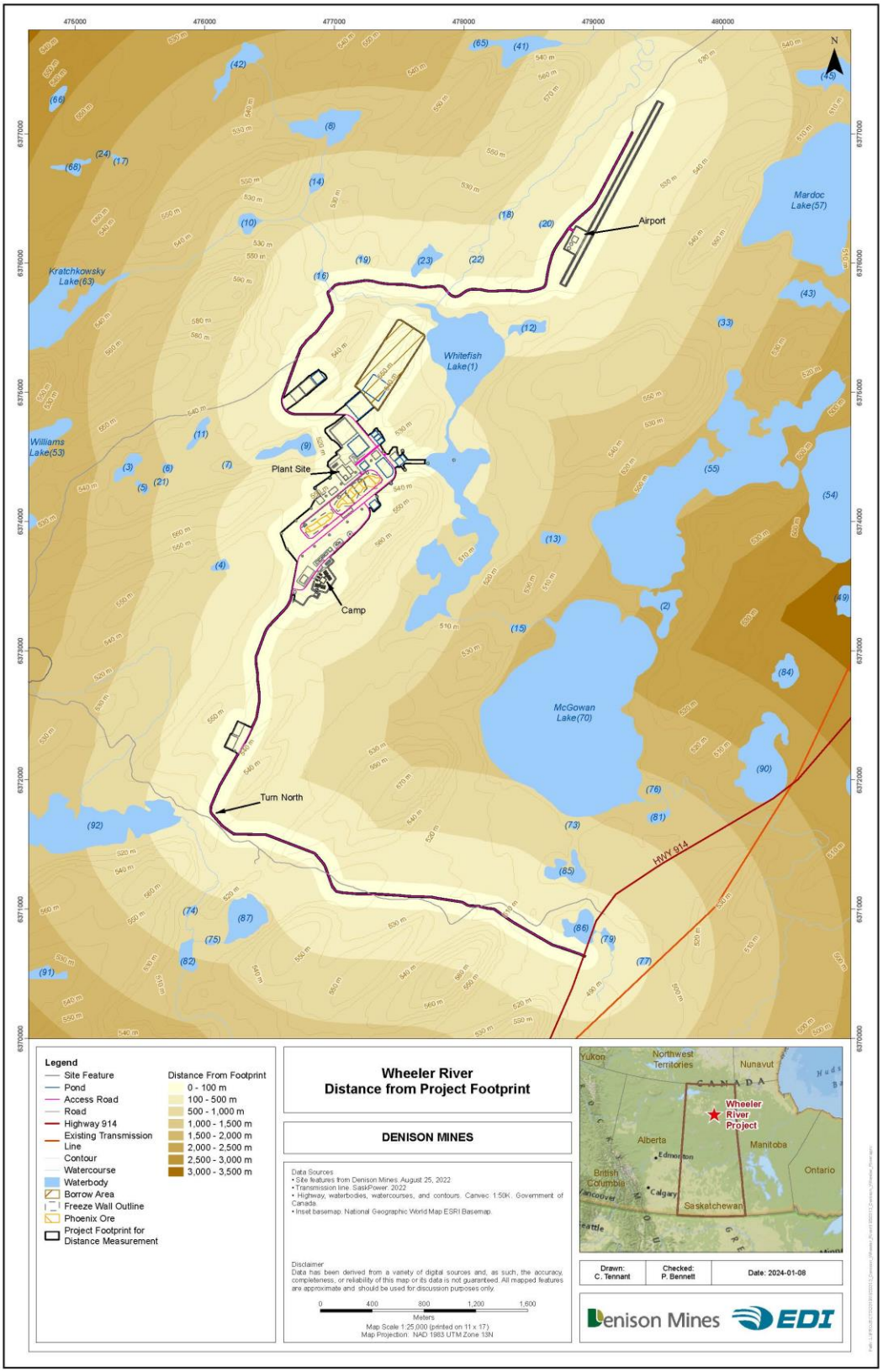


Figure IR-12-5: Distance from Project Footprint to Waterbodies

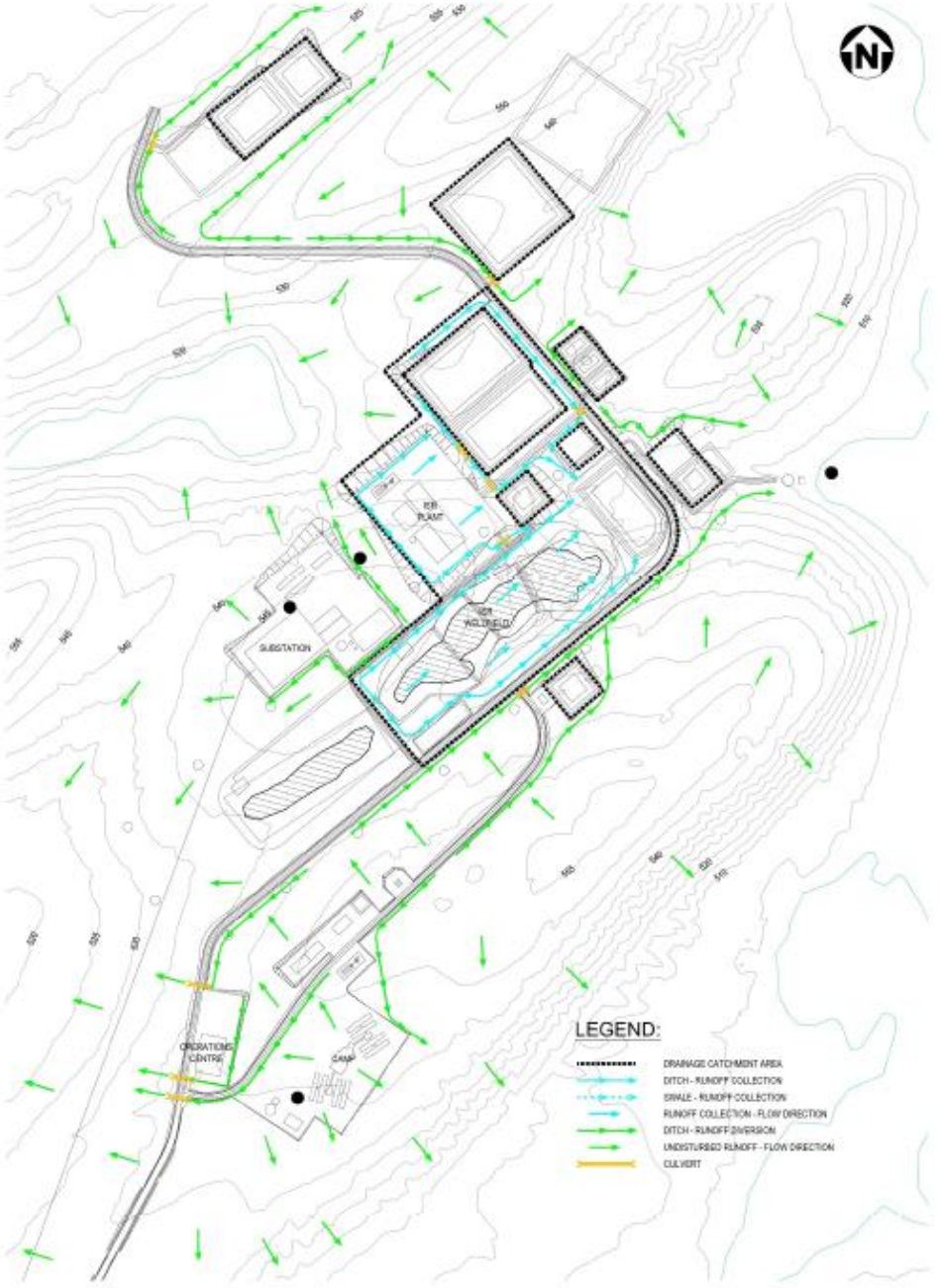


Figure 2.2-17: Site Drainage Plan with Flow Direction and Culvert Locations

For reference: Figure 2.2-17 from revised draft EIS

Attachment IR-12, IR-12-R1A, IR-12-R1B (Round 3 with updates from Round 4 in track changes)

In response to IR-12 and related IRs 12-R1A and 12-R1B Denison offers the following that has been divided into two parts.

In **Part 1**, an updated site water management plan is presented commensurate with the stage of the EA process for Wheeler River Project (or Project). That is, the site water management plan is largely conceptual at this time; however, Denison is able to provide additional information that builds on information presented previously in the EIS and supporting documentation including Round 1 and Round 2 IR responses as the Project-related engineering design process is advancing in parallel with the EA.

In **Part 2**, Denison has prepared specific responses to specific questions raised in IRs 12, 12-R1A and 12-R1B that are not necessary fully described by Part 1 of the response.

Part 1 – Wheeler River Project Site Water Management Plan

Introduction

The following conceptual Site Water Management Plan (SWMP, or Plan) has been prepared in response to the third round (May 2024) of Federal Indigenous Review Team (FIRT) information requirements (IRs) regarding the Wheeler River Project (Project) Environmental Impact Statement (EIS) submission, as well as the comments provided by CNSC on the Round 3 comment/disposition submission. The information offered herein builds on information provided previously by Denison Mines (Denison) in the EIS, its supporting documents, and responses to ~~Round 1 (March 2023) and Round 2 (November 2023)~~ FIRT IRs.

As noted, the Plan builds on information provided previously by Denison; but further seeks to consolidate this information into once place for ease of reference, as well as provide additional water management related detail that has been developed as Project-related engineering design has been advancing in parallel with the environmental assessment process. The Plan describes the SWMP design concept, its design basis, the delineation of so-called "contact" versus "non-contact" water management areas on the Project site, water management structures / infrastructure, the quantities of water that would be expected to be managed within the water management areas under normal and event-related conditions and monitoring.

The SWMP is provided with a conceptual level of detail and information commensurate with the stage of development of the Project and advancement of engineering design. Further detail and documentation, including engineering design to support construction, regarding site water management will be developed as the Project moves from the environmental assessment (EA) process into permitting and licensing, initially for site preparation and construction, subsequently for operations and ultimately for decommissioning.

Design Concept

The Project's design concept related to site water management is to keep clean water clean and minimize the total volume of water requiring more active management, treatment, and discharge. Denison will achieve this by 1) diverting clean, non-contact runoff around Project components and 2) collecting contact water for treatment in the Industrial Wastewater treatment Plant (IWWTP), and eventual release to Whitefish Lake. In general terms and within the context of this Plan, the following definitions are provided for contact and non-contact waters:

- Contact water is potentially contaminated as the result of interaction with Project process/structures/infrastructure and therefor requires management through site water infrastructure and conveyance to the IWWTP prior to controlled release to the environment.
- Non-contact water is suitable for direct release to the environment with appropriate, conventional best management practices and mitigation measures.

The rationale for the distinction of the two water types and management strategies is primarily associated with the desire to affect local hydrology as little as possible by only diverting runoff from natural catchments and sub-catchments where it is deemed necessary to protect water quality. Conceptually, minimizing changes in surface drainage patterns and watersheds is an important mitigation measure in the surface water quantity assessment. Collecting and managing non-contact water would result in a larger potential Project effect on surface water quantity associated with changes in surface drainage patterns and is not preferred.

Design Basis

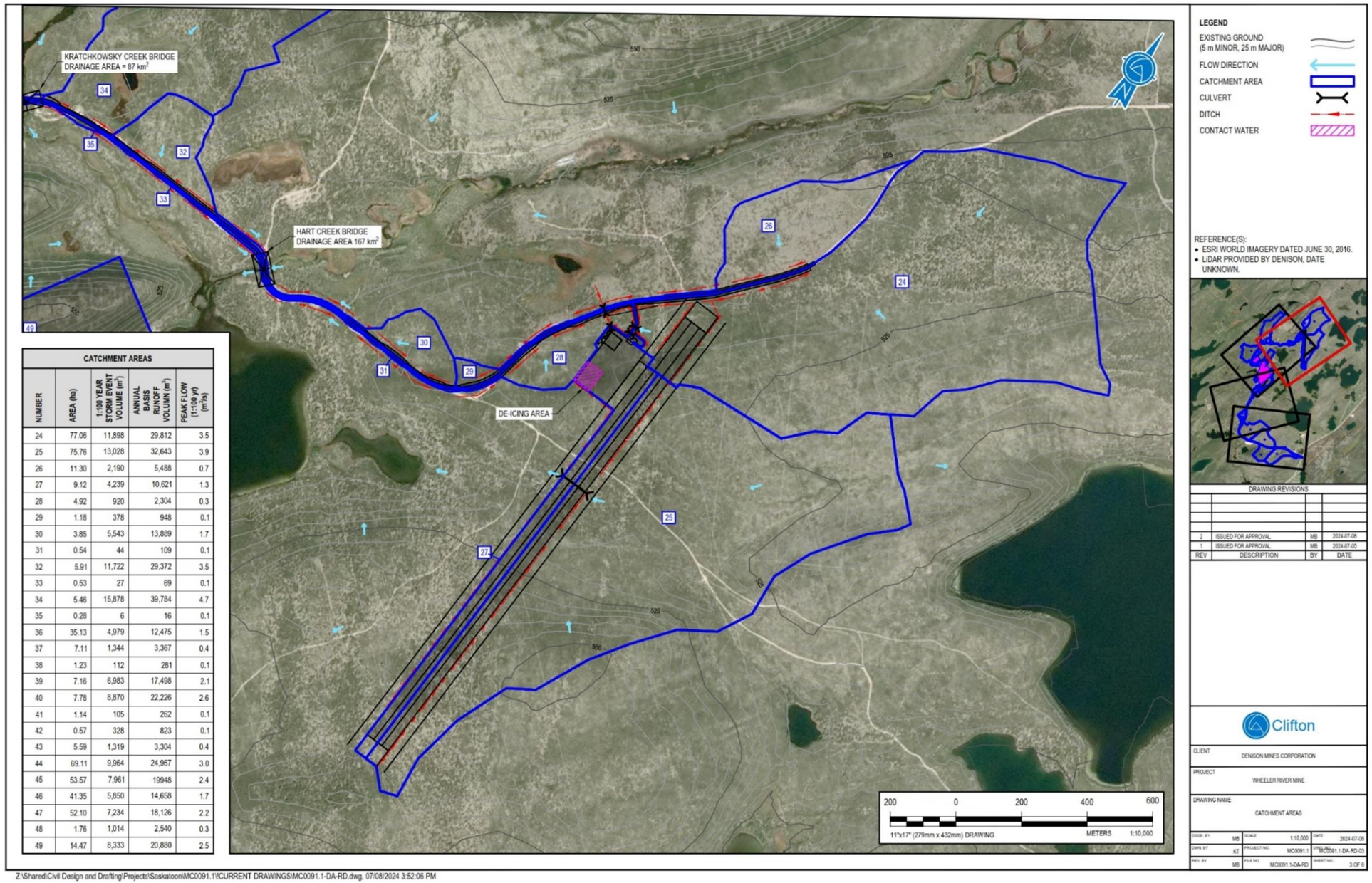
For the purpose of contact and non-contact water management, the following design bases have been assumed.

For the contact water portion of the system, all water management structures/infrastructure would be designed to contain an event equivalent to 493 mm of precipitation over a 24-hour period (herein referred to as the 24-hour probable maximum precipitation (PMP) event). By definition, events exceeding this magnitude would be conveyed to the environment through purposely built emergency spillways so that the structural integrity of the structures/infrastructure would be maintained and not result in further event related consequences. For context, this volume of water is greater than the average annual precipitation recorded at nearby Key Lake (refer to Appendix D to Appendix 6-C) for the period 2011 through 2020 that was 456 mm. Additionally, as described in Section 2 of the EIS, a wash bay is proposed as part of the Wheeler River Project infrastructure. The wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants. For the purpose of the site water management strategy, water derived from the wash bay is by definition "contact water" (i.e., fits the definition of contact water above), despite the fact that the wash bay is associated with the "camp" area and is not considered in the screening of non-contact water sources below for that reason. The wash bay area will have an impermeable floor and a lined water collection sump. Rinse water from the wash bay sump will be routed to the wellfield runoff pond or directly to the process water pond. It will be subsequently conveyed as a component of the influent stream to the IWWTP and treated. Treated effluent would be discharged to Whitefish Lake once deemed suitable for release.

For the non-contact water portion of the system, all water management structures/infrastructure would be designed to withstand an event equivalent to 89 mm of precipitation over a 24-hour period (herein referred to as the 24-hour intensity-duration frequency (IDF) event). This event is the 1 in 100 year return event and was calculated utilizing the publicly available web-based intensity-duration-frequency tool that is pre-loaded with data from 898 Environment and Climate Change Canada rain stations. This number was derived based on the projection of conditions for the period 2020 - 2050 for the Wheeler River Project site coordinates and therefore considers the time period that overlaps with the time period when water is likely to be actively managed on the site (i.e., construction, operation, initial phase of decommissioning).

Delineation of Catchments Areas

For the purpose of defining water management areas / nodes within and adjacent to the Project site, a series of maps delineating catchments areas based on local topography and drainage patterns have been developed. The delineation of key catchments at the Project site is shown in Figures 1 to 5 below.



CATCHMENT AREAS				
NUMBER	AREA (ha)	1:100 YEAR STORM EVENT VOLUME (m^3)	ANNUAL BASIS RUNOFF VOLUMN (m^3)	PEAK FLOW (1:100 yr) (m^3/s)
24	77.06	11,898	29,812	3.5
25	75.76	13,028	32,643	3.9
26	11.30	2,190	5,488	0.7
27	9.12	4,239	10,621	1.3
28	4.92	920	2,304	0.3
29	1.18	378	948	0.1
30	3.85	5,543	13,889	1.7
31	0.54	44	109	0.1
32	5.91	11,722	29,372	3.5
33	0.53	27	69	0.1
34	5.46	15,878	39,784	4.7
35	0.28	6	16	0.1
36	35.13	4,979	12,475	1.5
37	7.11	1,344	3,367	0.4
38	1.23	112	281	0.1
39	7.16	6,983	17,498	2.1
40	7.78	8,870	22,226	2.6
41	1.14	105	262	0.1
42	0.57	328	823	0.1
43	5.59	1,319	3,304	0.4
44	69.11	9,964	24,967	3.0
45	53.57	7,961	19948	2.4
46	41.35	5,850	14,658	1.7
47	52.10	7,234	18,126	2.2
48	1.76	1,014	2,540	0.3
49	14.47	8,333	20,880	2.5

LEGEND

- EXISTING GROUND (5 m MINOR, 25 m MAJOR)
- FLOW DIRECTION
- CATCHMENT AREA
- CULVERT
- DITCH
- CONTACT WATER

REFERENCE(S):
- ESRI WORLD IMAGERY DATED JUNE 30, 2016.
- LIDAR PROVIDED BY DENISON, DATE UNKNOWN.

DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE
2	ISSUED FOR APPROVAL	MB	2024-07-08
1	ISSUED FOR APPROVAL	MB	2024-07-05

Clifton

CLIENT: DENISON MINES CORPORATION

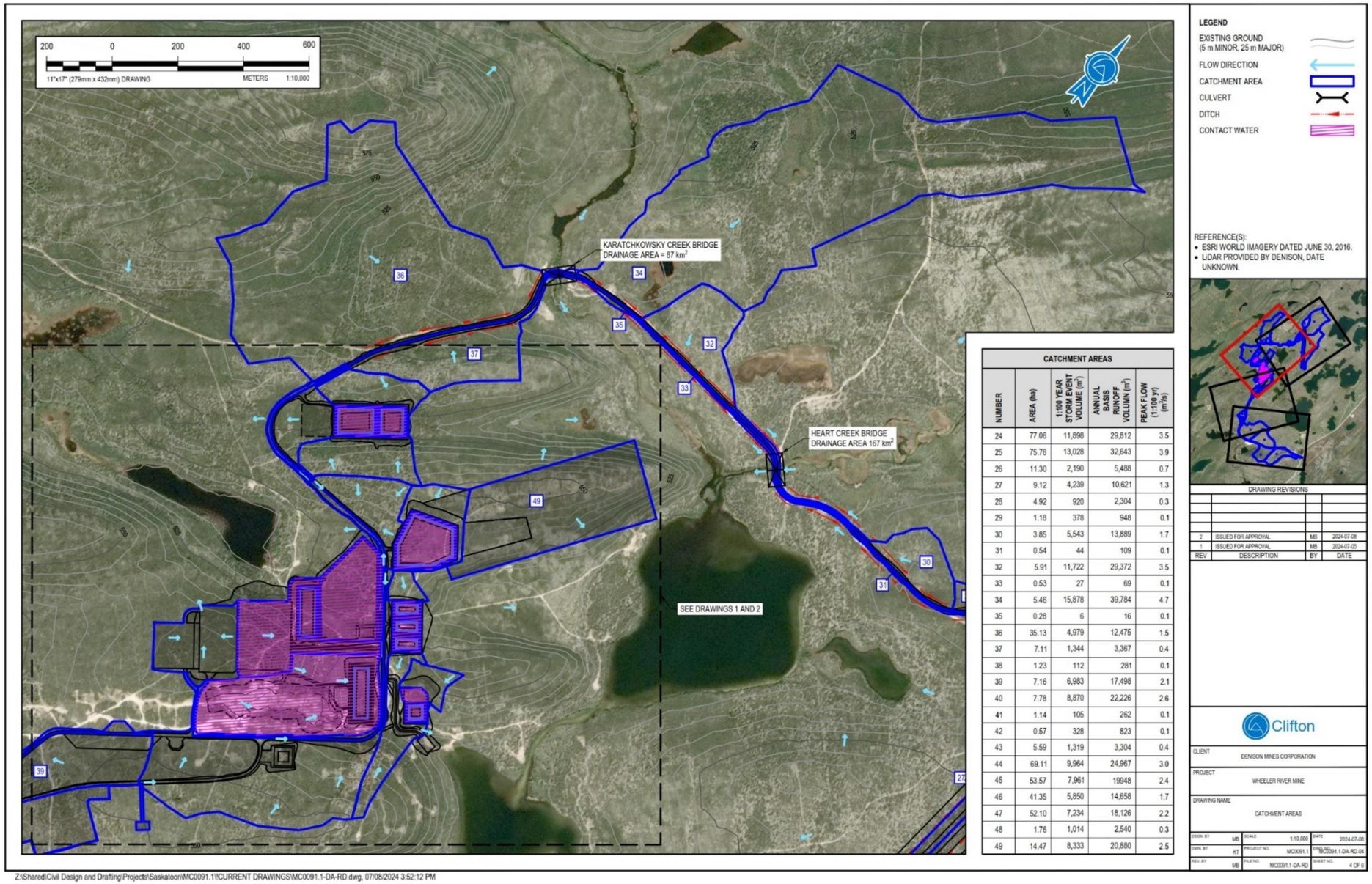
PROJECT: WHEELER RIVER MINE

DRAWING NAME: CATCHMENT AREAS

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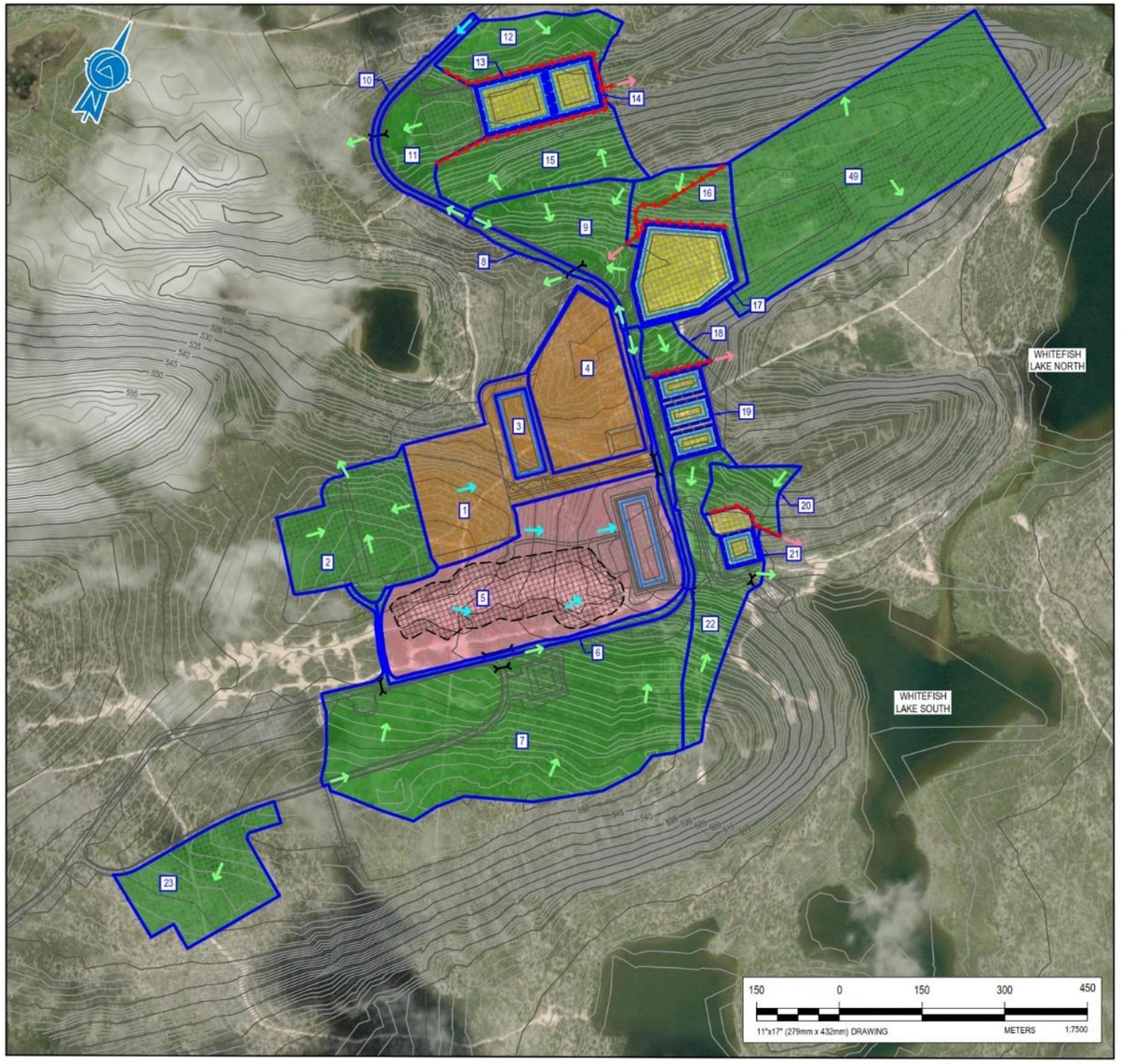
Figure 1: Site water management catchment areas – layout 1 of 5: Airstrip and portion of airstrip access road



CATCHMENT AREAS				
NUMBER	AREA (ha)	1:100 YEAR STORM EVENT VOLUME (m^3)	ANNUAL BASIS RUNOFF VOLUMN (m^3)	PEAK FLOW (1:100 yr) (m^3/s)
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48	1.76	1,014	2,540	0.3
49	14.47	8,333	20,880	2.5

Figure 2: Site water management catchment areas – layout 2 of 5: Airstrip access road

CATCHMENT AREAS (ha)				
AREA	NAME	TOTAL	SELF-CONTAINED	EFFECTIVE AREA
1	PROCESS PLANT	6.01		6.01
2	FREEZE PLANT AND SUBSTATION	5.06		5.06
3	PROCESS WATER POND AND PUMPHOUSE	0.87		0.87
4	PROCESS PRECIPITATES SOLIDS PAD	4.58		4.58
5	ISR WELLFIELD	11.54		11.54
6	MAIN ROAD 1 WEST	1.14		1.14
7	MAIN ROAD 1 EAST	17.58		17.58
8	MAIN ROAD 2 WEST	0.53		0.53
9	MAIN ROAD 2 EAST	3.80		3.80
10	MAIN ROAD 3 WEST	0.57		0.57
11	MAIN ROAD 3 EAST	3.12		3.12
12	LANDFILL NORTH DIVERSION	2.89		2.89
13	INDUSTRIAL LANDFILL	1.20	1.20	0.00
14	LEACHATE COLLECTION POND	0.82	0.82	0.00
15	LANDFILL SOUTH DIVERSION	4.21		4.21
16	GYPSUM DIVERSION	2.24		2.24
17	GYPSUM PRECIPITATES POND	2.63	2.63	0.00
18	EFFLUENT NORTH DIVERSION	0.83		0.83
19	TREATED EFFLUENT MONITORING AND RELEASE PONDS	1.31	1.31	0.00
20	CLEAN WASTE DIVERSION	1.31		1.31
21	CLEAN WASTE PAD AND RUNOFF COLLECTION POND	0.71	0.32	0.39
22	LAKE ROAD	3.63		3.63
23	CAMP	4.15		4.15



LEGEND

- EXISTING GROUND (1 m MINOR, 5 m MAJOR)
- DIVERSION DITCH
- FLOW DIRECTION (DIVERSION DITCH OUTLET)
- FLOW DIRECTION (RELEASED TO ENVIRONMENT)
- FLOW DIRECTION (CONTAINED ON SITE)
- ZONE2 , 3, OR NATURAL CATCHMENT AREA (RELEASED TO ENVIRONMENT)
- POND SELF-CONTAINED CATCHMENT AREA (CONTAINED ON SITE)
- ZONE 1 PLANT SITE CATCHMENT AREA (CONTAINED ON SITE)
- ZONE 1 WELLFIELD CATCHMENT AREA (CONTAINED ON SITE)
- CONTAINMENT BERM
- POND
- CULVERT

NOTE:

DOES NOT INCLUDE THE CAMP SITE AREA AND AERODROME.

REFERENCE(S):

- ESRI WORLD IMAGERY DATED JUNE 30, 2016.
- LIDAR PROVIDED BY DENISON, DATE UNKNOWN.

DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE
2	ISSUED FOR APPROVAL	MB	2024-07-08
1	ISSUED FOR APPROVAL	MB	2024-07-05
0	ISSUED FOR APPROVAL	MB	2024-04-02

Clifton

CLIENT: DENISON MINES CORPORATION

PROJECT: WHEELER RIVER MINE

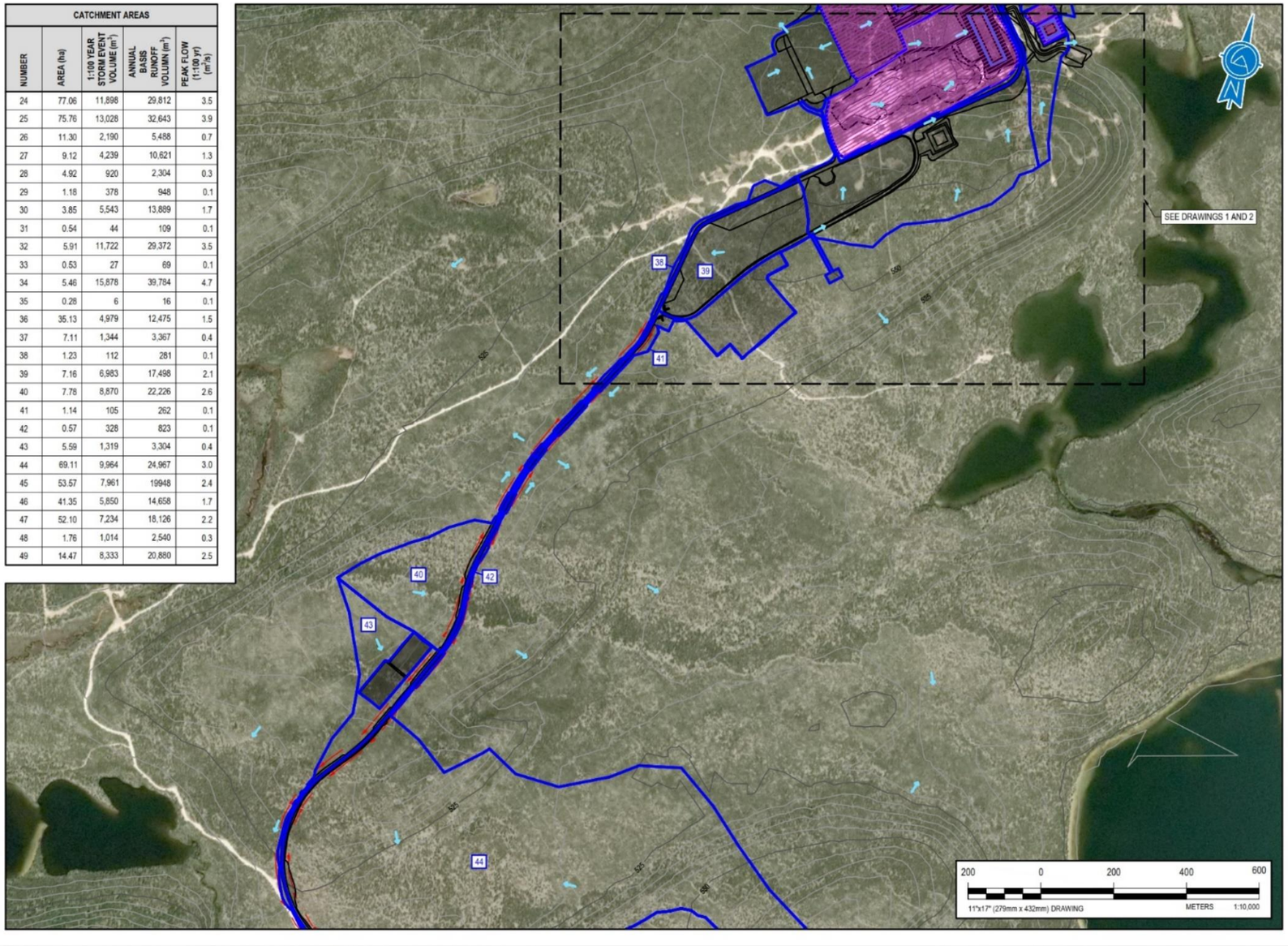
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REV. BY: MB	FILE NO.: MC0091.1	SHEET NO.: 1 OF 6	

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Figure 3: Site water management catchment areas – layout 3 of 5: main Project area

CATCHMENT AREAS				
NUMBER	AREA (ha)	1:100 YEAR STORM EVENT VOLUME (m^3)	ANNUAL BASIS RUNOFF VOLUMN (m^3)	PEAK FLOW (1:100 yr) (m^3/s)
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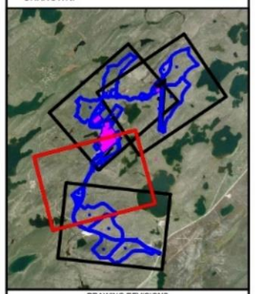


LEGEND

- EXISTING GROUND (5 m MINOR, 25 m MAJOR)
- FLOW DIRECTION
- CATCHMENT AREA
- CULVERT
- DITCH
- CONTACT WATER

REFERENCE(S):

- ESRI WORLD IMAGERY DATED JUNE 30, 2016.
- LiDAR PROVIDED BY DENISON, DATE UNKNOWN.



DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE
2	ISSUED FOR APPROVAL	MB	2024-07-08
1	ISSUED FOR APPROVAL	MB	2024-07-05

Clifton

CLIENT: DENISON MINES CORPORATION

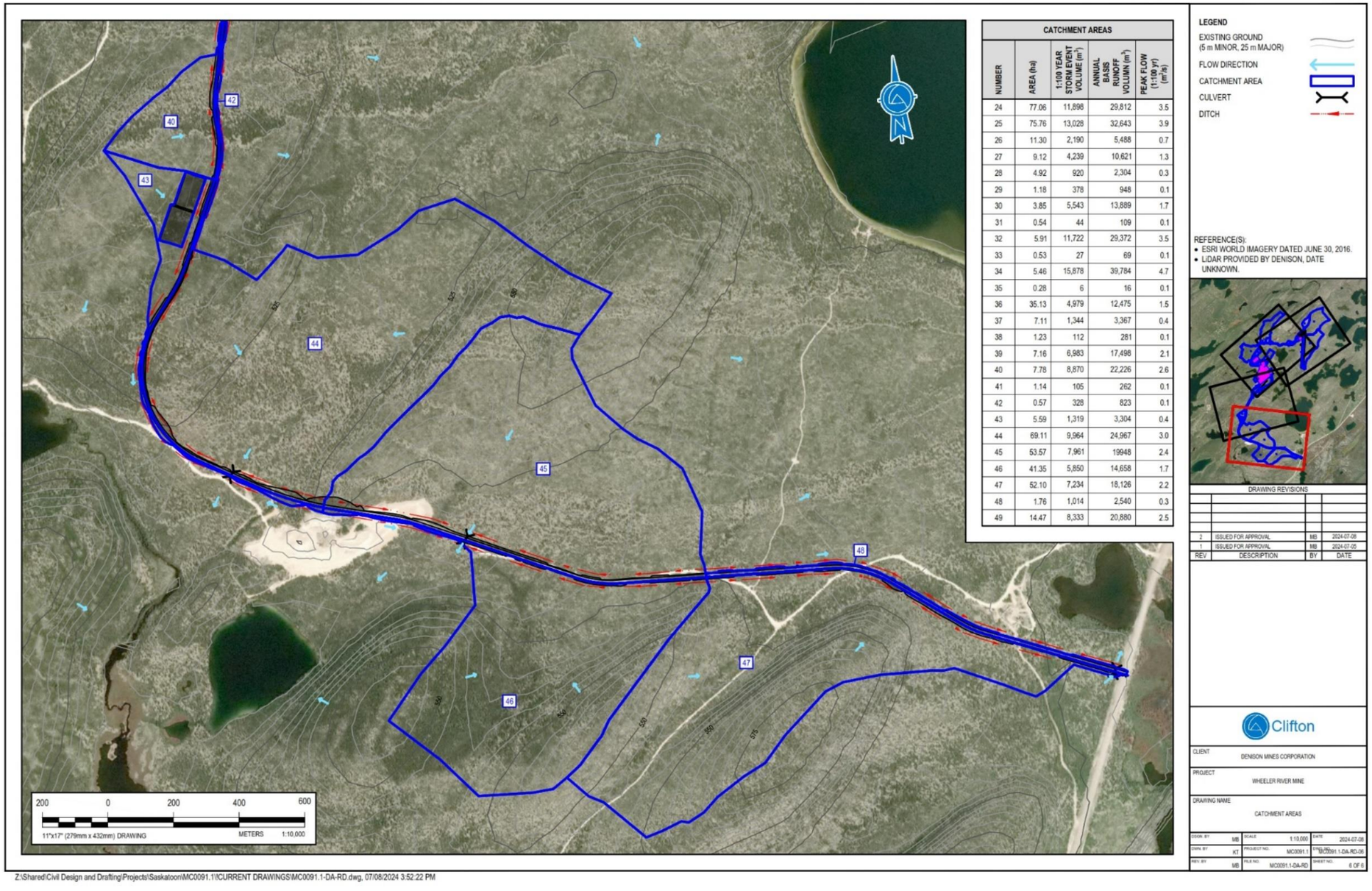
PROJECT: WHEELER RIVER MINE

DRAWING NAME: CATCHMENT AREAS

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REV. BY: MB	FILE NO.: MC0091.1-DA-RD	SHEET NO.: 5 OF 6	

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Figure 4: Site water management catchment areas – layout 4 of 5: Access road south of main Project area



CATCHMENT AREAS				
NUMBER	AREA (ha)	1:100 YEAR STORM EVENT VOLUME (m^3)	ANNUAL BASIS RUNOFF VOLUMN (m^3)	PEAK FLOW (1:100 yr) (m^3/s)
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25	75.76	13,028	32,643	3.9
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33	0.53	27	69	0.1
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47	52.10	7,234	18,126	2.2
48	1.76	1,014	2,540	0.3
49	14.47	8,333	20,880	2.5

LEGEND

EXISTING GROUND (5 m MINOR, 25 m MAJOR)

FLOW DIRECTION

CATCHMENT AREA

CULVERT

DITCH

REFERENCE(S):
- ESRI WORLD IMAGERY DATED JUNE 30, 2016.
- LiDAR PROVIDED BY DENISON, DATE UNKNOWN.

DRAWING REVISIONS

REV	DESCRIPTION	BY	DATE
2	ISSUED FOR APPROVAL	MB	2024-07-08
1	ISSUED FOR APPROVAL	MB	2024-07-05

Clifton

CLIENT: DENISON MINES CORPORATION

PROJECT: WHEELER RIVER MINE

DRAWING NAME: CATCHMENT AREAS

DSGN. BY: MB	SCALE: 1:10,000	DATE: 2024-07-08	
DWN. BY: KT	PROJECT NO.: MC0091.1	DWG NO.: MC0091.1-DA-RD-06	
REV. BY: MB	FILE NO.: MC0091.1-DA-RD	SHEET NO.: 6 OF 6	

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Figure 5: Site water management catchment areas – layout 5 of 5: Access road connection to Highway 914

Screening of Constituents of Potential Concern (COPCs) and Non-contact Water Source Areas

The screening of constituents of potential concern (COPCs) in non-contact water is provided in Table 1 and is organized in terms of catchment characteristics / land use and Project components within or adjacent to the catchments. A screening was not completed here for contact water, as Denison has previously outlined the need to collect and treat this water (refer to Section 2.3.3 of the EIS).

A description of the Project's landscape, key Project components and activities, and management system plans are included here to facilitate the screening exercise.

Setting

The Project is located within the Wheeler Upland Landscape Area of the Athabasca Plain Ecoregion within the Boreal Shield Ecozone of Saskatchewan. The area is characterized by Brunisolic soils which are typically sandy, well-drained soil. Standing water is not a common occurrence.

Ground surface topography regionally has been shaped by glacial and fluvial processes active for over tens of thousands of years. The terrain is characterized by northeast to southwest trending drumlins and eskers, with small variations in elevation (ranging 480 to 590 m above sea level) resulting in a gently sloping terrain. Most of the Project Area consists of upland forest ecosite. Refer to Figure 1-6 in the EIS for a summary of landscape features and current site conditions.

Airstrip

The airstrip will be constructed and maintained using locally-sourced granular material. Denison will be using material from the borrow area (overburden material). Borrow pit area selection was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples. As such, the material used to construct and maintain the airstrip will not be a source of metals or ARD.

Design for airstrip will in general be such that runoff will be encouraged through appropriate grading to drain away and not pond on or near the airstrip. The condition of the airstrip will be inspected and maintained routinely. For example, should unexpected water pooling be observed at the airstrip during Operation, temporary water removal means such as vac trucks or sump pumps could be employed, and the areas would be re-graded to minimize water accumulation.

All fueling and de-icing activities will occur in specifically designed areas to collect any hydrocarbons and de-icing fluids. Collected waters will be characterized and brought to the Project site for treatment, shipped offsite to an approved facility or released to environment if water quality allows.

Roads

Mainland access to the site will be from Highway 914. A 7-km section of road will be constructed from the highway to the Project site and a 5-km long road will also be constructed from the Project site to the airstrip; the total road length is 12 km. The road or trail to the airstrip is currently an

unmaintained road: the decommissioned Fox Lake Road. Additional site roads will include, for instance, a service loop to the camp.

Roads will be constructed of locally-source granular subbase and base. For road upgrades and maintenance, Denison will be using material from the borrow area (overburden material). Borrow pit area selection was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples. As such, the material used to construct, upgrade, and maintain roads will not be a source of metals or ARD. Design for roads will in general be such that runoff will be encouraged through appropriate grading to drain away and not pond on or near the road. The condition of site roads will be inspected and maintained routinely. For example, should unexpected water pooling be observed during Operation, temporary water removal means such as vac trucks or sump pumps could be employed, and the areas would be re-graded to minimize water accumulation.

In terms of material being transported on the site roads, the final product (yellowcake) will be transported in sealed drums from the processing plant south to the public highway network. With the selection of the in-situ recovery method the Project does not involve transporting large volumes of mine waste rock around the site.

Stream Crossings

Two water crossings (Kratchkowsky Creek and Hart Creek) will be installed along the road from the Project site to the airstrip. Both stream crossings occur along the section of the road which is an existing, unmaintained road (the decommissioning Fox Lake Road). The crossings will be designed, constructed, and maintained to avoid causing harm to fish and fish habitat and will be clear span bridges. Clear span bridges are designed to completely span a watercourse without interfering with the channel bed and banks.

Miscellaneous Project Components

In the SWMP, specific consideration is given to other areas of the Project including the diversion ditches at the main Project area, borrow area, camp, freeze plant and substation based on the delineation of catchments / land uses. Infrastructure in these areas will be constructed using locally-source material from the borrow area and are subject to Project-wide management system and best management practices. Any specifics of relevance to water quality are provided in Table 1.

Management System

We note that accident and malfunctions screening and assessment was completed in Section 14 of the EIS. The SWMP and screening of COPCs contained herein focuses on more routine events within the Project design basis, for example discrete leaks or spills of hydrocarbons from equipment. Events outside of the design basis were appropriately considered in Section 14 of the EIS. For instance, through the hazard identification process (see Appendix 14-A Section 3.0 and Appendix A), the release of fuel (diesel) was carried forward for more detailed analysis.

While details of Denison's management system programs and plans will be developed to support licensing, for context on the SWMP a description of key topics is provided here.

Erosion and Sediment Control (ESC):

Soil erosion is a natural process, but erosion is increased when land is disturbed. Erosion can result in sedimentation. The main concern is erosion caused by precipitation and run off. Erosion control is any measure undertaken to reduce the potential for erosion to occur (SK MHI 2012). Sediment control is any measure implemented to reduce the potential for sediment to be transported and/or deposited beyond the limits of the site (SK MHI 2012). Erosion control will be viewed as a first defense when protecting downstream aquatic habitats, while sediment control will be implemented as a contingency plan. Denison will focus on preventing soil erosion in order to reduce sedimentation and potential effects to the aquatic environment. In selecting the appropriate ESC treatment for areas of the Project, Denison will consider both temporary and permanent measures. Selection of ESC measures are dependent on site slopes, drainage patterns, existing vegetation and other site-specific conditions. Erosion control measures may include preventing or minimizing ground disturbance when working near water, maintaining/retaining as much vegetation as possible, erosion control blankets, and rip rap. Sediment control measures may include wattles and silt fencing.

Spill Response Plan:

Should unplanned events or conditions occur, it will be important for Denison to address and respond in an appropriate manner. Denison will identify and reduce the potential for accidents and emergency situations, and implement emergency response plans that will protect the health and safety of its workers, contractors, the public and the environment. Spill response plans would include procedures for worker and environment protection, details about personnel protection equipment, and procedures to evaluate exposures during a spill.

Radiation Protection Program:

The Radiation Protection Program has been designed, and will be implemented, such that Denison complies with, or exceeds, the level of radiation safety that is required by the applicable regulations and Denison’s Environment, Health, Safety and Sustainability Policy. Areas within the Operation are designated according to potential radiological hazards and contamination control requirements. The movement and accumulation of all forms of radioactive contamination will be monitored via dosimetry and area monitoring. Contamination control measures will be in place to minimize the spread of radioactive materials into unintended locations.

Waste Management Program:

The Waste Management Program provides the framework that confirms Denison’s licensed activities involving the processing, storage, and disposal of wastes are performed in a manner that complies with applicable regulatory and licence requirements and protects workers, the public, and the environment. The Waste Management Program includes identification of waste inventory and the characteristics of the waste (radiological and hazardous non-radiological). The program also includes waste segregation, waste packaging, and transfer requirements,

and the plan for storage or disposal of wastes. The Waste Management Program outlines the principles of reduction/reuse/recycle/and recovery (4 Rs) applied at the Project.

Personnel and Contractor Training and Performance Management Program:

A Personnel and Contractor Training and Performance Management Program would be developed to ensure all Project related personnel are fully equipped to effectively implement their work functions, in particular consideration of how job function may affect the environment, including worker and public health, within the context of the Environment Management System (EMS). Measurement of performance provides the means to Denison to foster a culture of continuous improvement.

Table 1: Screening of Constituents of Potential Concern (COPCs) in Water Catchments

Catchment Description	Catchment IDs	Constituent Group	Risk to Aquatic Environment	Management / Mitigation	Summary
Airstrip	24, 25, 27, 28	Metals (metal leaching)	Metal leaching can occur when certain minerals in rocks containing metals are exposed to air and water. If the material used to construct, and maintain the airstrip contains metals, then there is the potential for metals to leach into runoff, and report to the surrounding environment, where there is the potential for negative effects on the aquatic environment.	• The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.	At the airstrip, the infrastructure design in combination with management plans (e.g., geochemical characterization of borrow material, spill response plans, ESC) and best management practices result in a determination that runoff in this area is classified as **non-contact water**.
		Acid Rock Drainage	Acid rock drainage (ARD) is a process where sulfide minerals in rocks react with air and water to produce sulfuric acid, which then leaches metals from the rocks. If the material used to construct and maintain the airstrip results in ARD, the quality of runoff will be impacted and there is the potential for negative effects on the aquatic environment.	• The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.	
		Nutrients	None expected	n/a	
		Hydrocarbons	A release of hydrocarbons such as diesel, gasoline, or jet fuel to the environment poses a threat to aquatic organisms.	• All fueling and de-icing activities will occur in specifically designed areas to collect any hydrocarbons and de-icing fluids. ○ Collected waters will be characterized and brought to the project site for treatment, shipped offsite to an approved facility or released to environment if water quality allows. • Personnel training. • Spill Response Plan will be in place throughout the life of the Project. • Appropriate spill response kits will be positioned adjacent to areas where hazardous materials such as hydrocarbons are stored in accordance with the Spill Response Plan. • Fuel storage and distribution infrastructure will be constructed in accordance with applicable legislation requirements. • Fuels will be stored in approved, above-ground, double-walled storage tank(s) equipped with secondary containment in accordance with provincial regulations and standards.	
		Suspended solids	Erosion and the resulting sedimentation can have a number of impacts on the aquatic environment (WSA 2024): sediments can cover the small spaces between productive rock or gravel habitats; increased levels of sediment in the water can displace aquatic organisms from prime habitat into less suitable areas; cloudy or turbid waters affect visual predators' ability to forage; high levels of suspended sediment in the water can affect fish and other aquatic organisms' ability to breath; and turbid water absorbs more sunlight energy increasing the water temperature, which in turn, does not allow the water to hold as much oxygen.	• Restrict all construction activities to the approved construction footprint. • Leave vegetated buffer zones around watercourses and other sensitive features when developing/operating supporting infrastructure. • Implement best management practices associated with erosion and sediment control (ESC).	
		Other Chemicals	A release of glycol and other de-icing fluids to the environment poses a threat to aquatic organisms.	• All fueling and de-icing activities will occur in specifically designed areas to collect any hydrocarbons and de-icing fluids. ○ Collected waters will be characterized and brought to the project site for treatment, shipped offsite to an approved facility or released to environment if water quality allows. • Personnel training • Spill and Emergency Response Plan will be in place throughout the life of the Project	

Catchment Description	Catchment IDs	Constituent Group	Risk to Aquatic Environment	Management / Mitigation	Summary
Roads	26, 29, 30, 31, 32, 33, 34, 35, 36, 37, 11, 10, 9, 8, 7, 6, 22, 38, 41, 42, 40, 43, 44, 45, 46, 47, 48	Metals (metal leaching)	Metal leaching can occur when certain minerals in rocks containing metals are exposed to air and water. If the material used to upgrade, construct, and maintain roads contains metals, then there is the potential for metals to leach into runoff, and report to the surrounding environment, where there is the potential for negative effects on the aquatic environment.	• The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.	On and adjacent to the Project's roads, ESC will be the focus. Best management practices are important for ESC throughout the life of the Project, and of particular importance during construction. Routine inspections and monitoring will be completed to document the effectiveness of the erosion and sediment control measures, and any required maintenance or replacement of ESC structures would be completed as required. Through the implementation of road design and best management practices, the runoff in these areas is classified as **non-contact water**.
		Acid Rock Drainage	Acid rock drainage (ARD) is a process where sulfide minerals in rocks react with air and water to produce sulfuric acid, which then leaches metals from the rocks. If the material used to upgrade, construct, and maintain roads results in ARD, the quality of runoff will be impacted and there is the potential for negative effects on the aquatic environment.	• The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.	
		Nutrients	None expected.	n/a	
		Hydrocarbons	A release of hydrocarbons such as diesel, gasoline, or jet fuel to the environment poses a threat to aquatic organisms.	• Spill Response Plan will be in place throughout the life of the Project • Appropriate spill response kits will be positioned adjacent to areas where hazardous materials such as hydrocarbons are stored in accordance with the Spill Response Plan. • Traffic control measures. • Travel management plan. • A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing. • Project components including equipment and machinery will be regularly maintained and inspected to make sure they are in good working order. • Fuel storage and distribution infrastructure will be constructed in accordance with applicable legislation requirements. • Fuels will be stored in approved, above-ground, double-walled storage tank(s) equipped with secondary containment in accordance with provincial regulations and standards. • A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.	
		Suspended solids	Erosion and the resulting sedimentation can have a number of impacts on the aquatic environment (WSA 2024): sediments can cover the small spaces between productive rock or gravel habitats; increased levels of sediment in the water can displace aquatic organisms from prime habitat into less suitable areas; cloudy or turbid waters affect visual predators' ability to forage; high levels of suspended sediment in the water can affect fish and other aquatic organisms' ability to breath; and turbid water absorbs more sunlight energy increasing the water temperature, which in turn, does not allow the water to hold as much oxygen.	• Restrict all construction activities to the approved construction footprint. • Leave vegetated buffer zones around watercourses and other sensitive features when developing/operating supporting infrastructure. • Implement best management practices associated with ESC, with a particular focus on Project components and activities located within 50 to100 m of a waterbody where required (i.e., at locations where there is no vegetated buffer adjacent to the waterbodies). Refer to Figure 6 below. • Traffic control measures.	
		Other Chemicals	Radionuclides are a potential contaminant associated with the Project activities.	• A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants. • Administrative controls will be in place to control radioactive materials and radiological clearance: All objects (equipment, vehicles, etc.) from potentially contaminated work areas that need to be transported off-site as non-radioactive materials must be thoroughly cleaned and checked for contamination prior to release.	

Catchment Description	Catchment IDs	Constituent Group	Risk to Aquatic Environment	Management / Mitigation	Summary
Stream crossings	Kratchkowsky Creek bridge area and Hart Creek bridge area	Metals (metal leaching)	Metal leaching can occur when certain minerals in rocks containing metals are exposed to air and water. If the material used to upgrade, construct, and maintain roads adjacent to the stream crossings contains metals, then there is the potential for metals to leach into runoff, and report to the surrounding environment, where there is the potential for negative effects on the aquatic environment.	• The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.	The stream crossings are clear span bridges. At the stream crossing location, the infrastructure design in combination with management plans associated with the adjacent roads (e.g., geochemical characterization of borrow material, spill response plans, ESC) and best management practices result in a determination that runoff in these areas is classified as **non-contact water**.
		Acid Rock Drainage	Acid rock drainage is a process where sulfide minerals in rocks react with air and water to produce sulfuric acid, which then leaches metals from the rocks. If the material used to upgrade, construct, and maintain roads adjacent to the stream crossings results in ARD, the quality of runoff will be impacted and there is the potential for negative effects on the aquatic environment.	• The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.	
		Nutrients	None expected.	n/a	
		Hydrocarbons	A release of hydrocarbons such as diesel, gasoline, or jet fuel to the environment poses a threat to aquatic organisms.	• Spill Response Plan will be in place throughout the life of the Project • Appropriate spill response kits will be positioned adjacent to areas where hazardous materials such as hydrocarbons are stored in accordance with the Spill Response Plan. • A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing. • Project components including equipment and machinery will be regularly maintained and inspected to make sure they are in good working order. • A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.	
		Suspended solids	Erosion and the resulting sedimentation can have a number of impacts on the aquatic environment (WSA 2024): sediments can cover the small spaces between productive rock or gravel habitats; increased levels of sediment in the water can displace aquatic organisms from prime habitat into less suitable areas; cloudy or turbid waters affect visual predators' ability to forage; high levels of suspended sediment in the water can affect fish and other aquatic organisms' ability to breath; and turbid water absorbs more sunlight energy increasing the water temperature, which in turn, does not allow the water to hold as much oxygen.	• Restrict all construction activities to the approved construction footprint. • Leave vegetated buffer zones around watercourses and other sensitive features when developing/operating supporting infrastructure. • Implement best management practices associated with ESC, with a particular focus on Project components and activities located within 50 to100 m of a waterbody where required (i.e., at locations where there is no vegetated buffer adjacent to the waterbodies). Refer to Figure 6 below. • Traffic control measures.	
		Other Chemicals	None expected	n/a	
Borrow area	49	Metals (metal leaching)	Metal leaching can occur when certain minerals in rocks containing metals are exposed to air and water. If the borrow area contains metals, then there is the potential for metals to leach into runoff, and report to the surrounding environment, where there is the potential for negative effects on the aquatic environment.	• The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.	Erosion and sediment control will be important at the borrow area. Routine inspections and monitoring will be completed to document the effectiveness of the erosion and sediment control measures, and any required maintenance or replacement of ESC structures would be completed as required. Through the implementation of various best management practices, the runoff at the borrow area is classified as **non-contact water**.
		Acid Rock Drainage	Acid rock drainage is a process where sulfide minerals in rocks react with air and water to produce sulfuric acid, which then leaches metals from the rocks. If earthworks associated with the borrow area results in ARD, the quality of runoff will be impacted and there is the potential for negative effects on the aquatic environment.	• The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.	
		Nutrients	None expected.	n/a	

Catchment Description	Catchment IDs	Constituent Group	Risk to Aquatic Environment	Management / Mitigation	Summary
		Hydrocarbons	A release of hydrocarbons such as diesel, gasoline, or jet fuel to the environment poses a threat to aquatic organisms.	• Spill Response Plan will be in place throughout the life of the Project • Appropriate spill response kits will be positioned adjacent to areas where hazardous materials such as hydrocarbons are stored in accordance with the Spill Response Plan. • A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing. • Project components including equipment and machinery will be regularly maintained and inspected to make sure they are in good working order. • A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.	
		Suspended solids	Erosion and the resulting sedimentation can have a number of impacts on the aquatic environment (WSA 2024): sediments can cover the small spaces between productive rock or gravel habitats; increased levels of sediment in the water can displace aquatic organisms from prime habitat into less suitable areas; cloudy or turbid waters affect visual predators' ability to forage; high levels of suspended sediment in the water can affect fish and other aquatic organisms' ability to breath; and turbid water absorbs more sunlight energy increasing the water temperature, which in turn, does not allow the water to hold as much oxygen.	• Restrict all construction activities to the approved construction footprint. • Leave vegetated buffer zones around watercourses and other sensitive features when developing/operating supporting infrastructure. • Implement best management practices associated with ESC, with a particular focus on Project components and activities located within 50 to100 m of a waterbody where required (i.e., at locations where there is no vegetated buffer adjacent to the waterbodies). Refer to Figure 6 below. • Traffic control measures.	
		Other Chemicals	None expected	n/a	
Diversion ditches around Project components (Figure 3)	12 (landfill north diversion), 15 (landfill south diversion), 16 (gypsum diversion), 18 (effluent north diversion), 20 (clean waste diversion)	Metals (metal leaching)	Metal leaching can occur when certain minerals in rocks containing metals are exposed to air and water. If diversion ditches are constructed with material containing metals, then there is the potential for metals to leach into runoff, and report to the surrounding environment, where there is the potential for negative effects on the aquatic environment.	• The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.	At the diversions ditches, the infrastructure design in combination with management plans (e.g., geochemical characterization of borrow material, spill response plans, ESC) and best management practices result in a determination that runoff in this area is classified as **non-contact water**.
		Acid Rock Drainage	Acid rock drainage is a process where sulfide minerals in rocks react with air and water to produce sulfuric acid, which then leaches metals from the rocks. If diversion ditches are constructed of sulfide containing material, then there may be potential for ARD to occur, the quality of runoff will be impacted, and there is the potential for negative effects on the aquatic environment.	• The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.	
		Nutrients	None expected.	n/a	
		Hydrocarbons	A release of hydrocarbons such as diesel, gasoline, or jet fuel to the environment poses a threat to aquatic organisms.	• Spill Response Plan will be in place throughout the life of the Project • Appropriate spill response kits will be positioned adjacent to areas where hazardous materials such as hydrocarbons are stored in accordance with the Spill Response Plan. • A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing. • Project components including equipment and machinery will be regularly maintained and inspected to make sure they are in good working order. • A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.	
		Suspended solids	Erosion and the resulting sedimentation can have a number of impacts on the aquatic environment (WSA 2024): sediments can cover the small spaces between productive	• Restrict all construction activities to the approved construction footprint.	

Catchment Description	Catchment IDs	Constituent Group	Risk to Aquatic Environment	Management / Mitigation	Summary
			rock or gravel habitats; increased levels of sediment in the water can displace aquatic organisms from prime habitat into less suitable areas; cloudy or turbid waters affect visual predators' ability to forage; high levels of suspended sediment in the water can affect fish and other aquatic organisms' ability to breath; and turbid water absorbs more sunlight energy increasing the water temperature, which in turn, does not allow the water to hold as much oxygen.	• Leave vegetated buffer zones around watercourses and other sensitive features when developing/operating supporting infrastructure. • Implement best management practices associated with ESC, with a particular focus on Project components and activities located within 50 to100 m of a waterbody where required (i.e., at locations where there is no vegetated buffer adjacent to the waterbodies). Refer to Figure 6 below. • Traffic control measures.	
		Other Chemicals	None expected.	n/a	
Freeze Plant and Substation	2	Metals (metal leaching)	Metal leaching can occur when certain minerals in rocks containing metals are exposed to air and water. If the freeze plant and substation foundations/pads are constructed with material containing metals, then there is the potential for metals to leach into runoff, and report to the surrounding environment, where there is the potential for negative effects on the aquatic environment.	• The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.	At the freeze plant and substation area, the infrastructure design in combination with management plans (e.g., geochemical characterization of borrow material, spill response plans, ESC) and best management practices result in a determination that runoff in this area is classified as **non-contact water**.
		Acid Rock Drainage	Acid rock drainage is a process where sulfide minerals in rocks react with air and water to produce sulfuric acid, which then leaches metals from the rocks. If the freeze plant and substation foundations/pads are constructed of sulfide containing material, then there may be potential for ARD to occur, the quality of runoff will be impacted, and there is the potential for negative effects on the aquatic environment.	• The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.	
		Nutrients	None expected.	n/a	
		Hydrocarbons	A release of hydrocarbons such as diesel, gasoline, or jet fuel to the environment poses a threat to aquatic organisms.	• Spill Response Plan will be in place throughout the life of the Project • Appropriate spill response kits will be positioned adjacent to areas where hazardous materials such as hydrocarbons are stored in accordance with the Spill Response Plan. • A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing. • Project components including equipment and machinery will be regularly maintained and inspected to make sure they are in good working order. • A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.	
		Suspended solids	Erosion and the resulting sedimentation can have a number of impacts on the aquatic environment (WSA 2024): sediments can cover the small spaces between productive rock or gravel habitats; increased levels of sediment in the water can displace aquatic organisms from prime habitat into less suitable areas; cloudy or turbid waters affect visual predators' ability to forage; high levels of suspended sediment in the water can affect fish and other aquatic organisms' ability to breath; and turbid water absorbs more sunlight energy increasing the water temperature, which in turn, does not allow the water to hold as much oxygen.	• Restrict all construction activities to the approved construction footprint. • Leave vegetated buffer zones around watercourses and other sensitive features when developing/operating supporting infrastructure. • Implement best management practices associated with ESC, with a particular focus on Project components and activities located within 50 to100 m of a waterbody where required (i.e., at locations where there is no vegetated buffer adjacent to the waterbodies). Refer to Figure 6 below. • Traffic control measures.	
		Other Chemicals	Freeze plant chemicals, e.g., calcium chloride brine	• Spill Response Plan will be in place throughout the life of the Project	
Camp	22	Metals (metal leaching)	Metal leaching can occur when certain minerals in rocks containing metals are exposed to air and water. If the camp foundations/pads are constructed with material containing metals, then there is the potential for metals to leach into	• The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are	At the camp area, the infrastructure design in combination with management plans (e.g., geochemical characterization of borrow material,

Catchment Description	Catchment IDs	Constituent Group	Risk to Aquatic Environment	Management / Mitigation	Summary
			runoff, and report to the surrounding environment, where there is the potential for negative effects on the aquatic environment.	ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.	spill response plans, ESC) and best management practices result in a determination that runoff in this area is classified as **non-contact water**.
		Acid Rock Drainage	Acid rock drainage is a process where sulfide minerals in rocks react with air and water to produce sulfuric acid, which then leaches metals from the rocks. If the camp foundations/pads are constructed of sulfide containing material, then there may be potential for ARD to occur, the quality of runoff will be impacted, and there is the potential for negative effects on the aquatic environment.	• The borrow pit area selected for construction and maintenance of various Project components was based on geotechnical program completed in 2021 which did not identify any potential for ARD/ML. Further works are ongoing part of engineering activities and with confirmation of characterization through assays of representative samples.	
		Nutrients	The domestic wastewater treatment plant (DWWTP) is a contained modular facility and as such represents low risk of routine or accidental release. The domestic wastewater treatment plant pond stores treated domestic wastewater prior to conveyance to the process water pond that reports to the industrial wastewater treatment plant (IWWTP). The accidents and malfunctions assessment (EIS Section 14) considered four scenarios that could introduce COPCs to the environment from site "ponds and retention berms" (see Table 3-13, Appendix A or EIS Appendix 14-A), including overtopping, flooding and containment failure. The "ponds and retention berms" scenarios were deemed low risk or risks were deemed to be as low as reasonably practical (ALARP), given design and other mitigations. Overtopping, flooding and containment failure related to releases at the domestic wastewater treatment plant pond is unlikely; however, it would have the potential for release of constituents in treated domestic wastewater to reach the aquatic environment (Whitefish Lake). For reference Whitefish Lake is approximately 500 m downgradient of the domestic wastewater treatment plant pond. Consequences of a release of treated domestic wastewater into Whitefish Lake could result in localized and/or transient effects such as increased nutrient concentrations (and associated algal growth), oxygen depletion, or toxicity to aquatic biota.	• Personnel training and orientation • Project components including equipment and machinery will be regularly maintained and inspected to make sure they are in good working order. • Surface water management • Pond designed for PMP • Pond designed with composite liner system • Monitoring (surface water and groundwater) • Spill Response Plan will be in place throughout the life of the Project • Appropriate spill response kits will be positioned adjacent to areas where hazardous materials such as hydrocarbons are stored in accordance with the Spill Response Plan.	
		Hydrocarbons	A release of hydrocarbons such as diesel, gasoline, or jet fuel to the environment poses a threat to aquatic organisms.	• Spill Response Plan will be in place throughout the life of the Project • Appropriate spill response kits will be positioned adjacent to areas where hazardous materials such as hydrocarbons are stored in accordance with the Spill Response Plan. • A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing. • Project components including equipment and machinery will be regularly maintained and inspected to make sure they are in good working order. • A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants.	
		Suspended solids	Erosion and the resulting sedimentation can have a number of impacts on the aquatic environment (WSA 2024):	• Restrict all construction activities to the approved construction footprint.	

Catchment Description	Catchment IDs	Constituent Group	Risk to Aquatic Environment	Management / Mitigation	Summary
			sediments can cover the small spaces between productive rock or gravel habitats; increased levels of sediment in the water can displace aquatic organisms from prime habitat into less suitable areas; cloudy or turbid waters affect visual predators' ability to forage; high levels of suspended sediment in the water can affect fish and other aquatic organisms' ability to breath; and turbid water absorbs more sunlight energy increasing the water temperature, which in turn, does not allow the water to hold as much oxygen.	• Leave vegetated buffer zones around watercourses and other sensitive features when developing/operating supporting infrastructure. • Implement best management practices associated with ESC, with a particular focus on Project components and activities located within 50 to100 m of a waterbody where required (i.e., at locations where there is no vegetated buffer adjacent to the waterbodies). Refer to Figure 6 below. • Traffic control measures.	
		Other Chemicals	Radionuclides are a potential contaminant associated with the Project activities.	• A wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants. • Administrative controls will be in place to control radioactive materials and radiological clearance: All objects (equipment, vehicles, etc.) from potentially contaminated work areas that need to be transported off-site as non-radioactive materials must be thoroughly cleaned and checked for contamination prior to release.	

Notes:

- As described earlier in the SWMP, the screening completed in Table 1 is based on routine or normal operating conditions. Accidents and malfunction type risks were assessed separately in Section 14 of the EIS and mitigations associated with accident and malfunction events have been incorporated and described in that analysis in the EIS.
- As described in Section 2 of the EIS, a wash bay is proposed as part of the Wheeler River Project infrastructure. The wash bay will be available to clean items, equipment, and vehicles that may have been in contact with potential contaminants. For the purpose of the site water management strategy, water derived from the wash bay is by definition "contact water" (i.e., fits the definition of contact water above) and is not considered in the screening of non-contact water sources in Table 1 for that reason. The wash bay area will have an impermeable floor and a lined water collection sump. Rinse water from the wash bay sump will be routed to the wellfield runoff pond or directly to the process water pond. It will be subsequently conveyed as a component of the influent stream to the IWWTP and treated. Treated effluent would be discharged to Whitefish Lake once deemed suitable for release.

n/a = not applicable
ARD = acid rock drainage
ARD/ML = acid rock drainage/metal leaching
ESC = erosion and sediment control

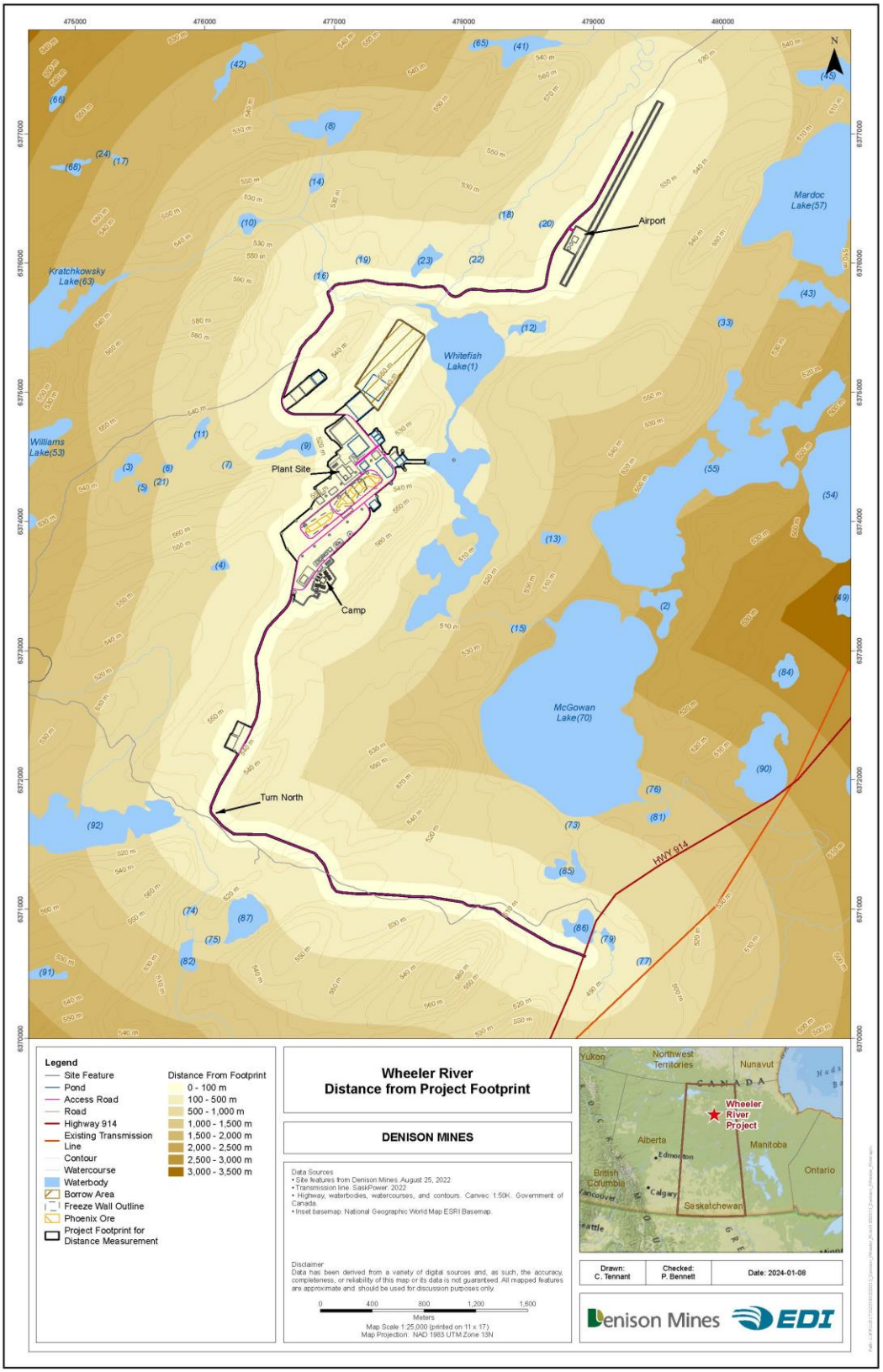


Figure 6: Distance from Project Footprint to Waterbodies

Delineation of Contact and Non-contact Water Source Areas on the Site

Based on information in the EIS and additional clarifications contained here, contact water is expected at the wellfield, processing plant terrace, the refueling and de-icing area at the airstrip, and leachate collection areas at the landfills. Contact water will be collected in various ponds and eventually routed through the IWWTP for treatment prior to release to Whitefish Lake.

Based on the screening completed in Table 1 using Figures 1 through 5, the non-contact water areas are locations where clean water can be diverted away from Project infrastructure. Through design and implementation of best management practices, the catchment areas described above were determined to contain non-contact water. The runoff from these areas will not be collected and treated.

Estimation of Typical and Event Volumes from Contact and Non-contact Water Source Areas

Refer to Figures 1 to 5 for information on the size of individual catchment areas, the volume of water expected on an annual basis and with a 1:100 year storm event, and the peak flow associated with a 1:100 year storm event.

At the wellfield and processing plant terrace the volume of water expected during a 24-hour PMP of 493 mm is approximately 37,240 m^3. The wellfield runoff pond has been sized appropriately (38,200 m^3 with 1 m of freeboard) to contain this volume of water.

Water Management Structures

The Stormwater Management Plan associated with non-contact water uses shallow ditching to dissipate the energy of runoff, to promote settling of suspended solids and allow the runoff to report to ground via natural grades that flow away from the infrastructure and into the natural drainage systems. The approximate location of proposed ditches are shown in Figures 1 through 5.

Diversion ditching of non-contact water away from disturbed and developed areas. Diversion ditching is designed to divert as much clean non-contact surface water as reasonably possible away from any disturbed areas, facilities or works where that water may become contaminated, including but not limited to the wellfield, processing plant area, and waste management areas.

Road ditch inverts adjacent to roadways and graveled pads should be lower than the subgrade at the shoulder and ditches will be designed based on specific criteria for slopes (sideslopes, longitudinal slopes), bottom widths, a range of velocities, and a minimum freeboard (refer to Table 2). Ditch design criteria will be refined as the Project advances.

Table 2: Preliminary Ditch Design Criteria

Ditch Element	Design Criteria
Conveyance Capacity Requirements	a) 1:100 yr., 24 hr. event for diversion ditches and non-contact water collection ditches b) 24 hr. PMP event critical ditches where upset would be considered a release to environment (i.e., contact water)
Manning's Roughness Coefficient	n = 0.030

Preferred Ditch Sideslopes	3H:1V
Maximum Ditch Sideslopes	2H:1V (with depth restrictions and possible sideslope erosion protection determined on case-by-case basis)
Minimum Longitudinal Slope	0.20%
Maximum Longitudinal Slope	2.00% (steeper ditching require engineered channels)
Minimum Velocity	0.3 m/s
Maximum Velocity	0.73 m/s (subject to variance dependent on ditch bottom materials)
Preferred Ditch Bottom Width	1200 mm
Minimum Ditch Bottom Width	600 mm
Minimum Ditch Freeboard	200 mm (below road finished grade shoulder to 1:100 yr 24 hour rain event)

Armouring such as rip-rap or re-vegetation will be required for erosion prone areas on all road slopes and ditching. Because of the sandy soil conditions of this site, erosion control will be an important consideration in design for all ditching and grading features due to high erodibility of the soils. Ditches require armouring for a minimum horizontal distance of 3 metres around culvert inlets, or as determined by hydraulic modeling. The general rule for protecting the downstream of a culvert is that armouring of three (3) pipe diameters should be used for each 1 m/s of velocity reduction required.

Monitoring and Compliance

Site water management plan monitoring will be conducted, primarily to confirm the best management practices related to ESC are functioning as intended. Routine inspections and management would be completed to document the effectiveness of the ESC measures, and any maintenance or replacement of ESC structures would be completed as required.

The EIS Section 2.9 Management System outlines the framework to support EIS review. The Project's detailed management programs and plans will be developed to support licensing and permitting. Of relevance to this Plan, the following is noted:

- The Spill Response Plan will outline how Denison will appropriately respond to and clean-up any unexpected spills. Spill reporting to Saskatchewan Ministry of Environment, ECCC, and the public will be required depending on the nature of the spill.
- The Effluent and Emissions Monitoring Plan includes sampling plans for stormwater during construction.
- The Construction Management Plan incorporates environmental considerations. Construction activities with higher potential risk of ESC problems include excavation and borrow areas, clearing and grubbing, ditch construction, and earthwork near/across streams and lakes
- Environment inspections will be conducted at various project areas on a frequency specified in future licences and permits. This may include for instance daily and weekly

inspections of fuel storage tanks, ponds, pads, lines, etc. to ensure compliance with operational conditions, best management practices and other requirements. Inspection (and sampling) plans for non-contact water mitigation measures such as silt fencing will coincide with precipitation events and spring runoff.

Various aspects of Project monitoring will not only be included in Denison's management system documentation but also included as conditions in permits, authorizations, and licences. The Provincial laws governing development in, or near, water are set out in *The Environmental Management and Protection Act, 2010* and *The Environmental Management and Protection (General) Regulations*. Denison will apply to the Saskatchewan Water Security Agency for an Aquatic Habitat Protection Work for any work near water and will adhere to the conditions of the permit. Fish and fish habitat are protected by provisions of the *Fisheries Act*. The Project will be constructed, operated and decommissioned in a manner compliant with Section 36 of the *Fisheries Act*. The Ministry of Environment enforces provincial legislation in collaboration with federal regulators.

Education and Training

Denison will provide education and training to staff and contractors about the importance of non-contact water management and best practices associated with erosion and sediment control. This helps ensure that everyone involved in the safe Construction, Operation and Decommissioning of the Project understands their role in protecting the aquatic environment.

In Closing

Denison views the EIS as an important planning tool that will be used to support future activities and represents one stage in the rigorous overall approvals process for a uranium mining facility in Canada. Denison is completing a sequential EA and licensing process for the Project. In the EIS, a framework for the EMS is provided along with a clear commitment for Denison to include Project design and water management-related mitigation measures into the EMS documents as they are developed / as the Project proceeds through the licensing and permitting phases. We trust that the FIRT has been provided with the appropriate level of detail on the water management topic for drawing conclusions on the EA process, and the summary contained in this SWMP will facilitate ECCC's review.

References:

Saskatchewan Water Security Agency. 2024. Aquatic Habitat Protection Permit - Preventing the discharge of deleterious substances. https://www.wsask.ca/preventing-the-discharge-of-deleterious-substances.

Saskatchewan Ministry of Highways and Infrastructure (SK MHI). 2012. Erosion and Sediment Control. June 2003, updated February 2012. Available online: https://pubsaskdev.blob.core.windows.net/pubsask-prod/124304/EP_ESC%252B%2528Feb% 252B2012%2529.pdf

Part 2 – Response to Specific Questions Raised in IRs 12, 12-R1A and 12-R1B

The table below highlights questions raised in IRs 12, 12-R1A and 12-R1B that weren't necessary fully described by the updated site water management plan (see Part 1).

Question from the IR	Denison Response
From FIRT's Information Request Rationale (2023-12-05): CNSC requests that Denison use a PMP value that is estimated using historical rainfall data that includes the most up to date meteorological data or provide justification on the validity of the current PMP.	Denison understands that validation of the current PMP will be assessed as part of CNSC licensing.
From Denison submission of responses to IRs (2023-08-18): Details related to culvert design and conveyance capacity are being developed as part of ongoing engineering activities. Culverts will be a designed with a sufficient size and length to convey water around the site during a PMP event.	Project design is bound by the EIS. Culverts within contact water areas are being designed to convey water associated with a PMP event.
The Proponent should include updated information on water treatment, flows, capacity and effluent discharge during normal operations, and a 24-hr Probable Maximum Precipitation (PMP) Event.	Non-contact water is not collected and routed through the industrial wastewater treatment plant (IWWTP). The wellfield runoff pond has been designed to accommodate the PMP. Influent to the IWWTP would be metered into the plant, per the treatment design rates and there would be no changes in effluent release rates beyond the assessed rates and plant design criteria.

IR- 101

- Department: ECCC
- Project Effects Link: Fish and fish habitat
- Reference to EIS, appendices, or supportant documentation: Section 8.1.1.3, Section 8.2.1.3 Aquati Environment

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, June 28, 2024)	IR (ROUND 4, Sept. 16, 2024)	Denison Response (ROUND 4, Oct. 18, 2024)
IR-101	-	**Context:** In Section 8.1.1.3 Spatial and Temporal Boundaries the Project Area, Local Study Area (LSA) and Regional Study Area (RSA) are established as they pertain to surface water quantity. The same is done in Section 8.2.1.3 for surface water quality. In Section 8.1.1.3 Figure 8.1-4, the locations of the Project Area, LSA, RSA and surface water features and monitoring stations are provided. However, the locations of wetlands located near the Project area and within the LSA and RSA have not been provided. The location of wetlands within or near the Project footprint, as well as the other wetlands existing within the LSA can be confirmed from Part II_S9 Terrestrial Environment, Section 9.2.3.3 Figure 9.2.-8, including the wetland classifications. There appears to be at least one shallow open water wetland and several bogs located within the Project Area. There is no consideration of wetlands or potential effects to wetland hydrology, surface water or sediment quality throughout the aquatic environment assessments. There is no baseline information regarding wetlands and their status as fish habitat and ecological function, or assessment of potential effects to flow rates, water levels, water quality, sediment quality, or biota. **Rationale:** There is currently not enough information provided for ECCC to provide advice on the potential risks of the proposed Project to wetland hydrology, surface water and sediment quality within the LSA. This pathway of effects is important to assess in terms of potential effects to wetland habitat availability and quality due to changes in flow rates, water levels, water quality, sediment transport, sediment quality and potential effects to terrestrial and aquatic receptors. It is necessary to evaluate if changes in groundwater and surface water runoff flows and routing will affect water levels and habitat availability	1. Provide baseline information regarding wetland characterization within the Project Area and LSA, including: locations, wetland type, size, water surface elevation, depth, water flow pathways, and the presence of wildlife receptors including presence of fish/fish habitat within the Aquatic Environment section of the draft EIS. If this information is available in annexes or baseline studies, summarize it within the main body of the Aquatic Environment section of the draft EIS with references to respective documents for review. 2. Provide baseline information on wetland surface water and sediment quality characterization for wetlands within the Project footprint. 3. Provide an assessment of potential effects to wetlands within the LSA and potential effects to ecological receptors during all phases of the proposed Project. 4. Provide further information on mitigation measures and monitoring that would be applied for the protection of wetlands.	Responses are numbered as listed in the IR. Figures associated with this IR are provided in Attachment IR-101. 1) Below indicates the information that is presented in the draft EIS regarding wetland characteristics. This information was housed within the terrestrial environment component and potential impacts to wetlands as a valued component is further assessed under Section 9.2 of the draft EIS, and specifically Section 9.2.6.4. The following list indicates what information was provided in the draft EIS specific to information request #1. As such, repackaging the available information in Section 8 would be redundant and therefore in Denison's view unnecessary. a. *Locations of Wetlands* **Section 9, Figure 9.2-8** on page 9-83 of the draft EIS presents a map of the RSA and LSA detailing the locations of various wetland features including bogs and fens. b. *Wetland Types* **Section 9, Figure 9.2-8** on page 9-83, and **Table 9.2-8** on pages 9-91 to 9-92 of the draft EIS provides the geographical distribution and listing of the following wetland types within the LSA: i. BS17 – Black spruce treed bog ii. BS18 – Labrador tea shrubby bog iii. BS19 – Graminoid bog iv. BS19/24 – Graminoid bog/Graminoid fen v. BS20 – Open bog vi. BS21 – Tamarack treed fen vii. BS23 – Willow shrubby rich fen viii. BS24 – Graminoid fen ix. BS25 – Open fen x. BS27 – Sedge rocky shore (shallow open water) c. *Wetland Size* **Section 9, Table 9.2-8** on pages 9-91 to 9-92 of the draft EIS lists the following wetland types and the cumulative area they encompass within the LSA: i. BS17 – 18.2 ha ii. BS18 – 23.3 ha iii. BS19 – 2.8 ha iv. BS19/24 – 0.8 ha v. BS20 – 0.6 ha vi. BS21 – 1.9 ha vii. BS23 – 0.6 ha viii. BS25 – 0.4 ha ix. BS27 – 4.2 ha d. *Wetland Water Surface Elevation* Surface elevations for the wetland have been assessed and the information is summarized below and in the Attachment IR-101 **Figure 1 Elevations of wetland features in the LSA**. • Wetlands 1.5 km west of the SSA range from 526-524 masl • Waterbodies and their surrounding wetlands directly to the east of the SSA are at an elevation of between 506 and 500 masl • Waterbodies and surrounding wetlands 2 km east	This response has not been accepted for the following reasons: 1. The response (#1(d)) by the proponent states that "Surface elevations for the wetland have been assessed and the information is summarized below and in the Attachment IR-101 Figure 1 Elevations of wetland features in the LSA" but it is not indicated that this information will be placed in the EIS. CNSC staff requests proponent to include the information provided in response #1(d) and Attachment IR-101 Figure 1 (Elevations of Wetland Features in the LSA) and Attachment IR-101 Figure 2: (Denison Wheeler River Project SSA and Wetland Feature Distribution) in the EIS. 2. The Proponent stated in response #2 (a) and (b) that ''surface water quality and sediment quality in wetlands were not specifically sampled in the wetland complexes adjacent to the Project footprint during the original baseline assessment.'' CNSC staff requests the proponent to provide justification why they have relied on measurements upstream and downstream of the wetlands over direct measurements in the wetland areas. It is recommended to conduct direct measurements in the wetland areas. 3. The information provided did not satisfy the IR. Additional information regarding the potential impacts to wetlands due to changes in surface water quality and sediment quality should be included within Section 8.3 of the main EIS. This is needed to fully understand the scope of potential effects to the aquatic environment. a. Update Section 8.3 to include additional information on predicted water and sediment quality impacts to wetlands from the Proponent's response to directly consider wetlands as fish and fish habitat for the purpose of assessing water quality impacts. b. Update Section 8.3 to provide an assessment of potential effects to wetlands from water and sediment quality changes within the LSA. 4. It is stated in response #4 that "[…] Updated baseline information on wetland depths and water-levels may be useful in providing a frame of comparative reference to potential changes during the operation, decommissioning and post-decommissioning phases of the project" and CNSC staff agrees with the proponent and recommend collection of monitoring	1. This information has been incorporated into the EIS as Appendix 8-F. 2. Denison is committed to conducting surface water quality and sediment quality in wetlands within the LSA and specifically in wetlands directly adjacent to the Operation prior to construction commencing for the purposes of collecting baseline to further assess the effectiveness of mitigation measures. 3(a). Section 8.3 has been updated and specifically sections 8.3.1, 8.3.1.2, 8.3.3, 8.3.4.1, 8.3.4.2 (8.3.4.2.2 and 8.3.4.2.3, 8.3.4.2.5), 8.3.5, 8.3.7, 8.3.9 to include consideration of wetlands as aquatic habitat features within the context of their potential to provide fish and fish habitat. Sections 9.2.4.2.1, 9.2.6.2.1, 9.2.6.4.1, 9.2.7.3, and 9.2.9 have been updated to be aligned with Section 8. 3(b). Section 8.3 has been updated and specifically sections 8.3.1, 8.3.1.2, 8.3.3, 8.3.4.1, 8.3.4.2 (8.3.4.2.2 and 8.3.4.2.3, 8.3.4.2.5), 8.3.5, 8.3.7, 8.3.9 to include consideration of wetlands as aquatic habitat features within the context of changes to water quality and sediment quality within the LSA due to the Project. Sections 9.2.4.2.1, 9.2.6.2.1, 9.2.6.4.1, 9.2.7.3, and 9.2.9 have been updated to be aligned with Section 8. 4. Denison is committed to conducting surface water quality and sediment quality in wetlands within the LSA and specifically in wetlands directly adjacent to the Operation prior to construction commencing for the purposes of collecting baseline to further assess the success of mitigative measures.	Responses to items one and four have been accepted, but items two and three require additional information. For item two, the Proponent has not included justification regarding why they have relied on measurements upstream and downstream of the wetlands over direct measurements in the wetland areas within their response. Please provide the missing justification for item two, as well as describe how baseline information will be used to further assess the effectiveness of mitigation measures. Water and sediment quality in wetlands differ than those in stream and lakes systems because of their distinct biota and hydrology. In wetlands, there is a greater cycling of nutrients, more nutrients and metals can be sequestered in sediment, and metal toxicity modifying water quality factors such as pH and dissolved organic carbon are not the same as in streams and lakes. Baseline data on water and sediment quality in wetlands are necessary to evaluate potential effects on fish and fish habitat of proposed discharge to Whitefish Lake upstream of the wetlands. The information would also be used to assess possible effectiveness of proposed mitigation measures. For item three, the Proponent has not provided the predicted sediment quality impacts within item three, which is part of the wetlands assessment that was requested. Please also update Section 8.3 to include additional information on predicted sediment quality impacts to wetlands and to provide an assessment of potential effects to wetlands from sediment quality changes within the LSA. This Information is required in order to identify and define potential effect pathways linked to project-related changes to wetland sediment quality and assess effects on wetland functions, fish and fish habitat, and other valued components. Potential effect pathways in wetlands can be different than those in lakes and streams and warrant a separate assessment.	Per the Round 3 IR, responses to items 1 and 4 from the Round 2 IR have been accepted, but items 2 and 3 require additional information. For Item 2, for clarity ECCC specified during the meeting on June 14, 2024, that the wetlands of interest are those located within the nearshore environments of Whitefish Lake (Upper, Mid and Lower) as these lakes will directly receive treated effluent during operation. Water quality was sampled both upstream (river inlet to lake) within the lakes and downstream (river outlet of lakes) (e.g., SA4, SA-5, SA-6, LA-5 and LA-6; refer to Appendix 8-D for the aquatic baseline report including photographs of water quality sampling areas for context). As identified in Denison's response to the IR-107 (round 3), the baseline water quality variability was very low between these stations and therefore overall representative of the LSA and encompassing depositional and non-depositional environments. This was deemed appropriate and suitable for the scale of the EIS. The rationale for using water and sediment quality specific to the inlet/lake/outlet is further described below. Surface water quality modelling included predictions of water and sediment concentrations in Whitefish Lake, the lake into which treated effluent will be released, as well as locations farther downstream. Water quality was predicted as the incremental change in constituent concentrations during periods of effluent discharge on a monthly time step. Sediment quality predictions (as concentrations of constituents in sediment) were made on the same time step from surface water concentrations using the partitioning coefficients (Kd). The Kd values are presented in Table 3-6 of the ERA. They consist of regional published values that have been calibrated on similar sites in northern Saskatchewan over several years and have been checked against Wheeler River measurement data as shown in Figure 3-2 and Figure 3-3 of the ERA. For the purposes of the analysis the Kd value was used for a lake environment meaning that one estimate of sediment quality was assumed to be reasonable for the purposes of the EIS because the wetlands are directly connected to the lake as they are functional nearshore environments of the waterbody itself. The wetland portions under discussion are more accurately described as littoral areas and these wetland portions are not cut-off from or	Denison has not adequately responded to the request to identify potential effects to sediment quality to support identification of project-related effect pathways to wetlands. The Kd values could differ significantly in wetland environments compared to in lake/stream measurements where all samples were taken and there are discrepancies in wetland classification within the EIS and information provided in IRs with the actual classification standards for various wetland types. For further explanation, the descriptions of the wetland areas provided in the round 3 response do not correspond to information provided in the last round of responses received from Denison. For example, Figure 2 of Appendix 8-F: Wetland Effects Assessment Report identifies a black spruce treed bog (ecotype BS17) between Whitefish Lake North and Whitefish Lake Middle (La-5), where effluent will be discharged. According to the Canadian Wetland Classification System (Warner & Rubec, 1997), bogs are defined as receiving water only from precipitation, with no hydrological connections to groundwater or littoral areas. This does not match with the response of "*littoral areas and these wetland portions are not cut-off from or isolated from the main basin of the lake.*" The response also does not correspond to the BS17 ecotype described in Appendix 9-B: Terrestrial Environment Wildlife and Vegetation Baseline Inventory. The uncertainty introduced as to the conditions on site complicates the discussions on baseline conditions and potential impacts in wetlands which the Proponent assumes to provide fish habitats. Bogs and fens (ecotypes BS17, BS18, BS19, BS21) are identified in and around Whitefish Lake and these wetlands will have different water and sediment chemistry than lakes and creeks. For example, the partitioning coefficients of sediments in a fen would not be expected to be the same as those in a lake, though both may be depositional environments, sediments in the fen would be richer in organic matter because of the vegetation present. Organic matter in sediment is an important factor affecting soil-water partitioning coefficients. Because of this, the sediment in wetlands is likely to adsorb more metals than sediment found in lakes. So it is important to understand baseline conditions and model impacts in order to ensure the aquatic environment will not be impacted by the project's planned discharges. The Proponent should clarify if the wetlands were misidentified in the Terrestrial Environment Wildlife and Vegetation Baseline Inventory. If they have been misidentified, then corrections should be made to the Baseline Inventory and Wetlands Assessment Report, and information provided in the Proponent's round 3 response should be integrated in Section 8.3 of the EIS. If they have not been misidentified, then the Proponent should respond to round 3 information requests considering the wetland environment. <u>In order to resolve this IR, Denison are expected to:</u> 1. Update wetland classification in the LSA according to the Canadian Wetland Classification System (Warner & Rubec, 1997). Focus should be applied to	Denison reaffirms the approach taken with baseline sediment data as utilized in the EIS and more specifically in the ERA (e.g., pooled sediment data from locations in an unimpacted system in the same watershed where land use and type is homogeneous) as an appropriate and acceptable basis to define existing conditions (and the variability thereof) and to identify potential Project effects to sediment and evaluate the significance of these effects. The IMPACT model predicts how constituents travel through the environment and concentrations of constituents change as a result of interactions with natural flows and lake sediments. The Kds applied in the model have largely over predicted the baseline sediment concentrations throughout the lakes demonstrating that the model and model inputs are conservative, and impacts (i.e., incremental changes in constituent concentrations resulting from Project emissions to the aquatic environment) have not been under predicted. For context on a sensitivity analysis for sediment quality predictions, refer to Appendix 10-A, Section 6.2.2 Effluent Discharge Rate. A sensitivity analysis of key model parameters was undertaken to understand the degree to which the results or conclusions of the risk assessment would vary if parameters differed from what was assumed. In this section, sediment predictions are shown for a scenario where effluent is released at the maximum upper bound rate of 81 m^3/hr and the maximum concentrations of COPCs in the receiving environment increases up to 120%. It is also a conservative prediction in that it assumes effluent is released during decommissioning at the same upper bound flow and quality as during operations. In this sensitivity analysis, the modelled concentrations of all COPCs are expected to be below their corresponding sediment quality guidelines, with the exception of cadmium, molybdenum, selenium and vanadium; however, the predicted exceedances for cadmium, molybdenum, selenium and vanadium are all below their probably effect level (PEL), no-effect (NE2), or severe effect level (SEL) values, therefore, adverse effects to benthic communities are not anticipated under the upper bound discharge scenarios. Importantly, monitoring programs will be implemented to assess the environmental performance of the Project relative to the predictive assessment that has been completed in support of the EA process. Such monitoring is needed since there is always some level of uncertainty associated with EA predictions (and it is noted that uncertainty analysis has been completed as part of the EIS and considered within the context of assessing the significance of effects).

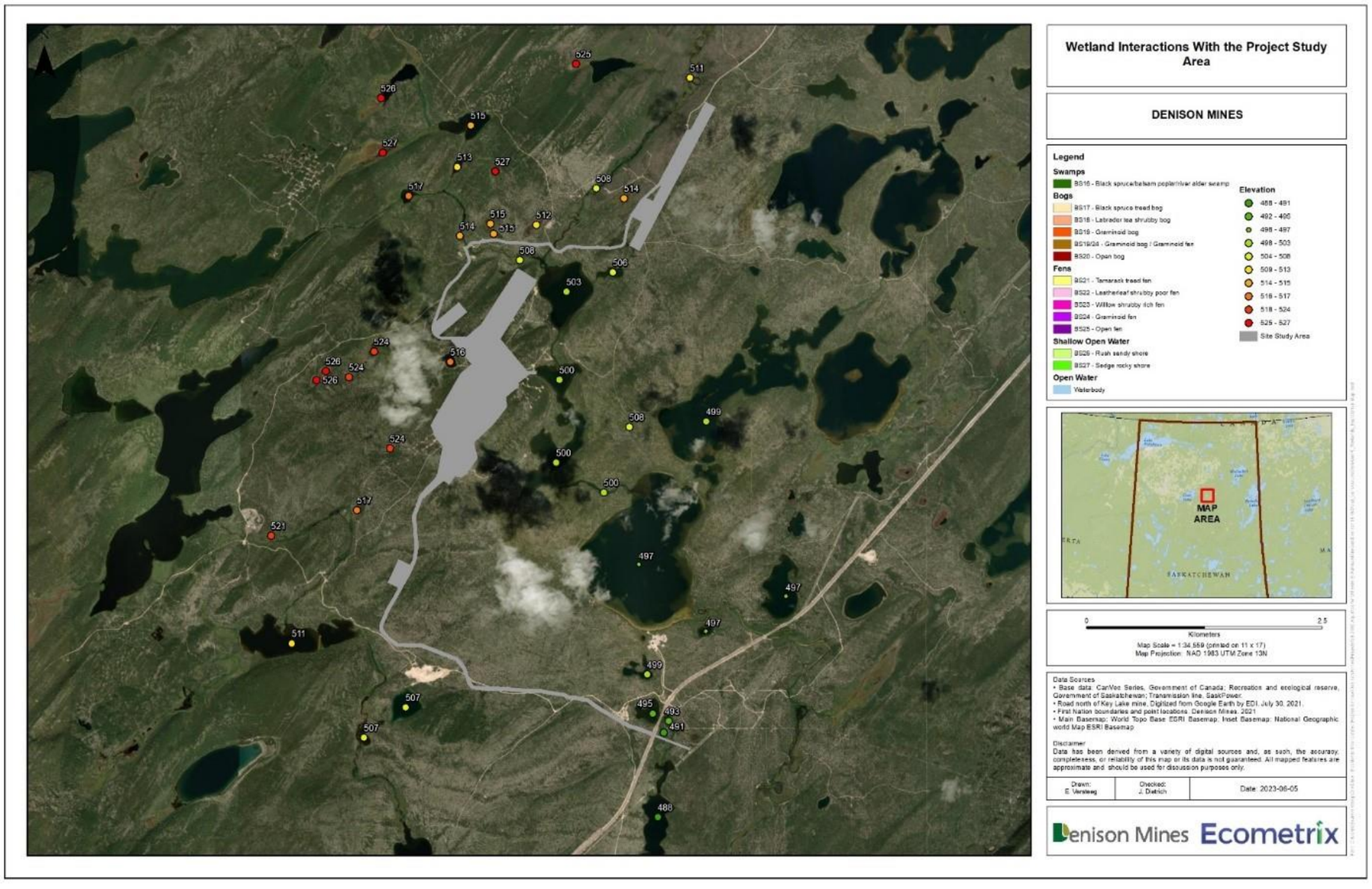
		within wetlands. Potential effects from COPCs and radionuclides to surface water and sediment, or potential effects to ecological receptors within wetlands have not been evaluated.		of site are approximately between 499 and 497 masl • Wetlands north of the SSA and in the vicinity of the proposed air strip range from 514-508 masl. • Wetlands situated further north of the SSA in the LSA were at an elevation of approximately 526 masl • Southern wetlands that will interact with the proposed hydro corridor extension for the mine have an elevation of 491masl • Most wetland evaluated south of the SSA had elevations ranging from 491-488 masl e. *Wetland Depth* – information associated with wetland depth for those in the LSA is not available. f. *Wetland Flow Pathways* - Nearly all wetlands are connected or adjacent to rivers and tributaries, and thus flow pathways are discernable in **Figure 9.2-8** of the draft EIS. g. *Presence of Fish and Fish Habitat* For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA. Section 9.2.6.4.1 of the draft EIS described the estimated change in the aerial extent of wetland due to direct impacts of the Project footprint (see also Figure 9.2-8). The assessment indicated a total loss of 0.5 ha (less than 0.1%) of all wetlands within the Terrestrial RSA. 2) As noted in other parts of this IR response, the wetlands within the Project footprint are limited to two areas (i.e., stream crossings along the access road to the airstrip and powerline connection SE of Highway 914 [See Figure 2: Denison Wheeler River Project SSA and Wetland Feature Distribution in Attachment IR-101]) and these wetland areas can be avoided through design and construction mitigations. As such, no direct impact to any wetlands or waterbodies are expected as part of the Wheeler River Project that may impact fish or fish habitat. In regard to baseline information on wetland surface water and sediment quality characterization for wetlands within the Project footprint: a. <u>Surface water quality in wetlands</u> – surface water quality was not specifically sampled in the wetland complexes adjacent to the project footprint during the original baseline assessment. However, surface water quality was sampled and assessed at stream and lake stations situated upstream and downstream of wetland areas. These stations were selected for sampling as they were identified as providing repeatability (i.e., relative water depth) and informative with respect to desired segments of the system. For example, water quality was sampled at SA-4, SA-5, LA-6, SA-6 and LA-5	information on the wetland areas.			isolated from the main basin of the lake. As such, it can be assumed that the lake environment is likely to be as depositional as the nearshore environment. The lakes of interests are very shallow (on average 1.5 m in depth) and therefore deposition may be as likely in the "offshore" environment as the nearshore. The wetlands are not likely to have a dominating effect on the water quality of Whitefish Lake due to their lesser aerial extent vs. the lake proper and the connectivity between the zones suggests that water quality would be similar between the shoreline and the "offshore" (i.e. likely good exchange). With respect to Item 4, and to further confirm these assumptions discussed above, Denison has committed to the collection of additional baseline information with the wetlands for water quality and sediment quality prior to construction as part of operational licencing (Commitment 8-46). Denison has also committed to conducting a pre-construction preliminary EEM for the site. The EEM study design will be further guided by the final design of the diffuser and the behaviour of the effluent plume (Commitment 8-49). Based on this and if applicable, the EEM study design could include an investigation of the differences in WQ and SQ nearshore and offshore. This would allow for an understanding of the differences in water to sediment contaminant ratios between nearshore and offshore environments.	updating areas with hydrological connections to groundwater and littoral sources, which may have been misclassified as bogs. This should include any sub-classification of wetlands currently categorized as Shallow Open Water in Appendix 8-F: Wetland Effects Assessment Report. Updates should be made as necessary to all relevant reports, including the Terrestrial Environment Wildlife and Vegetation Baseline Inventory as needed. 2. Update habitat mapping for wetlands to reflect any changes in wetland classifications, particularly for wetlands that may include fish and fish habitat. 3. Update Table 8.3-3 and 8.3-4 in Section 8 of the EIS to include more specific information on wetlands that may contain fish and fish habitat, such as information on wetland type & extent, vegetation, substrate type, organic matter content, etc. 4. Provide a table with summary statistics (grain size analysis and sediment quality) from sediment sampling specific to each individual sampled lake or stream, rather than summary statistics for all waterbodies and watercourses pooled together. 5. Provide the source reference for the Kd values used for the ERA in Table 3-6 and the specific characteristics of sediments (i.e. grain size and composition) of the regional study areas as they compare to LA-5, the LSA and the RSA. 6. Conduct a statistical analysis with a power analysis comparing sediment characteristics (grain size analysis and sediment quality) from the various sub-samples taken within each waterbody to conclude if there are any significant differences between sub-sampling stations, and determine if there is within-lake variation in sediments. Denison should provide the methodology they will use to conduct the statistical analysis and power analysis for CNSC review and acceptance prior to completing the analysis. Based on the results of this statistical analysis, Denison should: a. If the results determine that there is enough statistical power to confirm there is no within-lake variation in sediment characteristics within LA-5, Denison should then complete a statistical analysis and power analysis comparing LA-5 to other sampled areas to determine if there is any between-lake variation in sediment characteristics. b. If the results determine that there is not enough statistical power, or that there is enough statistical power but there is significant within-lake variation between sub-samples in LA-5, Denison will require the additional baseline data that Denison has already committed to collecting, to update the modelling during the EA phase to support conclusions on significance of effects to the receiving environment. This IR relates closely to IR-107 that demonstrates that there is not enough	Specific to this IR, sediment sampling will be completed to verify the accuracy of predicted effects and the effectiveness of proposed mitigation measures. Monitoring and follow-up programs will be integrated within Denison's overall Environmental Management System (EMS) framework and implemented through the various programs, plans and procedures that would be developed therein. Denison is committed to achieving continual improvement in environmental performance through its EMS. As part of this overall commitment to continual improvement, monitoring programs will be implemented via an adaptive management approach. Adaptive management is a systematic process for continuously improving environmental management practices by learning from their outcomes. It provides the flexibility to address/accommodate new circumstances, to adjust monitoring, to identify and implement new mitigation measures, or to modify existing measures throughout all Project phases. Further, it provides a means to confirm that the monitoring elements remain valid, meet regulatory requirements, and be responsive to evolving objectives. At the EIS stage, the conceptual plan is for sediment sampling at Whitefish Lake South (near-field), at an upstream reference location (Whitefish Lake North), and at downstream locations (far-field) every three years. The far-field monitoring locations will be located in Whitefish Lake South prior to its discharge to McGowan Lake. The details of the sediment monitoring program will be refined as the Project advances. Sediment constituent concentrations will be compared to the values used in the EIS and to applicable regulatory criteria or objectives. As noted, above sampling effort will be predetermined that meet the rigor required of federal / provincial requirements as described in relevant technical guidance documentation for operational monitoring. In general, applying equally to sediment quality as with all other environmental aspects that have been considered in the EIS, where an environmental monitoring program identifies predicted effects are greater than anticipated, Denison would evaluate whether these effects could result in changes to the conclusions in this EIS. If changes are confirmed, then Denison would evaluate the need for revised mitigation actions and management practices to manage effects. As highlighted above, Denison's interpretation of monitoring data would include reference to environmental performance criteria. An exceedance of environmental performance criteria would trigger Denison to respond to further investigate the potential issue. Based on this investigation, where need for revised mitigations is identified these measures would be developed and implemented. It is expected that the adaptive management process would be informed by input sought from Indigenous people,

				following the flow path from upstream to downstream, respectively. The water quality at these nodes was inclusive of upstream wetland influences. For further reference to surface water sampling station during baseline, please refer to Figure 8.2-4 of the EIS. b. Sediment quality in wetlands - sediment quality was not specifically sampled in the wetland complexes adjacent to the project footprint during the original baseline assessment. However, sediment quality was sampled and assessed at depositional lake stations situated upstream and downstream of wetland areas. The sediment quality at these nodes would be inclusive of upstream wetland surface water and sediment influences. For further reference to sediment sampling stations during baseline, please refer to Figure 8.2-4 of the EIS. 3) For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA. Section 9.2.6.4.1 of the draft EIS described the estimated change in the aerial extent of wetland due to direct impacts of the Project footprint (see also Figure 9.2-8). The assessment indicated a total loss of 0.5 ha (less than 0.1%) of all wetlands within the Terrestrial RSA However, when further scrutinizing the potential overprinting of wetland features as a result of the Project it is evident that even this loss is avoidable. The interaction of the Project with wetlands is relegated to those areas where stream crossings for access roads and powerline connections are proposed (**See Figure 2: Denison Wheeler River Project SSA and Wetland Feature Distribution (Attachment IR-101)**). Wetlands associated with stream crossings have been identified to have mitigative designs (clear-span) to ensure no impacts to fish and fish habitat. The hydro-line as shown in Figure 1 will be constructed to avoid direct impacts to fish and fish habitat following best installation practices. As such, no direct impact to any wetlands or waterbodies are expected as part of the Wheeler River Project that may impact fish or fish habitat. As discussed in Section 8.1.6.1 of the EIS, water levels in the ponds and lakes in the vicinity of the of the Project are expected to experience negligible effects, with magnitudes of changes in water levels predicted to be in the sub-centimeter range. As natural fluctuations in lake water levels were approximately 0.4 m from 2011 to 2019, Project-related changes are not expected to be of a magnitude to compromise the Surface Water Quantity VC. It can then be considered a reasonable assumption that any changes to wetland features will have similar sub-centimeter impacts to water levels due to changes in surface flow and/or groundwater and therefore do not pose an indirect effect to water quantity or fish and fish habitat associated with these wetland features. 4) As no impact is expected due to overprinting or due to draw down effects by the ISR, additional mitigation measures are not warranted. Updated baseline information on wetland depths and water-levels may be useful in providing a frame of comparative reference to potential changes during the operation, decommissioning and post-decommissioning phases of the					baseline data to support conclusions on significance of effects.	stakeholders, and regulatory agencies. The following section provides a response to each to the specific IR questions: 1. The project's ecosite classification is outlined in Section 9. Ecosite classification was completed using the Guide to the Ecosites of Saskatchewan's Provincial Forests (McLaughlin et al. 2010) Ecosite information was transferred directly into Appendix 8-F which originated in January 2024 during the EIS review process in response to FIRT IRs. Refer to Section 9 for the wetland assessment and Appendix 9-B for the terrestrial baseline report with information on ecosite mapping in Section 2.1.3 and ecosite characterization methods and results in Section 2.2. The measurable parameter for the wetlands assessment in Section 9 was change in areal extent of wetlands; this was also considered in Appendix 8-F. The EIS guidelines do not require use of the suggested classification scheme (Canadian Wetland Classification System (Warner & Rubec, 1997). Denison used information from the province's land classification system and have fulfilled that EIS requirement. Effectively, to be conservative in one assessment (assessing change in areal extent of wetlands in Section 9) we have introduced questions and confusion in Appendix 8-F. The data was fit for purpose for Section 9 and to be consistent, it was carried over into Appendix 8-F without any adjustments or reclassifications. This IR is not questioning the assessment of changes in areal extent of wetlands, but the purported under estimation of risk through the effluent modelling. As such, no updates to the wetland classifications are warranted at this time. Further, Denison has committed to completing additional wetland studies (see response to point 2). 2. Additional wetland surveys will be completed after the EA stage, per commitment 8-46 in Denison's commitment register (i.e., "To further supplement existing information that exists for the LSA wetlands, Denison is committed to undertaking wetland surveys including the collection of water quality, sediment quality, benthic invertebrates and fish and fish habitat surveys prior to the construction to provide an updated baseline for assessing the success of mitigation measures and to assess potential effects of the project on wetlands. These locations will then be further considered as part of the EMP for continued monitoring for these media and biota."). Appendix 8-F has been updated and specifically, a new appendix (Appendix A) has been added. This new appendix provides photos and text to orient the reviewer to the in-lake wetlands of interest. While some of these in-lake areas were conservatively classified as wetlands in the terrestrial assessment (EIS Section 9), from an aquatic perspective, these in-lake wetlands of

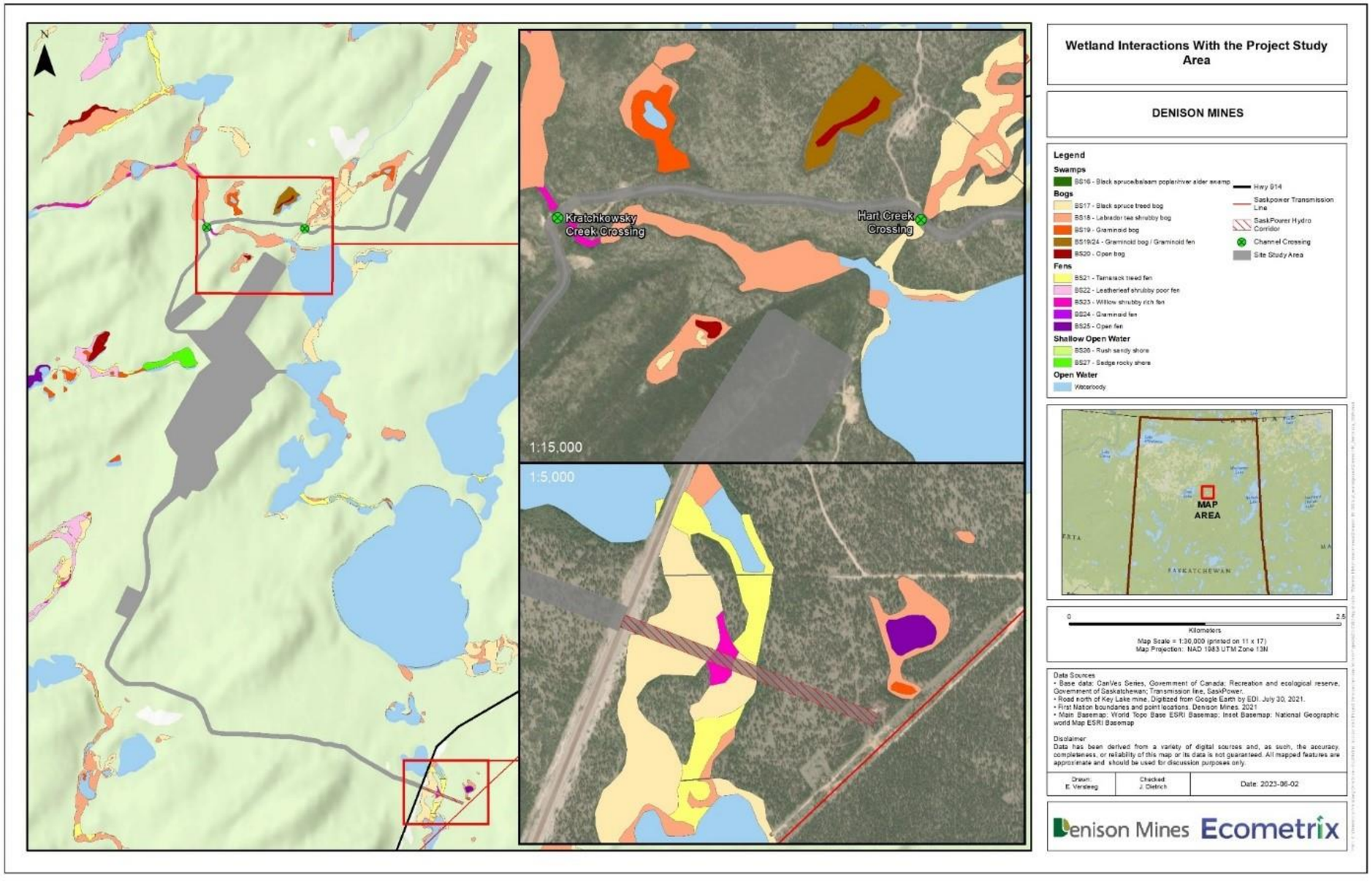
				project. However, such changes are expected to be less than measurable.						interest are littoral / nearshore zones in the lake and connecting channels. The balance of this IR response outlines the rationale for why the CNSC's suggested wetland mapping updates to the EIS would not change any EIS conclusions and are not required at this stage for EA determination. 3.Any wetlands that were present within water bodies, were mapped as part of the baseline program and results would be incorporated into the existing fish habitat summaries provided in Tables 8.3-3 and Table 8.3-4. Refer to Section 8.3.3 for the existing environment methods and results. It is noted in the EIS that detailed information regarding fish and fish habitat baseline data collection and analyses are provided in Appendix 8-D, Appendix 8-B, and additional information pertaining to wetlands is provided in Appendix 8-F. 4. Sediment grain size results for McGowan Lake, Whitefish Lake south, Whitefish Lake north and Russell Lake are summarized in EIS Section 8 Table 8.4-2, and sediment chemical composition results are summarized in Table 8.4-3. The baseline sediment grain size and chemistry analysis for all stations within the baseline study area are provided in Appendix 8-D Aquatic Baseline, Tables A-3 and A-4 of Appendix A, respectively. 5. A summary of the source reference for the Kds is provided in Attachment IR-101 (Round 4), and a discussion on sediment grain size for the Wheeler River and regional study area is also provided. 6. Based on discussions between the CNSC and Denison in September 2024, the primary request from the CNSC was related to additional information on the IMPACT Kds, which has been provided as part 5 of this response. The requested power and additional statistical analyses can be completed as part of licensing and will include results from pre-operational sediment sampling. Any pre-operational sediment sampling results will be included in the environmental risk assessment (ERA) update to support Denison's application for a licence to operate. Additionally, the pre-operational sediment sample results in combination with existing data will be the basis of future comparisons of measured data from effluent exposed and reference areas. Such comparisons would be based on statistically based study designs that meet the rigor required of federal / provincial requirements as described in relevant technical guidance documentation for operational monitoring.

Attachment: IR-101 (included in Round 1 submission)

Supporting figures to the response provided in table:

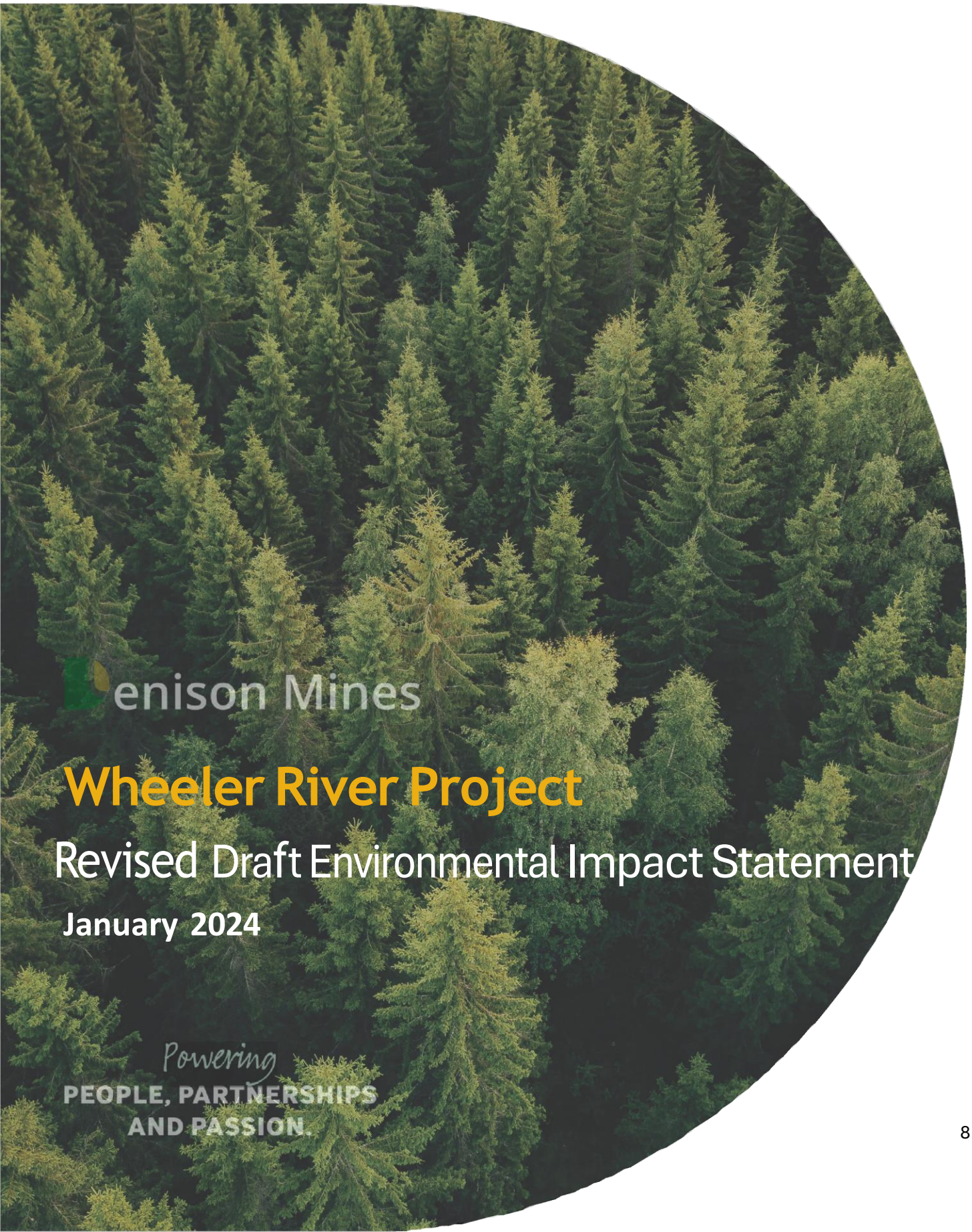


Attachment IR-101 Figure 1 – Elevations of Wetland Features in the LSA.



Attachment IR-101 Figure 2: Denison Wheeler River Project SSA and Wetland Feature Distribution

Round 2: New EIS Appendix 8-F



Wheeler River Project

Revised Draft Environmental Impact Statement

January 2024

TO:	FROM:
Denison Mines – Janna Switzer	Ecometrix
REF:	**DATE:**
Wheeler River Project EIS – Appendix 8-F: Wetland Effects Assessment Report	19 January 2024

1.0 Introduction

On October 21, 2022, Denison Mines Corp. (Denison) submitted a draft Environmental Impact Statement (EIS) for the proposed Wheeler River Project (the Project). Based on their initial review, the Canadian Nuclear Safety Commission indicated that the submission contained the required information to proceed with the Federal-Indigenous Review Team (FIRT) technical review of the draft EIS. On March 20, 2023, the FIRT provided Denison with a list of information requests (IRs) for Denison to respond to and eventually submit a final EIS document. Responses to these IRs were provided in July and August of 2023. Additional FIRT IRs were provided to Denison on December 5, 2024. Of these IR-101 was not adequately answered and additional information was requested.

This appendix provides additional information to address IR-101 provided by Environment Canada and Climate Change (ECCC) as part of the second round of FIRT comments. The comment included a request for a further summary of wetland characterization information from available sources, baseline information pertaining to water quality and sediment quality, and assessment of potential effects to wetlands within the LSA for all phases of the Project and provide further information on mitigation measures and monitoring that would be applied for the protection of wetlands.

2.0 Scope of the Assessment

This section addresses the potential effects of the Project on the Fish and Fish Habitat VC for which wetland habitats are considered a component. The purpose of this assessment is to assess potential changes to wetlands (as represented by the Fish and Fish Habitat VC) in consideration of all phases of the Project at the Project Area, local, and regional study area scales. Pathways affecting wetlands are directly associated with potential changes to the Surface Water Quantity (hydrology), Surface Water Quality, Sediment Quality, and Benthic Invertebrates VCs. Changes to

hydrology, water quality, sediment quality, and benthic invertebrate communities may directly affect wetlands as both fish and wildlife habitat and food resources. The assessment approach reflects these connections within the environment, as the significance determination for the Surface Water Quantity and Surface Water Quality VCs was conducted at the receptor VC level.

The Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs are interrelated, to varying extents, and are linked to other VCs, including:

Surface Water Quality – surface water contributes to local moisture regimes, and surface water quality can influence the persistence of Vegetation and Ecosystems, Listed Plant Species, and Wetlands.

Surface Water Quantity – surface water contributes to local moisture regimes, and surface water quantity contributes to site drainage and discharge, which can influence the persistence of Vegetation and Ecosystems, Listed Plant Species, and Wetlands.

Sediment Quality – Vegetation and Ecosystems, Listed Plant Species, and Wetlands contribute to ecosystem form and function that stabilize riparian areas and influence quality of surface water runoff to aquatic systems.

This appendix will focus on the interrelations between these VCs as they apply to Wetland function.

Pathways that are of interest include those associated with site clearing and the potential for erosion-driven mobilization of suspended sediment into local surface waters; groundwater interactions with surface water features including wetlands; the establishment of new subwatershed boundaries and the resulting effects of effluent discharge to the receiving environment; and the potential overprinting of wetland habitat by Project infrastructure.

2.1 Key indicators and Measurable Parameters

The KIs for the wetland component of the Fish and Fish Habitat VC include potential changes in surface water quantity, surface water quality, and available wetland habitat from baseline conditions. The rationale for each KI and associated MPs is summarized in Table 1.

Table 1: Key Indicators and Measurable Parameters for the Wetlands Valued Component

Key Indicator	Rationale for Key Indicator	Measurable Parameter
Change in available wetland habitat from baseline conditions	2. Project activities may result in a change in the extent of Wetlands. 3. Of provincial and federal management concern 4. Contributes to biodiversity and habitat for wildlife species and listed plant species. 5. Cultural importance. 6. Contributes to biodiversity, maintenance of hydrologic cycles, nutrient cycling, water quality, and carbon storage. 7. Sensitive to disturbance. 8. Historically addressed for other mining projects in northern Saskatchewan.	Aerial extent (m^2 or ha) of overprinted wetland habitat.
Change to water levels or flows from baseline conditions	Project activities are expected to result in changes to local hydrology. A reduction or increase in flows may result due to the elimination or redirection of subwatershed area and through Project water management (i.e., water taking, storage, and effluent discharge). These changes in flow to the environment may alter stream flows, lake levels and such feature interactions (inundation) with wetland features required for fish and wildlife during all life stages.	Changes in water levels (m) or percent changes to flow conditions (%).
Change in surface water quality from baseline conditions	Changes in water quality are regulated (subsection 36(1) of the *Fisheries Act* and the MDMER). Changes that may occur as a result of the Project include: • mobilization of solids into local watersheds; and • deposition of deleterious substances into the receiving environment as a result of mine effluent and/or surface runoff.	Change in the concentration of constituents that are directly related to Project activities, measured as a mass of a chemical per unit volume in water (e.g., mg/L).

2.2 Spatial and Temporal Boundaries

The areas used to assess the effects of the Project on the Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs are (Figure 1):

Project Area: the area within which the Project and all components/activities are located (i.e., the area of maximum physical disturbance). The Project Area is considered to be a conservative estimate of the area of direct disturbance effects on VCs in this assessment.

Vegetation LSA: the area that surrounds the Project Area where all direct effects and most indirect effects are likely to occur on the Vegetation and Ecosystems, Listed Plant Species, and

Wetlands VCs. The Vegetation LSA is defined as the Project Area plus a 250 m buffer along roads and a 500 m buffer around all other infrastructure (1,161.8 ha).

Terrestrial RSA: the area that surrounds and includes the Vegetation LSA, established to assess the potential, largely indirect effects of the Project on Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs in a regional context. The Terrestrial RSA (40,173.6 ha) is defined as a minimum 8 km buffer around the Vegetation LSA and has been delineated to capture all indirect effects of the Project on the Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs and provide context for the type, distribution, extent, and prevalence of plant species and ecosystems in the region. The Terrestrial RSA also defines the area within which cumulative effects are likely to occur (i.e., CEA boundary).

Temporal boundaries identify when an effect is expected to occur in relation to specific Project phases and activities. The temporal boundaries are based on the timing and duration of Project activities, with the associated interactions with each VC and KI (where applicable). In the EA, the temporal boundaries are described as appropriate for each activity and cumulatively for the life of the Project.

The temporal boundaries for the EA represent the timeframes that the Project is expected to interact with and potentially affect Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs. The temporal boundaries are aligned with the Project development schedule as described in the EIS: Construction; Operation; Decommissioning; and Post-Decommissioning.

3.0 Existing Conditions

Wetlands are defined as "land that is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation and various kinds of biological activity which are adapted to a wet environment" (National Wetlands Working Group 1997). As such, ecosites have been determined to be wetland ecosystems where these conditions are expected to occur. This includes both wetland ecosites and sparsely vegetated ecosites where the water table is within 50 cm of the ground surface (McLaughlan et al. 2010). No wetlands within the Terrestrial RSA have been designated as Ramsar Wetlands of International Importance (The RAMSAR Convention Secretariat 2022).

Project-specific investigations pertaining to the Terrestrial Environment were conducted by Omnia Ecological Consulting (Omnia; Calgary, AB) from 2017 to 2019. Details on the methods, survey parameters and assumptions, and comprehensive data summaries/findings are presented in the Project-specific baseline report (Omnia 2020; see **Error! Reference source not found.** of the EIS) and a supplementary baseline annex report completed in 2021 (EDI 2021; see **Error! Reference source not found.** of the EIS).

Project baseline studies for vegetation presented a description of the ecosystems/habitat types (i.e., ecosite classifications) within the Terrestrial RSA. Vegetation communities and ecosystems are represented by provincial ecosite classifications for the Boreal Shield Ecozone in accordance with the Field Guide to the Ecosites of Saskatchewan's Provincial Forests (McLaughlan et al. 2010). These ecosite classifications were summarized within a 1:20,000 interpreted ecosite mapping product compiled within the Terrestrial RSA with the use of the following inputs:

- 1:5,000 anthropogenic features mapping;
- historical fires data;
- provincial Predicted Ecosite Mapping;
- current and historical imagery; and
- field sampling/ground truthing sites (EIS Appendix 9-B).

As the Boreal Shield Ecozone experiences a largely natural fire regime, much of the vegetation within the Terrestrial RSA (70.6%) is comprised of post-fire regeneration (i.e., shrubby structural stages).Twenty (20) upland ecosites were identified within the RSA with relative percentages by area estimated for each ecosite code.

The assessment also identified fourteen (14) wetland ecosite types within the RSA which included swamps, bogs, fens and shallow open water ecosite codes. The area of these wetlands was also estimated to provide a relative percent area of representation within the RSA.

This cataloguing of ecosite presence and relative area composition across the RSA provides the basis for understanding landscape change and succession over the course of the construction and operation of the Wheeler River Operation.

Waterbodies were conservatively included here as wetlands, as they have the potential to be classified as shallow open water wetlands (i.e., water bodies 2 m deep or less; Warner et al. 1997). Waterbodies represent the most common wetland ecosystem within the Vegetation LSA and the Terrestrial RSA, comprising 3.9% (44.9 ha) and 10.7% (4,101.9 ha), respectively. The black spruce treed bog is the second most common wetland ecosystem within the Vegetation LSA (18.2 ha, 1.6%) and the Terrestrial RSA (1,157.1 ha; 2.9%). The Labrador tea shrubby bog is the most common wetland ecosystem in the Vegetation LSA, comprising 2.0% (23.3 ha), and the second most common wetland ecosystem in the Terrestrial RSA (989.9 ha, 2.5%). All other wetland ecosites are relatively uncommon, each comprising less than 0.5% of the Vegetation LSA and

Terrestrial RSA. The location, size and relative area composition of the wetland features is provided in Table 2 and Figure 1).

Table 2: Summary of Wetlands

Ecosite Code[1]	Ecosite Description[1]	Structure Code[2]	Vegetation LSA (ha)	Vegetation LSA (%)	Terrestrial RSA (ha)	Terrestrial RSA (%)
Swamps						
BS16	Black spruce / balsam poplar / river alder swamp	6	--	--	8.8	<0.1
Swamps Subtotal			**--**	**--**	**8.8**	**<0.1**
Bogs						
BS17	Black spruce treed bog	5	18.2	1.6	1,157.1	2.9
BS18	Labrador tea shrubby bog	3	23.3	2.0	967.6	2.4
		3a	--	--	20.3	0.1
		3b	--	--	2.0	<0.1
		Total	23.3	2.0	989.9	2.5
BS19	Graminoid bog	2	2.8	0.2	160.5	0.4
BS19/24[3]	Graminoid bog or graminoid fen	2	0.8	0.1	1.2	<0.1
BS20	Open bog	1	0.6	<0.1	65.5	0.2
Bogs Subtotal			**45.6**	**3.9**	**2,374.2**	**5.9**
Fens						
BS19/24[3]	Graminoid bog or graminoid fen	2	0.8	0.1	1.2	<0.1
BS21	Tamarack treed fen	5	1.9	0.2	66.5	0.2
BS22	Leatherleaf shrubby poor fen	3a	-	-	28.5	0.1
BS23	Willow shrubby rich fen	3b	0.6	<0.1	20.9	0.1
BS24	Graminoid fen	2	-	-	9.0	<0.1
BS25	Open fen	1	0.4	<0.1	5.7	<0.1
Fens Subtotal			**3.6**	**0.3**	**131.8**	**0.3**
Shallow Open Water						
BS26	Rush sandy shore	2	-	-	15.1	<0.1

Ecosite Code[1]	Ecosite Description[1]	Structure Code[2]	Vegetation LSA (ha)	Vegetation LSA (%)	Terrestrial RSA (ha)	Terrestrial RSA (%)
BS27	Sedge rocky shore	2	4.2	0.4	29.3	0.1
Waterbody[4]	--	0	44.9	3.9	4,101.9	10.7
Shallow Open Water Subtotal			**49.0**	**4.2**	**4,146.3**	**10.3**
Total Wetlands[5]			**98.3**	**8.5**	**6,661.1**	**16.6**

Notes:

1 Ecosystems are described in detail in the Guide to the Ecosites of Saskatchewan's Provincial Forests (McLaughlan et al. 2010).

2 Modified from the Field Manual for Describing Terrestrial Ecosystems (BC Ministry of Environment, Lands, and Parks, and BC Ministry of Forests 1998). 0 = unvegetated; 1 = sparse / bryophyte / lichen; 2 = herb/graminoid; 3a = low shrub; 3b = tall shrub; 5 = young forest, 6 = mature forest.

3 This ecosite type is an artifact of mapping uncertainty, as baseline mappers were unable to distinguish between these ecosites due to a lack of available information (e.g., soil information, vegetation field plots, water quality data). As such, this ecosite has conservatively been split between bog and fen classifications.

4 Areas of open water <2 m deep are defined as shallow open water wetland ecosystems (National Wetlands Working Group 1997); as such, unnamed waterbodies and areas of open water observed to exhibit an average depth of <2 m (Ecometrix Incorporated 2020) have been conservatively included as wetland ecosystems.

5 Some numbers are rounded for presentation purposes. Therefore, the totals may not equal the sum of the individual values.

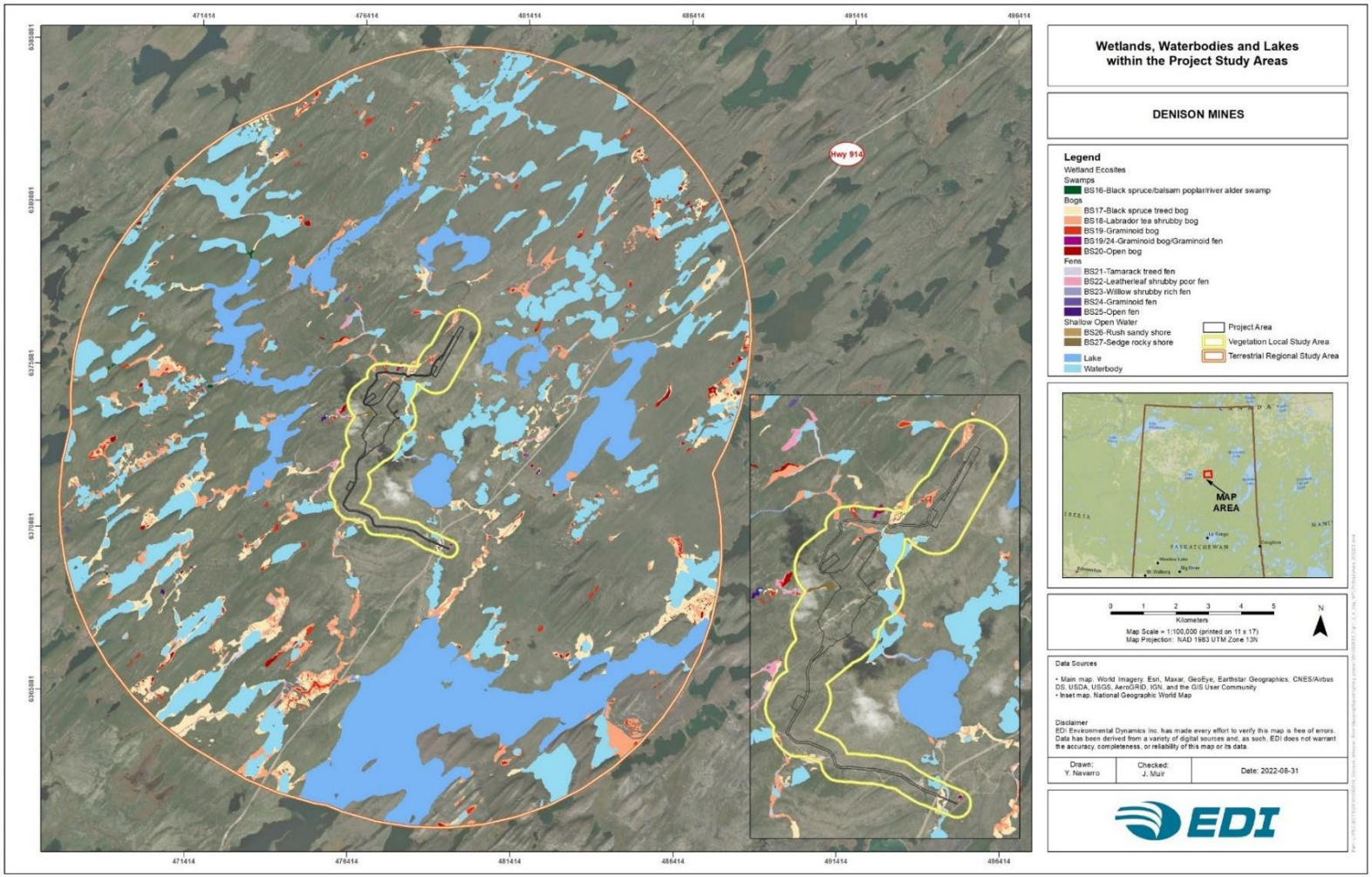


Figure 1: Wetlands, Waterbodies and Lakes within the Project Study Areas

Surface elevations for the wetland have been assessed and the information is summarized below and in the Figure 1 .

- Wetlands 1.5 km west of the Project Area range from 526-524 masl
- Waterbodies and their surrounding wetlands directly to the east of the SSA are at an elevation of between 506 and 500 masl
- Waterbodies and surrounding wetlands 2 km east of site are approximately between 499 and 497 masl
- Wetlands north of the Project Area and in the vicinity of the proposed air strip range from 514-508 masl.
- Wetlands situated further north of the Project Area in the LSA were at an elevation of approximately 526 masl
- Southern wetlands that will interact with the proposed hydro corridor extension for the mine have an elevation of 491masl
- Most wetland evaluated south of the Project Area had elevations ranging from 491-488 masl

Wetland depth, presence of fish or fish habitat, water quality and sediment quality are not currently available for the non-waterbody wetlands (i.e. those not identified as a lake or watercourse in Section 8 of the EIS). However, Denison is committed to conducting field surveys to collect this data prior to the initiation of construction of the Operation. This will allow for baseline information to be available to compare future changes and assess the success of mitigation measures and the predicted effects or lack thereof.

For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA.

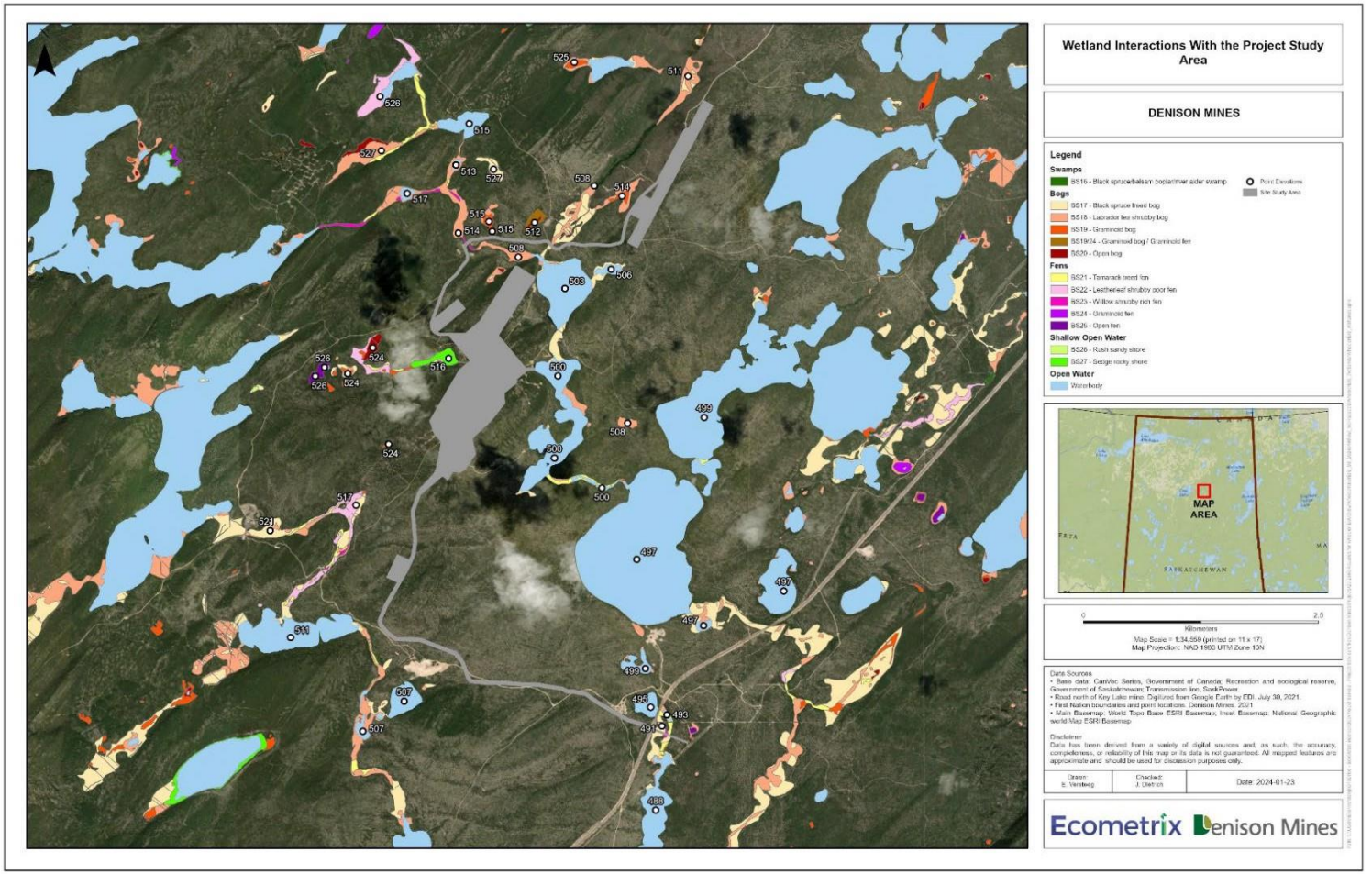


Figure 2: Elevations of wetland features in the LSA

4.0 Assessment of Project Related Effects

4.1 Potential Interactions Between the Project and Valued Component/Key Indicators

The Project will require the Construction, Operation, and Decommissioning of several components (as described in Section 2 of the EIS). Potential interactions between these Project components and activities and Fish and Fish Habitat in the form of Wetlands and their associated KIs are summarized by Project phase and activity in Table.

Potential interactions in Table are ranked as:

Primary Interaction (✓): Project activity is expected to interact with the VC / KI which may result in an adverse effect on the VC (i.e., a measurable or detectable change in the MP) and is further considered in the effects assessment as the primary contributor to potential adverse effects.

Other Interaction (✓): Project activity is expected to interact with the VC / KI. While the interaction is further considered in the effects assessment, it is not expected to be a primary contributor to potential adverse effects.

No Interaction: Project activity is not expected to interact with the VC or the KI, no adverse effects are expected, and rationale is provided for not considering this potential interaction further.

Table 4: Potential Project Interactions for Wetlands Valued Component

Project Phase/Activity	Wetlands Valued Component and Key Indicator
Development of access roads and air strip	✓
Site preparation and earthworks; clearing, leveling and grading of the Project Area	✓
Power generation - generators	✓
Installation of main substation and distribution of power around site	✓
Wellfield and freeze hole drilling; ground freezing	✓
Batch plant operation (concrete); crusher at borrow area	✓
Development of surface infrastructure (camp, operations centre, plants, ponds, pads and support facilities)	✓
Waste management (composting, domestic and industrial landfill operation, recycling)	
Water management (including treatment and site runoff)	✓
Groundwater supply	✓

Project Phase/Activity	Wetlands Valued Component and Key Indicator
Surface water withdrawal	✓
Fuel management (e.g., propane for comfort heating; vehicle and aircraft fuel)	✓
On-site and off-site operation of vehicles and transportation of materials	✓
Air transportation for workers	✓
Regulatory site inspections	✓
Engagement – site visit from Interested Parties	✓
Operation of the ISR wellfield	
Wellfield and freeze wall drilling	✓
Operation and expansion of freeze wall	✓
Batch plant operation (grout and cement); crusher in borrow area	✓
Expansion of pond and pads	✓
Operation of the processing plant and production of uranium concentrate	
Water withdrawal from groundwater or surface water body	✓
Management of surface water (including seepage and site runoff)	✓
Water treatment, both domestic and industrial	
Water release to surface water body	✓
Waste management (composting, domestic and industrial landfill operation, recycling)	
Hazardous waste management (temporary storage, handling, and off-site transportation)	✓
Storage and disposal of drill waste rock, process precipitates and industrial wastewater treatment plant precipitates	✓
On-site and off-site operation of vehicles and transport of materials	✓
Power supply – primarily power from the grid, also generators and back-up generators	✓
Package and transport of nuclear substances	✓
Fuel management (e.g., propane for comfort heating; vehicle and aircraft fuel)	✓
Air transportation for workers	✓
Progressive decommissioning and reclamation	✓
Regulatory site inspections	✓

Project Phase/Activity	Wetlands Valued Component and Key Indicator
Engagement – site visit from Interested Parties	✓
Site water management, treatment, and release	✓
Mining horizon remediation and thawing of freeze wall	✓
Process water treatment and release	✓
Closure of ISR and freeze wells and related infrastructure	✓
Decontamination of surface facilities and injection, recovery and monitoring wells	
Asset removal (including site power transmission lines and electrical infrastructure)	✓
Demolition and disposal of non-salvageable surface infrastructure and materials	✓
Remediation of contaminated areas (wellfield, pads, ponds, domestic wastewater treatment location, and process plant area)	✓
Generators	✓
Waste management (composting and landfill operation)	
Decommissioning of landfills; hazardous materials management (temporary storage and off-site disposal)	✓
On-site and off-site operation of vehicles and transportation of materials	✓
Reclamation of disturbed areas	✓
Regulatory site inspections	✓
Engagement – site visit from Interested Parties	✓
Environmental monitoring	✓
Regulatory site inspections	✓
Engagement - Site visit from Interested Parties	✓

1 Operational activities include maintenance.

4.2 Potential Project-related Effects

Based on the timing and nature of the interactions identified in Table 4, the following adverse effects have a potential to occur on the Wetland VC (Table 5). The key indicator of effects to wetlands is the change in areal extent of wetlands in the study area.

Table 5: Potential Project-related Effects on Wetlands Valued Component During all Project Phases

Project Phase/Potential Effect	Wetlands Valued Component and Key Indicator
Construction	
Direct disturbance / Overprinting	✓
Mobilization of suspended materials	✓
Introduction and/or Proliferation of Invasive Plants	✓
Changes in Water Quantity (water levels or flow)	✓
Edge Effects	✓
Changes to Water Quantity and Quality	✓
Dust Deposition	✓
Operation	
Direct disturbance / Overprinting	✓
Mobilization of suspended materials	✓
Edge Effects	✓
Introduction and/or Proliferation of Invasive Plants	✓
Controlled Discharge	✓
Changes in Water Quantity (water levels or flow)	✓
Controlled Discharge / Water Quality	✓
Dust Deposition	✓
Decommissioning	
Direct disturbance / Overprinting	✓
Mobilization of suspended materials	✓
Edge Effects	✓
Introduction and/or Proliferation of Invasive Plants	✓
Controlled Discharge	✓
Changes in Water Quantity (water levels or flow)	✓
Controlled Discharge / Water Quality	✓
Dust Deposition	✓
Post-Decommissioning	

Project Phase/Potential Effect	Wetlands Valued Component and Key Indicator
Direct disturbance	✓
Introduction and/or Proliferation of Invasive Plants	✓
Edge Effects	✓
Changes to Water Quantity and Quality	✓
Dust Deposition	✓

4.3 Mobilization of Suspended Materials

Construction

The primary effect pathway during Construction relates to the mobilization of suspended material into natural surface water features including wetlands as a result of land disturbance and clearing. The mobilization of suspended material into natural surface water features is readily mitigatable by virtue of the mine development plan and through the implementation of standard water management and sediment control practices. Water management infrastructure (e.g., collection ditches, ponds, pumping stations) and various aspects of the water management and sediment control management systems will be put into place coincident with the initiation of construction activities. Waters (e.g., runoff) associated with areas under development will be collected and stored within management infrastructure (e.g., clean waste rock pond, see Figure 2.2-14 in Section 2 of the EIS). In the event that releases to the natural environment are necessary, they would only occur once it is safe to do so (i.e., suspended solid levels in the water would be at acceptable levels). No downstream effects on surface waters, natural sediments, fish and fish habitat including wetlands are expected.

Operation

During Operation, mobilization of suspended materials will be managed through the development and operation of water management infrastructure and implementation of surface water management through the Surface Water Management Program. Releases of contact water to the natural environment will be directed through applicable collection ponds, the IWWTP, and the Effluent Monitoring and Release Ponds. No specific discharge is expected to wetland features in the Project Area. Discharge will only occur once it is safe to do so (i.e., suspended solids levels in the water would be at acceptable levels). Denison may employ active means (e.g., filtering), if required, to achieve low TSS levels in discharge, in addition to passive means, such as settling and clarification in the IWWTP to manage TSS in the effluent stream to low levels. No

downstream effects on surface waters, natural sediments, or fish and fish habitat including wetlands are expected.

Decommissioning and Post-Decommissioning

During Decommissioning and Post-Decommissioning, the site-wide water management system will continue to operate such that Denison will maintain control of the site aspect affected water through the IWWTP. Surface drainage during Decommissioning activities will continue to be directed to the system of collection ponds, the IWWTP, and the Effluent Monitoring and Release Ponds to facilitate the control of suspended solids and achieve low TSS levels in the discharge, thereby minimizing any potential for adverse changes to water quality, sediment quality, and fish and fish habitat including wetland features.

4.4 Overprinting of Wetlands as Fish Habitat

For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA.

Bogs are predicted to be the wetland class most affected by the Project, with 0.4 ha (less than 0.1%) of mapped bog ecosystems within the Terrestrial RSA expected to be disturbed within the Project Area during Construction. Fens are the next most affected, with 0.1 ha (0.1%) anticipated to be disturbed during Construction (Figure 3). Less than 0.1 ha (less than 0.1%) of shallow open water wetlands within the Terrestrial RSA are also anticipated to be affected by the Project.

Within these wetland classes, the wetland ecosite expected to be most affected is the willow shrubby rich fen (ecosite BS23) with direct disturbance to 0.1 ha predicted to occur within the Project Area (0.5% of the BS23 ecosite within the Terrestrial RSA). The remaining ecosites anticipated to be directly affected by the Project are locally abundant, with direct disturbance expected to affect <0.1% of these ecosites within the Terrestrial RSA (**Error! Reference source not found.** 2).

Investigation of the potential overprinting of wetland features as a result of the Project it is evident that wetland loss is avoidable. The interaction of the Project with wetlands is isolated to those areas where stream crossings for access roads and hydro-line connections are proposed (Figure 3). With the use of single span bridges and implementation of best management practices, direct wetland disturbance associated with the crossings of Kratchkowsky Creek and Hart Creek is expected to be avoided. It should be noted that SaskPower proposes to tap the existing I3P 138 kV line near Highway 914 and build approximately 4.5 km of new 138 kV line from the I3P tap to the Project site. SaskPower will be responsible for conducting activities such as line routing, environmental studies, and permitting, public consultation, and engineering design work as applicable to the load interconnection. As such, wetland disturbance related to

the SaskPower Hydro Corridor is expected to be addressed through the SaskPower permitting process.

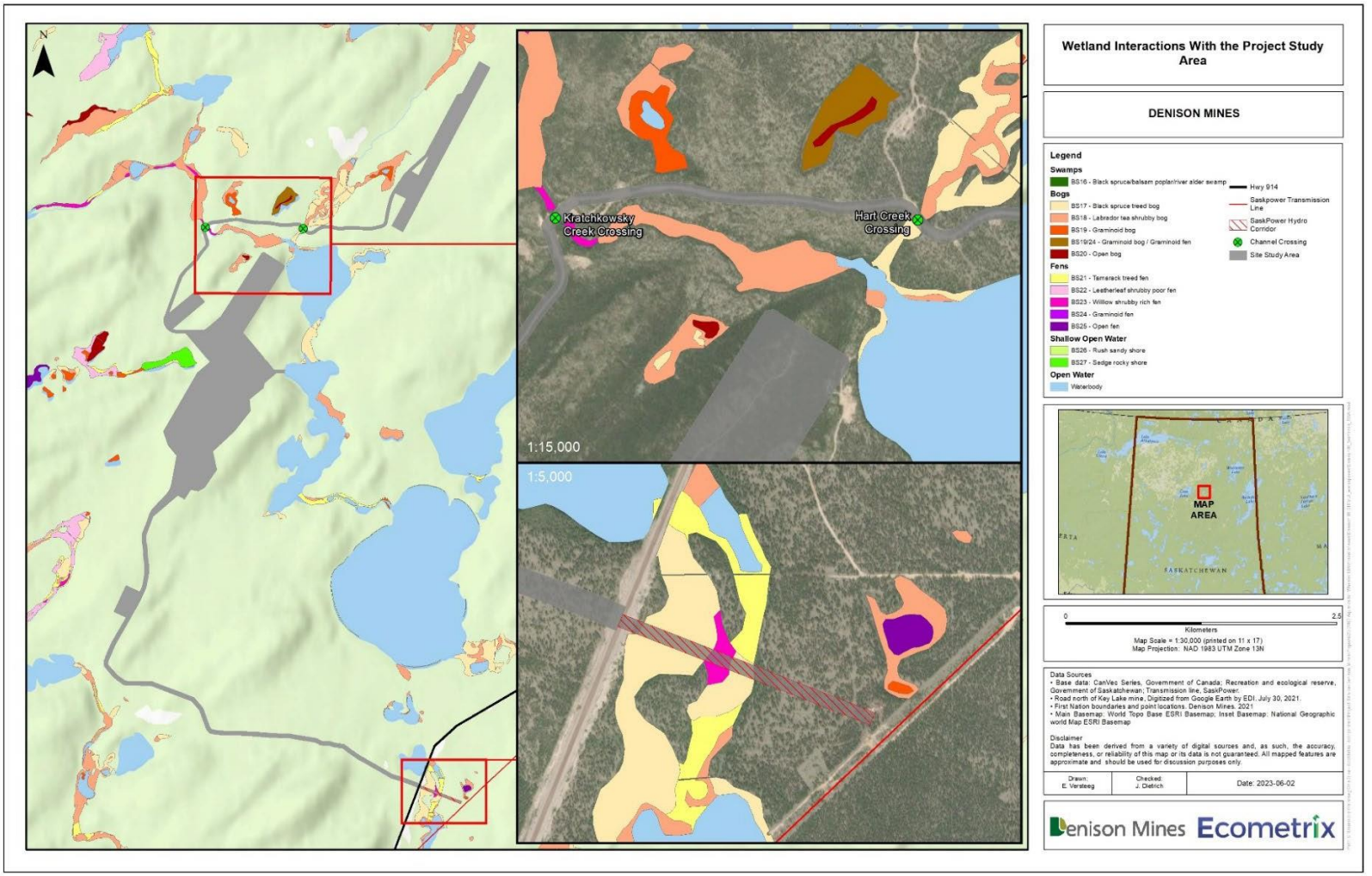


Figure 3: Denison Wheeler River Project Area and Wetland Feature Distribution

4.5 Controlled Discharge to Receiving Environments

According to the site water balance (Figure 2.2-14 in Section 2 of the EIS), there is no planned discharge to Whitefish Lake during Construction. Other than LA-5 (Whitefish Lake) no other controlled discharge will occur to the natural environment and no wetlands will be impacted as a result.

4.6 Change in Water Levels and Flow

As detailed in Section **Error! Reference source not found.** of the EIS, the projected withdrawal and discharge rates proposed for the Project are the largest influence on the hydrological effects of the Project. The largest predicted change in streamflow rate is -3.1% at the LA-5 and SA-2 nodes (immediately downstream of the Project) during Operation and Decommissioning, as projected against the 5th percentile low flow dataset in March. Lake levels and wetlands are expected to deviate less than ±0.01 m due to all Project influences. All Project influences on the environment are expected to return to baseline conditions during Post-Decommissioning. These changes are within the range of fluctuation of environmental flows and water levels and are unlikely to affect fish passage or life history environmental cues.

4.7 Introduction and/or Proliferation of Invasive Plants

Vegetation clearing and soil disturbance during Construction are expected to create conditions suitable for the introduction and proliferation of invasive plants. Vehicles and construction equipment can inadvertently transport seeds and other invasive plant propagules in tires or the undercarriage to previously unaffected areas. The effects of invasive plants on native vegetation diversity are well documented and recognized as the second greatest threat to listed species after habitat loss (Enserink 1999). Competition with native species can lead to a reduction in the growth and vigour of native species (including Wetlands), as well as changes in the diversity, structure and function of ecosystems and habitats.

The potential for the introduction and proliferation of invasive plants by transport on vehicles and equipment is expected to continue throughout Operation during wellfield and freeze wall drilling, expansion of ponds and pads, drill waste rock, process precipitates and industrial wastewater treatment plant precipitates, on-site and off-site operation of vehicles and transport of materials, package and transport of nuclear substances, and air transportation for workers (i.e., landing and taking off of airplanes). Progressive decommissioning and reclamation has the potential to introduce invasive plants on vehicles and equipment and if seed used for revegetation is not supplied from a native seed source (Polster 2003) with a certificate of analysis indicating an absence of invasive plant seeds.

The potential for the introduction and proliferation of invasive plants is expected to continue throughout Decommissioning (e.g., during closure of the ISR and freeze wells and infrastructure,

asset removal, demolition and disposal of non-salvageable surface infrastructure and materials, remediation of contaminated areas, reclamation of disturbed areas, and operation of vehicles and transportation of materials). The potential for the introduction and proliferation of invasive plants is expected to continue throughout Post-Decommissioning, but at lower levels due to reduced vehicle traffic.

4.8 Edge Effects

Edge habitat refers to an area on either side of a border between vegetation communities. Edges between vegetation communities often result in altered microclimatic conditions that can influence environmental conditions further away from the edge (Bannerman 1998). Edge effects are expected to extend into areas of native vegetation and habitats at the interface of disturbed areas and undisturbed native ecosystems, and could include altered microclimatic conditions that can influence quality in habitat away from the edge (Bannerman 1998). Where edge effects occur, Wetlands may experience changes in light intensity, temperature, wind, moisture, relative humidity, and patterns of snow accumulation and melt relative to undisturbed conditions. This can, in turn, affect plant health and alter natural disturbance regimes (e.g., blowdown), plant population persistence, and the structure and function of ecosystems and habitats. If changes to microclimatic conditions or vegetative structure at an edge exceed a species habitat preference or physiological tolerance, then edge habitat may result in lower occupancy or use, reduced survival, or lowered reproductive success.

Edge effects at the interface of disturbed areas and native ecosystems are expected to occur along the edges of the Project Area resulting from vegetation clearing during site preparation and earthworks during Construction. Edge effects are expected to continue throughout Operation, Decommissioning, and Post-Decommissioning, decreasing over time as revegetation and tree growth within reclaimed areas of the Project create a gradual structural transition at forest edges, aided by natural encroachment.

4.9 Long-Term Transport of Groundwater Solutes to Whitefish Lake in Future Centuries

During the 'future centuries' scenario as described in Section 8.3.1.3 of the EIS, remediation works will be completed and the site naturalized, thereby restoring drainage patterns to report to surface waterbodies. As indicated in Section 7 of the EIS, groundwater plumes may develop from residual mass remaining post-mining based on bench-scale lab tests of core flushing, and numerical modelling of reactive fate and transport. The results of this was described in Section 8.3.4.2.5 with respect to Fish and Fish Habitat and therefore wetlands.

The results of the numerical modelling (as provided in Section 7 and Appendix 10-A in Section 10 of the EIS) support the conclusion that with the implementation of appropriate mitigation during the decommissioning and restoration phases of the Project, the residual effects of the

Project on the intermediate Groundwater VC will not result in an adverse effect on surface water. Dissolved constituent concentrations emanating over hundreds to thousands of years in the future from the deep Ore Zone to Whitefish Lake are expected to remain below fresh water environmental quality criteria in Whitefish Lake.

Although the precise location of the groundwater discharge to the surface is somewhat uncertain, the groundwater transport scenarios that have been evaluated (Appendix 7-C of the EIS) to date suggest groundwater discharge impacted from mining will most likely be relegated to Whitefish Lake. The discharge to Whitefish Lake is generally predicted to occur along the eastern shore of the lake, as this is interpreted to be the eastern edge of the underlying desilicified zone. The Laborador Tea Shrubby Bog habitat located on the eastern shore of Whitefish Lake may be in the zone of influence of groundwater discharge, yet chemically will remain below freshwater environmental quality criteria. Groundwater impacts to other surrounding wetlands will be negligible as groundwater is not predicted to discharge within any area beyond the central portion of Whitefish Lake.

4.10 Indirect Effects

Indirect disturbance associated with the potential to adversely affect BS19/24 includes the introduction and/or proliferation of invasive plants, edge effects, changes to water quantity and quality, and dust deposition during all Project phases (as described in Section **Error! Reference source not found.**). Wetland ecosites BS19/24 (graminoid bog/fen) and BS25 (open fen) are peatland ecosystems typically characterized by high water tables (i.e., a very moist or very wet moisture regime), while ecosite BS27 (sedge rocky shore) is a sparsely vegetated ecosystem predominated by rocky substrates, typically occurring adjacent to lakes and ponds (McLaughlan et al. 2010). Because these ecosystems rely on high water tables and existing waterbodies, alteration of water quantity would be expected to have the highest potential to cause an adverse effect. Therefore, maintenance of wetland hydrology is expected to be the most effective mitigation to sustain these wetland ecosites within the Terrestrial LSA throughout the Project lifespan.

5.0 Mitigation Measures

Mitigation measures specific to the wetlands, discussed in the following subsection are applicable during all Operation phases and expected to be effective immediately following implementation and managed through the EMP.

Disturbance Reduction

- Wherever possible, wetlands will be avoided through Project design and instituting proper buffers.

- Disturbance to vegetation and soils will be avoided by clearly delineating Project Area boundaries (e.g., with the use of fencing, staking, or flagging), adhering to construction plans and schedules, and by restricting off-site machine use.
- Wetland boundaries in the proximity of planned disturbances will be clearly delineated (e.g., with the use of fencing, staking, or flagging) to facilitate avoidance to the extent practicable.
- Should they occur, areas prone to potential instability and areas in proximity to water bodies and drainage features will be identified and appropriate setbacks will be established and maintained.
- Temporary workspaces or laydown areas will be sited and constructed within existing disturbance or on previously compacted soils, where practicable. In areas requiring clearing only, grubbing will be avoided, and roots and groundcover will be retained to the extent feasible.
- Pre-construction listed plant surveys will be completed within the Project Area.
- Listed plants located adjacent to planned disturbances will be clearly delineated (e.g., with the use of fencing, staking, or flagging) to facilitate avoidance to the extent practicable and reduce the potential for accidental encroachment outside of the Project footprint.
- Should Listed Plants be identified within the Vegetation LSA prior to Construction, site- and species-specific mitigation measures to avoid and/or limit Project effects will be determined by a Qualified Vegetation Ecologist. Specific mitigation measures will depend on the species, its life history characteristics, time of year, and the location of the occurrence in relation to Project activities.
- Herbicide use will be avoided within 100 m of any known listed plant occurrences. Where herbicide use is unavoidable, use will be restricted to direct application instead of broadcast spraying and completed by qualified personnel.

Soil Handling and Reclamation

- Construction activities will be sequenced (i.e., site clearing, grading preparations, major earthworks and construction of infrastructure/facilities) so that surface vegetation, mineral soil and organic matter can be salvaged for later use in Project Decommissioning.
- Soil resources within the Project Area will be stripped/salvaged and stockpiled within the Project Area in accordance with relevant soil management BMPs, i.e., providing guidance on ground-truthing soil conditions, flagging potential hazards and sensitivities, and

modifying practices in relation to environmental conditions and avoiding or minimizing inadvertent/incidental disturbance.

- A soil monitoring program/protocol (or equivalent) will be undertaken to verify soil salvage volumes and reclamation suitability (Section 9.1.8.2).
- Soil stockpiling locations will be sited to reduce soil handling and travel distances and designed to minimize the potential for soil degradation and downgradient effects, e.g., having defined height and width that optimize soil storage and stockpile stability, and having integrated erosion control measures and surface water management features (if/where necessary). Sediment and erosion control measures will be implemented in accordance with BMPs and commensurate to site conditions and sensitivities.
- Sediment and erosion control measures and surface water management features will be installed and maintained at the Project. Erosion controls (e.g., sediment fencing, check-damns and/or sediment ponds) will be installed as necessary and at the discretion of construction personnel commensurate to site conditions and sensitivities to manage/mitigate erosion and sedimentation.
- Progressive reclamation and ecosystem-based revegetation will be conducted on disturbed areas as soon as practicable with the use of suitable native species and in accordance with the Reclamation and Closure Plan.

Surface Water Management

- Snow melt and runoff will be controlled within the Project Area to prevent the potential release of contaminated runoff from affecting vegetation in adjacent areas.
- Sediment and erosion control measures will be implemented in accordance with the EMS.
- Surface water management features (e.g., culverts and ditches) will constructed and maintained (as per Project design specification) along access roads and facility sites to facilitate surface drainage continuity and hydrologic connectivity—especially in proximity to wetlands, water crossings, and waterbodies.
- Hydrologic connectivity is expected to be maintained across the Project Area with the engineering, construction, and maintenance of surface water management features (e.g., culverts and ditches) as appropriate and as per Project design specifications along access roads and at facility sites.

Invasive Plant Management

- Equipment and vehicles will arrive at the Project Area clean, and will be inspected for soil, plant material, and seeds, and cleaned as appropriate, to limit the potential for the introduction of invasive plants and noxious weeds.
- Areas with a high risk for the potential spread of invasive plants and noxious weeds (i.e., within or adjacent to existing infestations) will be avoided to the extent practicable; if work must occur in these areas, invasive plant management will be implemented before starting work.
- Gravel, fill, straw matting, or similar materials to be used for erosion control will be inspected to minimize the potential for seeds or propagules of invasive plants being brought to site.
- All employees and contractors on the Project will receive an employee orientation appropriate to the work they are undertaking, including instruction on the definition of invasive plants and their potential effects, mitigation measures to avoid the introduction and spread of invasive plants, and training on the presence and identification of common invasive plant species and those known to occur within the Project Area.
- Invasive plant monitoring will be conducted periodically by personnel skilled in invasive plant identification during all Project phases to assess, evaluate, and document invasive plant occurrences within the Project Area. Invasive plant surveys will be completed during a biologically appropriate time of year (e.g., when invasive plants can be identified) within areas identified as most susceptible to invasive plant introduction and spread, including roads, ROW, debris and vegetation management areas (e.g., slash piles, timber decks, exposed soil or stockpiles) and other regularly disturbed habitats.
- Three general treatment options may be used alone or in combination to control of invasive plants in the Project Area:
    - mechanical control – involves the physical removal of the plants;
    - chemical control – involves application of synthetic and/or natural herbicides; and,
    - biological control measures – involves use of living organisms (e.g., rusts, insects) to control selected invasive plant species.
- The type of treatment option selected for an invasive plant occurrence will be based on a combination of specific information including the identity of the invasive plant species and its provincial designation, the size and extent of the occurrence, time of year, the proximity of the occurrence to other susceptible areas (e.g., rare plant occurrences, wetlands, waterbodies), and the available control options. Where possible, control of

invasive plants will be completed in consultation with a qualified professional to minimize potential effects on native vegetation, ecosystems and wetlands.

- Seed used during re-vegetation will be certified weed free, with a valid "Certificate of Seed Analysis".

6.0 Residual Effects Evaluation

6.1 Residual Effects Characterization

Residual effects on the Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs have been assessed in relation to the RSA, and characterized in terms of direction, magnitude, geographic extent, frequency, duration, reversibility, context, and likelihood (**Error! Reference source not found.** 6). Residual effect evaluation of residual effects are provided in Tables 7, 8 and 9.

Table 6: Definitions of Effect Characteristics Considered When Determining the Significance of Residual Effects

Residual Effect Characteristic	Definition	Rating
Direction	Identifies whether the residual effect will be adverse or positive.	**Adverse** – Negative effect or effect is not desirable. *Water Quantity* – Effect moves MPs (flow or water level) in a direction detrimental to water quantity relative to baseline conditions. A Project-related increase in surface water flows and levels during flooding, or a decrease in surface water flow below environmental flow requirements. *Water Quality* – An increase in constituent concentrations attributable to the Project in comparison to baseline conditions and trends. *Wetlands / Fish Habitat* – A physical loss of available fish habitat (extent of area) in comparison to baseline conditions. **Positive** – Beneficial effect or effect is desirable.
Magnitude	The amount of change in a measurable parameter relative to baseline conditions.	**Low** ▪ measurable decrease in the spatial extent of Wetlands, but less than a 10% loss; all original wetland classes are present. ▪ A measurable change that is not within the variability of baseline conditions but below relevant water quality objectives and criteria. A Project-related change in hydrology (flows or levels) compared to baseline conditions, but where the change is <5% from baseline conditions

Residual Effect Characteristic	Definition	Rating
		Moderate ▪ measurable decrease in the spatial extent of Wetlands between 10% and 30% loss; measurable changes in the diversity of wetland classes; some original wetland classes may be absent. ▪ A measurable change in water quality that is not within the variability of baseline conditions and not within applicable guidelines, legislated requirements, and/or federal and provincial management objectives. A Project-related change in hydrology (flows or levels) compared to baseline conditions, but where the change is >5% from baseline conditions, and could, therefore, have an adverse effect on Fish and Fish Habitat within the LSA. **High** ▪ measurable decrease in the spatial extent of Wetlands greater than 30% loss; some original wetland classes are absent. ▪ monthly flows (>10%), or lake surface elevation (m) in a waterbody or watercourse that is greater than the range of natural variability and large enough that fish can no longer rely on this habitat to carry out one or more of their life processes. A measurable change in water quality that is not within the variability of baseline conditions and not within applicable guidelines, legislated requirements, and/or federal and provincial management objectives and is likely to have an adverse effect on Wetlands (Fish and Fish Habitat) within the LSA, with the effect extending beyond the LSA.
Geographic Extent	The geographic area within which the residual effect is expected to occur.	**Project Area** – Effect is limited to the Project Area. **Local** – Effect is limited to the Vegetation LSA. **Regional** – Effect extends beyond the Vegetation LSA into the Terrestrial RSA. **Beyond Regional** – Effect extends beyond the Terrestrial RSA.
Duration	Length of time over which the residual effect is expected to persist.	**Short-term** – Less than 3 years (i.e., effect happens during Construction only). **Medium-term** – 3 years to 38 years (i.e., effect happens from Construction through to the end of Post-Decommissioning). **Long-term** – More than 38 years (i.e., effect extends beyond Post-Decommissioning).
Frequency	How often the residual effect is expected to occur.	**Infrequent** – Effect occurs several times at sporadic intervals. **Frequent** – Effect occurs many times on a regular basis. **Continuous** – Effect occurs continuously.

Residual Effect Characteristic	Definition	Rating
Reversibility	Whether or not the residual effect can be reversed once the activity causing the residual effect ceases.	**Fully Reversible** – A residual effect that diminishes to baseline conditions. **Partially Reversible** – A residual effect that partially diminishes to baseline conditions. **Irreversible** – A residual effect that will not diminish to baseline conditions.
Context	The extent to which the VC or KI has been affected by past and present environmental and socio-economic processes and conditions, its potential sensitivity to the Project-related residual effect, and its ability to recover from that effect (i.e., resilience)	**Low** – VC/KI has high resilience to stress or ecological change. This resilience can be a result of the ecological characteristics of the species or ecosystem, and/or a lack of historic and ongoing anthropogenic or natural disturbance. No listed species present. **Moderate** – VC/KI has moderate resilience to stress or ecological change. This resilience can be a result of the ecological characteristics of the species or ecosystem, and/or an intermediate level of historic or ongoing anthropogenic or natural disturbance with the capacity to assimilate more change. Presence of listed species **High** – VC/KI has weak resilience to stress or ecological change. This resilience can be a result of the ecological characteristics of the species or ecosystem, and/or a high level of historic or ongoing anthropogenic or natural disturbance. Presence of *SARA*-listed species
Likelihood	Likelihood that the residual effect will occur including consideration of the likelihood that the mitigation will be successful.	**Likely** – A moderate to high probability that the residual effect will occur. **Unlikely** – A low probability that the residual effect will occur.

Table 7: Wetland Fish and Fish Habitat – Summary of the Residual Effect Characteristics for Surface Water Quality

Residual Effect Characteristic	Rating	Summary Rationale for Rating
Direction	Adverse	The Project (specifically the discharge of effluent to the natural environment) will cause a change in the concentration of constituents, as measured as a mass of a chemical per unit volume in water (e.g., mg/L). Surface water quality in the local receiving environment will be adversely affected by effluent discharge to the aquatic environment, thereby providing a pathway to adversely affect surface waters. However, no discharge is planned to wetlands outside of Whitefish Lake.
Magnitude	Low	The magnitude of the residual effect is predicted to be low as constituents that may be introduced as part of Project activities are expected to remain below criteria for the protection of aquatic life and human health.
Geographic Extent	Local	The geographic extent of the residual effect is predicted to be confined to the immediate waterbody adjacent to the Project (i.e., Whitefish Lake). The estimated mixing zone is less than 5 m, implementing an effluent discharge configuration that promotes mixing.
Duration	Long-term	The residual effect is expected to last between 3 to 38 years (i.e., effect expected during Construction through to the end of Post-Decommissioning).
Frequency	Continuous	For the purposes of this EIS, a conservative scenario was identified, with effluent discharge being considered as continuous during Operation and Decommissioning.
Reversibility	Fully reversible	Surface water quality is expected to return to pre-development levels following Post-Decommissioning as Project-related sources will cease to operate.
Context	Low	Wetland health is expected to be resilient to changes in surface water quality in the context of this assessment, as COPC meet protective criteria even at the extreme low water scenario. Therefore, under applicable mitigative measures and average flow conditions, the contextual resilience of the aquatic system to respond to change is considered to be great.
Likelihood	Likely	A high probability exists that a change in water quality from background conditions will occur, but be restricted to Whitefish Lake and not other surrounding wetland features.

Table 8: Wetland Fish and Fish Habitat – Summary of the Residual Effect Characteristics for Change in Area Extent

Residual Effect Characteristic	Rating	Summary Rationale for Rating
Direction	Adverse	Impacts to wetlands in the LSA from physical disturbance or overprinting are expected to be minor in nature and relegated to wetlands located at stream crossings for access roads and the hydro-line corridor. In both cases the approach to design will be one of avoidance and minimal disturbance with clear span bridges and minimal clearing required for hydro-line installation where avoidance of open water areas can be met.
Magnitude	Low	The magnitude of the residual effect is predicted to be low. Less than 0.1% of Wetlands within the Terrestrial RSA are predicted to be directly affected as a result of Project Construction, and up to 1.5% may be indirectly affected during all Project phases.
Geographic Extent	Local	The residual effect is expected to be limited to the LSA, specifically to wetlands located at stream crossings for access roads and the hydro-line corridor
Duration	Long-term	Once natural drainage patterns are re-established following Operation, the structure and function of Wetlands altered as a result of indirect Project effects are expected to re-establish after Post-Decommissioning (more than 38 years).
Frequency	Frequent	While direct affects to specific Wetlands will occur over a short time period during Construction, Wetland alteration by indirect effects is anticipated to occur frequently throughout Construction, Operation, and Decommissioning, and infrequently during Post-Decommissioning.
Reversibility	Partially Reversible	Wetland effects are predicted to be partially reversible during Decommissioning once natural hydrologic conditions are reinstated. Alterations to wetland extent, structure and/or function as a result of indirect Project effects during all Project phases are predicted to be reversible over time once natural hydrologic conditions are reinstated and edge effects, dust, water quality changes, and invasive plant propagule pressure are reduced at the end of Decommissioning.
Context	Moderate	Wetlands can exhibit low resilience and high susceptibility to disturbance; however, disturbance is common within the Terrestrial RSA, and existing Wetlands have been historically disturbed by access roads and exploration activities.
Likelihood	Likely	The infrastructure associated with the bridges and the hydro-line are likely to affect the localized area for which they span in a limited way.

Table 9: Wetland Fish and Fish Habitat – Summary of the Residual Effect Characteristics for Change in Surface Water Quantity (Hydrology)

Residual Effect Characteristic	Rating	Summary Rationale for Rating
Direction	Adverse	Water quantity (flow and level) will be reduced in LA-5 as a result of the overprinting of its reporting drainage area by mine infrastructure and through site water balance. Water taking has an additional potential to reduce water levels in LA-5 and associated wetlands.
Magnitude	Low	The magnitude of the residual effect is predicted to be low. Under all scenarios, the Project-related change in hydrology (flows or levels) compared to baseline conditions is less than 5% of baseline conditions, and generally less than 3%.
Geographic Extent	Local	The residual effect is expected to be limited to the LSA, specifically the lakes and wetlands within proximity to the Project site (i.e., LA-5, LA-6, and LA-1).
Duration	Moderate	The residual effect is expected to last between 3 to 38 years (i.e., effect expected during Construction through to the end of Post-Decommissioning).
Frequency	Continuously	Although the mine is unlikely to require water taking on a continuous basis, this has been assessed as a bounding scenario and, as such, must be considered as a continuous effect.
Reversibility	Fully reversible	Surface water hydrology is expected to return to pre-development levels following Post-Decommissioning.
Context	Moderate	Surface water flow regimes are variable, and it is this variability that provides for morphological form to be maintained and for ecological reliance (i.e., wetlands, fish habitat). Some change to environmental flows is tolerated by wetland biota.
Likelihood	Low	Due to the localized nature and low magnitude of the effect on surface water hydrology, the likelihood of an effect is considered to be very low; therefore, the likelihood of an effect on Wetlands is expected to be low.

6.2 Significance and Confidence

The residual effect of change in the areal extent of the Wetlands VC as a result of the Project is not expected to result in a change to the wetlands KI that will alter its integrity within the Terrestrial RSA to the point where it is not sustainable or unavailable to contribute to ecological functions**.**

The threshold for significance for the Wetlands VC relates to predicted changes in the concentrations of water quality parameters, where changes could result in exceedances of

relevant water quality benchmarks that are protective of aquatic biota in waterbodies that receive mine-affected drainage. The threshold for significance for Wetlands also includes predicted changes in surface water flows greater than baseline environmental flows and direct habitat loss.

The significance of the residual effects on the Wetlands VC has been deemed **not significant**. Following mitigation, the residual effects are not expected to cause a change in Wetland habitat (or associated KIs) to the extent that they might alter the ecological integrity of the VC in the LSA beyond an acceptable level.

The predicted confidence with respect to the Wetlands VC is high as the mobilization of suspended materials can be readily mitigated, making the effects prediction relative to this effect pathway easily understood.

Confidence in the assessment of predicted effects on water levels or flow is quite high due to available hydrological data for the LSA. Uncertainty is minimal with the assumptions that the water withdrawal and discharge scenarios presented herein represent the bounding case, and hydrogeological modelling projections are not changed (Section 8.1 of the EIS).

Potential effects on water quality as a result of Project discharges to local receiving environments were assessed by way of numerical modeling. These predictions are generally considered conservative in nature because the assumptions on which they are based are conservative. For example:

- The assessment is based on a continuous (year-round) discharge at an expected average effluent rate of 0.0101 m^3/s (36.5 m^3/hr) throughout Construction, Operation, and Decommissioning, despite the likelihood that effluent discharge will not be continuous and will only discharge when site water balance requires, based on water storage capabilities.

- The constituents in effluent discharge have been estimated conservatively. Presented discharge concentrations provided herein include contingency factors of one to three times.

- Baseline water quality is defined by the 95th percentile concentrations of individual constituents. Such an assumption is conservative as it constrains the assimilative capacity associated with the receiving environment. By definition, the assimilative capacity of a receiving environment is equal to the incremental difference between the existing baseline condition and the assessment benchmark (i.e., water quality criterion) on which the evaluation is based. Use of the 95th percentile concentration, rather than a measure

of central tendency (i.e., 50th percentile, geomean), means that the incremental change in a given constituent concentration that can be assimilated by the receiving environment (whereby use of the receiving environment is protected) is relatively small in magnitude.

Due to the conservative nature of the assumptions on which the numerical assumptions are based, a high degree of confidence can be assumed.

6.3 Summary of Project Related Residual Adverse Effects

The results of the characterizations for these residual effects are summarized in Table 10. The residual effects of the Project on the Wetland KIs were predicted to be **not significant**. Thus, the residual effects of the Project on the Wetlands VC are predicted to be **not significant**.

Table 10: Summary of Project-related Residual Effects

Valued Component	Residual Effect	Project Phase	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context	Likelihood	Significance
Wetlands	Change in Water Quality	C, O, D	A	L	L	LT	C	FR	L	L	NS
	Change in Water Level or Flow	C, O, D	A	L	L	MT	C	FR	L	L	NS
	Change in the Areal Extent of Wetlands	C, O, D	A	L	L	LT	F	PR	M	L	NS

[1] Direction: Adverse (A), Positive (P)

Magnitude: Low (L), Moderate (M), High (H)

Geographic Extent: Local (L), Regional (R), Beyond Regional (BR)

Duration: Short-term (ST), Medium-term (MT), Long-term (LT)

Frequency: Infrequent (IF), Frequent (F), Continuous (C)

Reversibility: Fully Reversible (FR), Partially Reversible (PR), Irreversible (IR)

Context: Low (L), Moderate (M), High (H)

Likelihood: Unlikely (U), Likely (L)

Significance: Not-Significant (NS), Significant (S)

Level of Confidence: High (H), Moderate (M), Low (L)

7.0 Cumulative Effects

The cumulative effects are discussed in detail in Section 9.2.7 of the EIS and are not re-examined herein.

8.0 Summary

Bogs are predicted to be the wetland class most affected by the Project, with 0.4 ha (less than 0.1%) of mapped bog ecosystems within the Terrestrial RSA expected to be disturbed within the Project Area during Construction. Fens are the next most affected, with 0.1 ha (0.1%) anticipated to be disturbed during Construction. Less than 0.1 ha (less than 0.1%) of shallow open water wetlands within the Terrestrial RSA are also anticipated to be affected by the Project.

Within these wetland classes, the wetland ecosite expected to be most affected is the willow shrubby rich fen (ecosite BS23) with direct disturbance to 0.1 ha predicted to occur within the Project Area (0.5% of the BS23 ecosite within the Terrestrial RSA). The remaining ecosites anticipated to be directly affected by the Project are locally abundant, with direct disturbance expected to affect <0.1% of these ecosites within the Terrestrial RSA.

Investigation of the potential overprinting of wetland features as a result of the Project it is evident that wetland loss is avoidable. The interaction of the Project with wetlands is relegated to those areas where stream crossings for access roads and hydro-line connections are proposed.

Avoidance through design as well as mitigation measures to control sedimentation to wetland features during construction, operation and decommissioning phases. Water quantity and quality are not expected to cause impacts to wetlands as the change in surface water feature levels and flow are nearly negligible and water will not be discharged to wetlands save for Whitefish Lake, for which effluent will not be released unless meeting criteria for the protection of aquatic life.

Residual effects on the Wetlands VC resulting from the Project were identified and assessed as **not significant**. Existing provincial legislation (Environmental Management and Protection Act [Government of Saskatchewan 2010] and the Water Security Agency Act [Government of Saskatchewan 2019b]) requires written approval (i.e., Aquatic Habitat Protection Permits) prior to any works within a wetland.

To further supplement existing information that exists for the LSA wetlands, Denison is committed to undertaking wetland surveys including the collection of water quality, sediment quality, benthic invertebrates and fish and fish habitat surveys prior to the construction of the operation to provide an updated baseline for assessing the success of mitigation measures and

to assess potential effects of the project on wetlands. These locations will then be further considered as part of the EMP for continued monitoring for these media and biota.

9.0 References

Bannerman, S. 1998. *Biodiversity and Interior Habitats: The Need to Minimize Edge Effects*.

Part 6 of 7. Extension Note 21. Biodiversity: Management Concepts in Landscape Ecology. British Columbia Ministry of Forests Research Program. 8 pp.

Chen, J. 1991. *Edge effects: microclimatic pattern and biological responses in old-growth Douglas- fir forests*. PhD. University of Washington, Seattle, WA.

Ecometrix Incorporated. 2020. *Wheeler River Project: Baseline Aquatic Environment Study*.

Prepared for Denison Mines Corporation. Mississauga, Ontario. 948 pp.

EDI Environmental Dynamics Inc. (EDI) 2021. *Wheeler River Project Annex Report - Soil, Vegetation and Wildlife*. Prepared for Denison Mining Corp., Saskatoon, SK.

Enserink, M. 1999. Biological invaders sweep in. *Science* 285(5,435): 1,834–1,836.

Government of Saskatchewan. 2010. *Environmental Management and Protection Act*, 2010,

E-10.22. https://publications.saskatchewan.ca/#/products/31893 (accessed August 2021).

Government of Saskatchewan. 2019b. *The Water Security Agency Act*. Chapter W-8.1, formerly Chapter S-35.03 of the *Statutes of Saskatchewan, 2005* (effective May 27, 2005).

Kremsater, L., and F.L. Bunnell. 1999. Edge effects: Theory, evidence and implications to management of western North American forests. pp. 117–153. *Forest fragmentation: wildlife and management implications*. Brill, Leiden, Netherlands.

MacKenzie, W., and J. Shaw. 2000. Wetland classification and habitats at risk in British Columbia., *Proceedings of a Conference on the Biology and Management of Species and Habitats at Risk, 15–19 Feb. 1999*. Volume Two., 520 pp. BC Ministry of Environment, Lands and Parks, Victoria BC and University College of the Caribou, Kamloops, British Columbia.

McLaughlan, M. S., R. A. Wright, and R. D. Jiricka. 2010. *Field Guide to the Ecosites of Saskatchewan's Provincial Forests*. Saskatchewan Ministry of Environment, Forest Service, Prince Albert, SK. 343 pp.

Omnia Ecological Services (Omnia). 2020. *Terrestrial Environment Wildlife and Vegetation Baseline Inventory*. Prepared for Denison Mines. January 2020 Update. Calgary, AB. 265 pp.

Kds

As outlined in Section 2.2 of the IMPACT Model Report (Appendix A to Appendix 10-A), as constituents travel through a series of connected waterbodies such as lakes, concentrations in water can decrease as a result of mixing with natural inflows from the surrounding watershed and interactions with lake sediment. The sediment-water exchange of constituents is estimated using chemical-specific partitioning coefficients (Kds). The Kd describes the relationship between the concentration of a constituent in the solid (in this case sediment) and the aqueous phases (in this case surface water) for a system that is at equilibrium.

The sediment-water partitioning coefficients are based on regional data which includes the following:

- Environmental baseline studies at Key Lake from 1976 to 1978 which were presented in the Key Lake EIS (KLMC, 1979), including additional baseline data collected in 1982 (IES, 1983a,b), and 1999 (Conor Pacific, 2000). Since operations began in 1983 ongoing environmental monitoring data has been collected
- Environmental baseline studies at McArthur River from 1992 to 1994 (EMA, 1992; TAEM, 1993a,b; Golder 1994a,b) to support the 1995 EIS (Cameco, 1996). Since operations began in 2000 ongoing environmental monitoring data has been collected
- Environmental baseline studies for the proposed Millennium mine from 2006 to 2008 from Moon Lake, Slush Lake, Lake A, Lake B, and Lake C.

Monitoring data of this sort that can be used to derive Kds are particularly valuable. As noted above, in this context Kd describes the relationship between the concentration of a constituent in sediment and surface water. In order to define a reliable and predictive relationship there must be sufficient distribution of sediment and surface water quality and a relatively wide range. The data collected in the studies referenced above not only have regional relevance but include data collected under true baseline conditions (pre-operational conditions), operational conditions in areas the receive mill/mine effluents and reference areas during operational conditions that are uninfluenced by mill/mine effluents but provided a time series of data collected over time. Together these data meet the test of having sufficient distribution of sediment and surface water quality that are wide ranging and support Kd development. This is in contrast to developing Kds with baseline data only where many constituents in water and sediment are at or below laboratory detection and/or are not wide distributed enough to develop a predictive relationship.

The background water and sediment quality observed for Key Lake, McArthur River, and Millennium is shown on Figure IR-101-1 and Figure IR-101-2 below. Regional sediment to water partitioning coefficients were estimated through model calibration and comparison to literature values. Measured water and sediment concentrations were compared to approximate a Kd, and then further refined to achieve a best estimate of water and sediment concentrations. Limitations were found when data were below the detection limit. Kds have been refined over time when better detection limits were achieved in monitoring data (e.g., Pb-210 and Po-210 in 2015 based on McArthur River data). The sediment-water partitioning coefficients were applied to the

Wheeler River Project, and are shown in Table IR-101-1 below (Table 3-6 in the ERA Appendix 10-A). The source of the Kd has been added to the table.

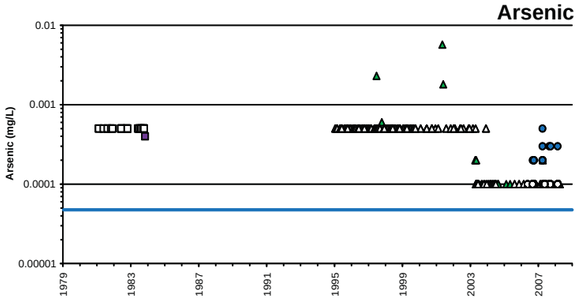
When comparing the water and sediment quality data in Figure IR-101-1 and Figure IR-101-2 to the Wheeler River baseline data, the Wheeler River baseline data falls within the spread of the regional data used since the 1970s. The exception is where improved detection limits have been achieved, showing lower water quality data. Plots of the baseline water quality data that were provided in Appendix A of the ERA in Appendix 10-A are reproduced below for ease of comparison. A few examples are described below:

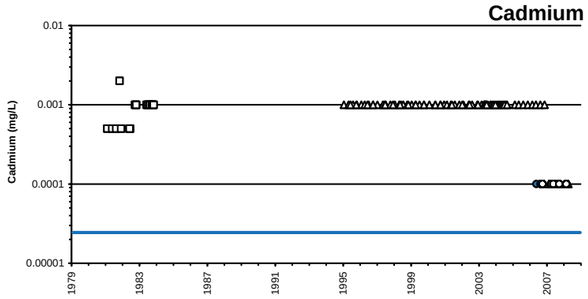
- Arsenic:
    - The regional data ranges from 0.0001 mg/L to 0.01 mg/L in water and 0.2 mg/kg to 11 mg/kg in sediment.
    - The Wheeler River data ranges from 0.0001 mg/L to 0.0003 mg/L in water and 0.4 mg/kg to 7.2 mg/kg in sediment.
- Cadmium
    - The regional data ranges from 0.0001 mg/L to 0.001 mg/L in water and 0.2 mg/kg to 10.5 mg/kg in sediment.
    - The Wheeler River data ranges from 0.00001 mg/L to 0.00007 mg/L in water and 0.1 mg/kg to 0.7 mg/kg in sediment.
    - The difference in water is related to improved detection limits in the Wheeler River baseline data compared to the regional data
- Copper
    - The regional data ranges from 0.0002 mg/L to 0.02 mg/L in water and 0.5 mg/kg to 11 mg/kg in sediment.
    - The Wheeler River data ranges from 0.0002 mg/L to 0.0008 mg/L in water and 0.5 mg/kg to 8.4 mg/kg in sediment.
- Selenium
    - The regional data ranges from 0.0001 mg/L to 0.001 mg/L in water and 0.008 mg/kg to 9 mg/kg in sediment.
    - The Wheeler River data ranges from 0.0001 mg/L to 0.0002 mg/L in water and 0.1 mg/kg to 1.8 mg/kg in sediment.

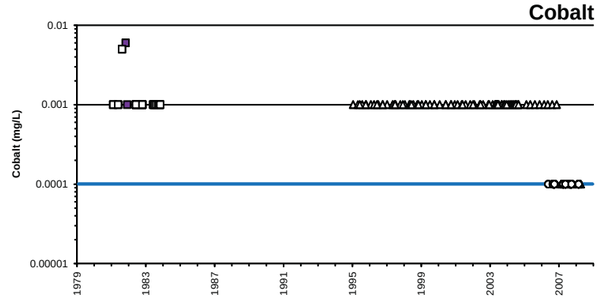
As the Wheeler River Project progresses through the licensing process, additional baseline data will be collected. The water and sediment data will continue to be validated against the regional Kds, to determine if the data are within the spread of the regional dataset, or if changes to the Kds are warranted.

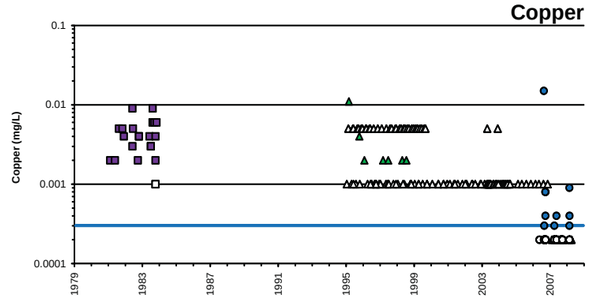
Table IR-101-1: Distribution Coefficients (K_d) Used in the IMPACT Model

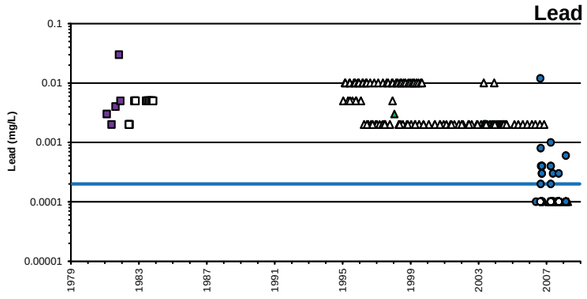
COPC	Distribution Coefficient L/kg (dw)	Source
Arsenic	9.64E+04	Millennium (Ecometrix, 2013)
Cadmium	1.50E+04	Millennium (Ecometrix, 2013)
Chromium	1.16E+04	Calibrated for Wheeler River
Cobalt	2.50E+03	Millennium (Ecometrix, 2013)
Copper	3.00E+03	Millennium (Ecometrix, 2013)
Molybdenum	3.17E+03	Millennium (Ecometrix, 2013)
Selenium	2.00E+04	Millennium (Ecometrix, 2013)
Uranium	2.00E+04	Millennium (Ecometrix, 2013)
Vanadium	9.10E+04	Calibrated for Wheeler River
Zinc	1.50E+04	Millennium (Ecometrix, 2013)
Lead-210	1.20E+05	McArthur River (Ecometrix, 2015)
Polonium-210	1.20E+05	McArthur River (Ecometrix, 2015)
Radium-226	1.20E+04	Millennium (Ecometrix, 2013)
Thorium-230	2.30E+03	Millennium (Ecometrix, 2013)
Uranium-234	2.00E+04	Millennium (Ecometrix, 2013)
Uranium-238	2.00E+04	Millennium (Ecometrix, 2013)

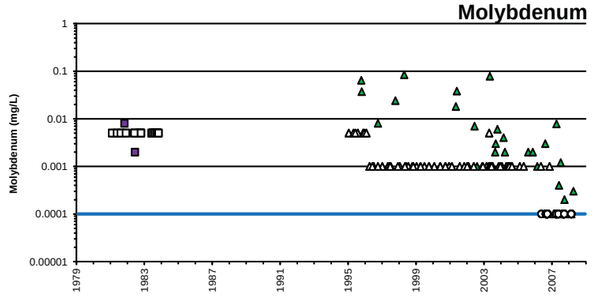


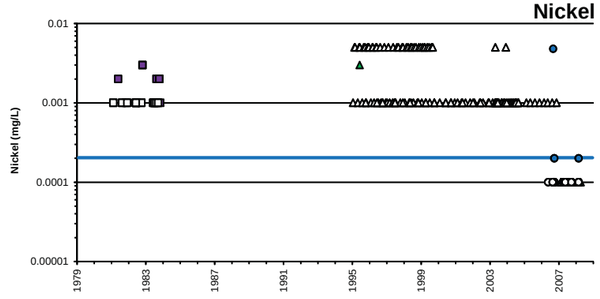


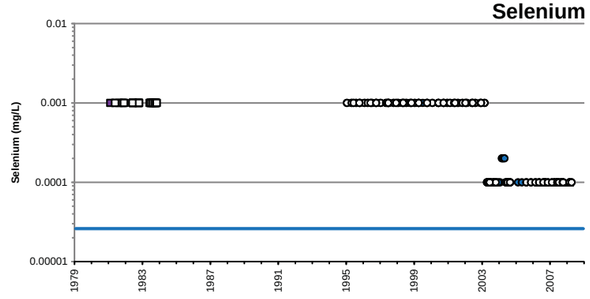


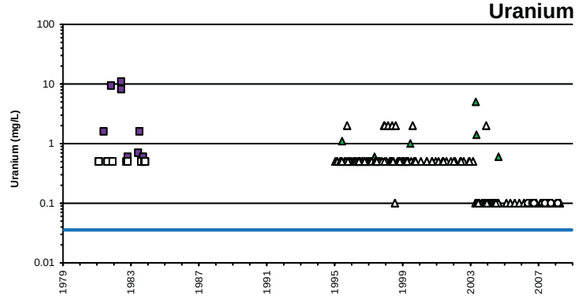


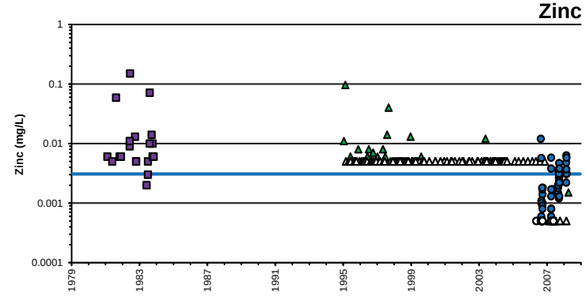


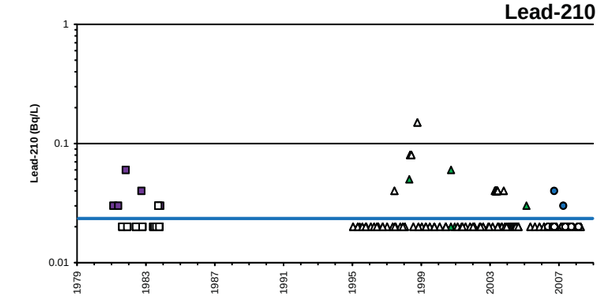


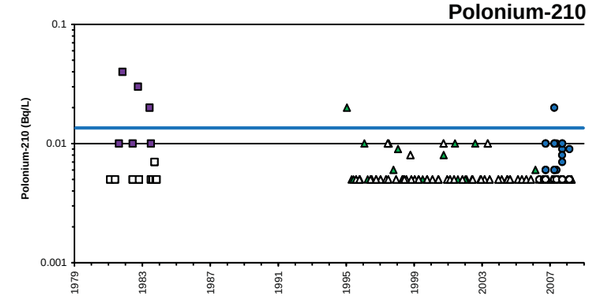


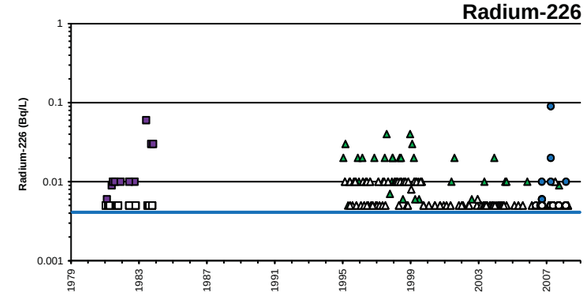


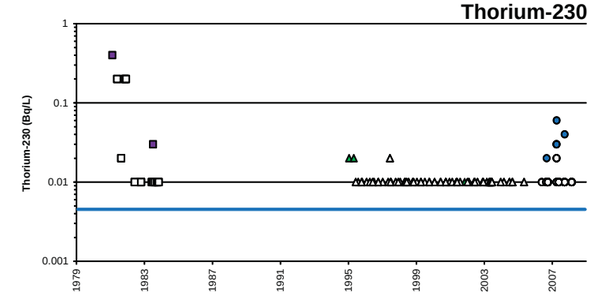












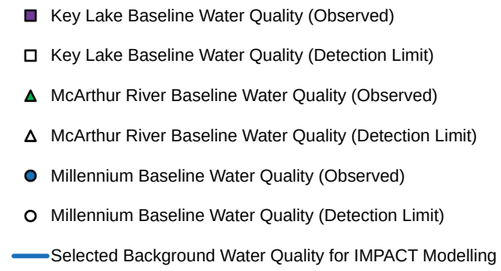


Figure IR-101-1: Selected and Observed Regional Water Quality

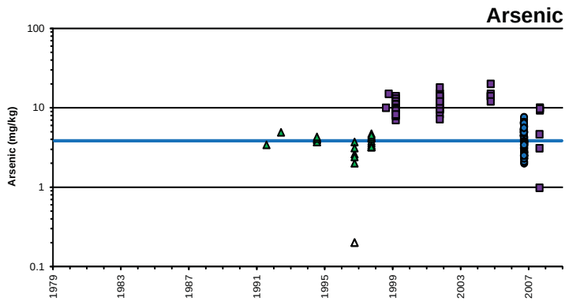
Millennium IMPACT Model 2012

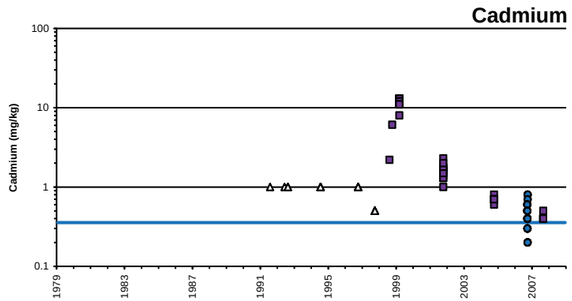
Selected and Observed Regional Background Water Quality - Metals and Radionuclides

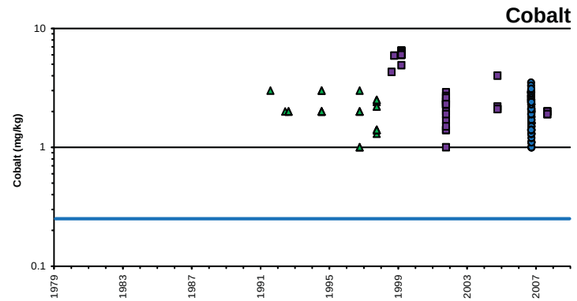
EcoMetrix INCORPORATED

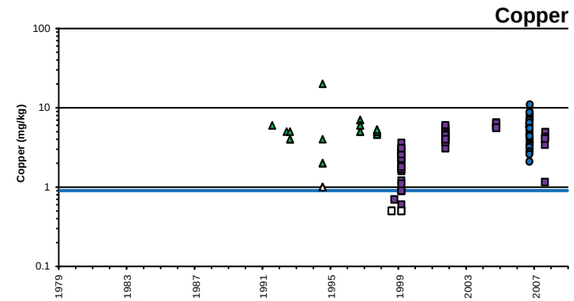
Cameco

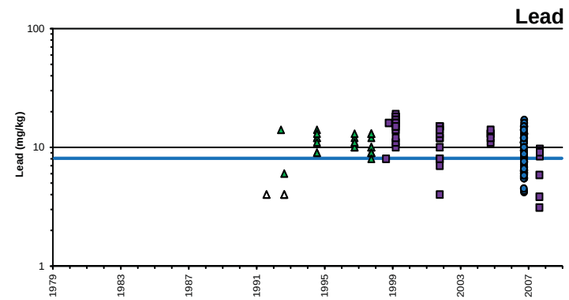
Figure 3.2-2

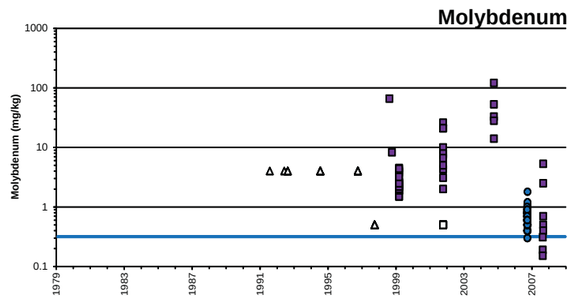


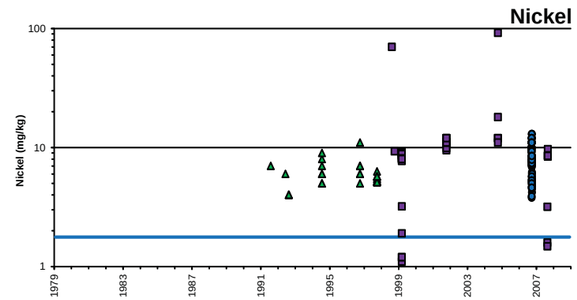


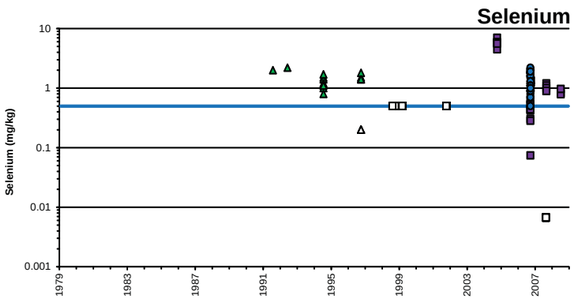


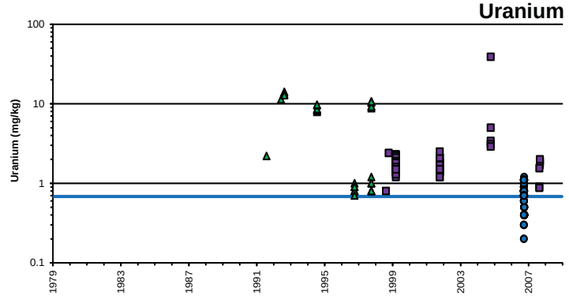


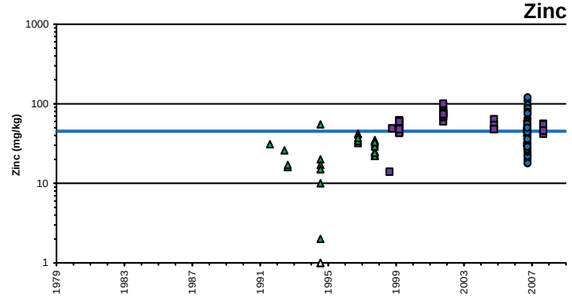


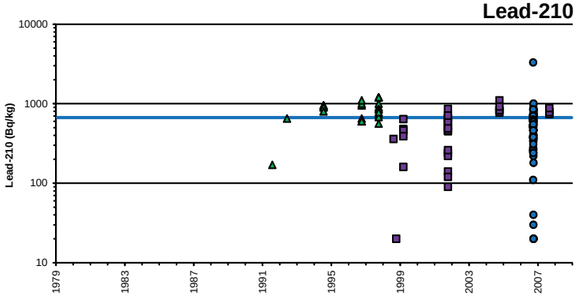


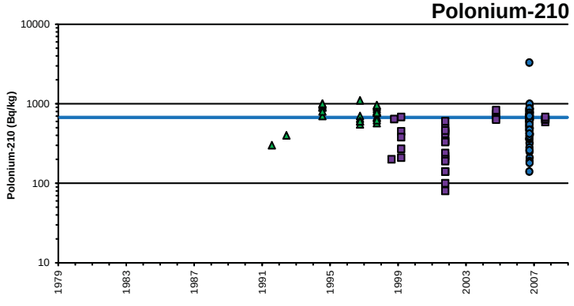


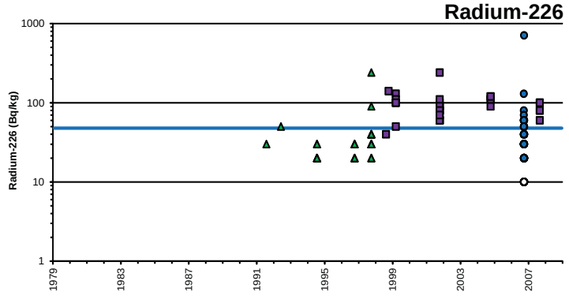












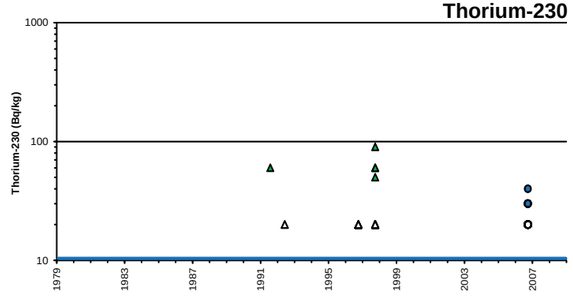




Figure IR-101-2: Selected and Observed Regional Sediment Quality

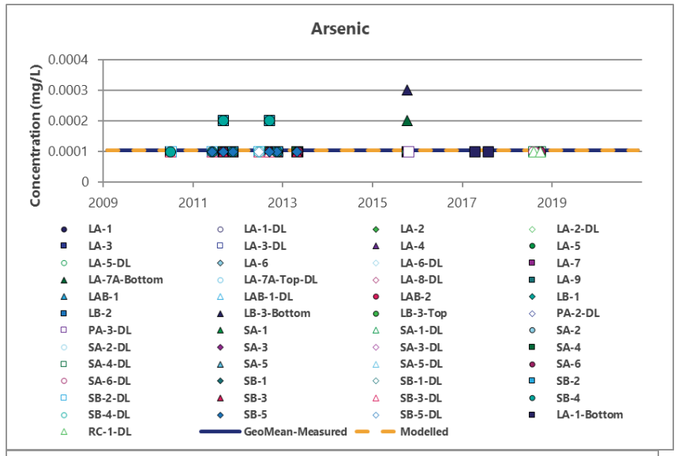
Millennium IMPACT Model 2012

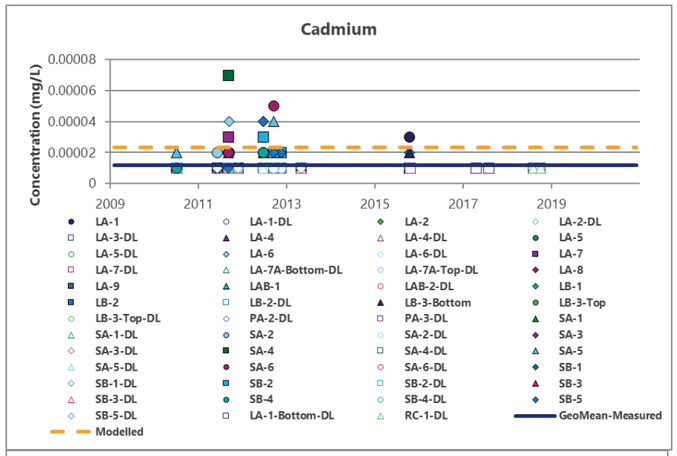
Selected and Observed Regional Background Sediment Quality - Metals and Radionuclides

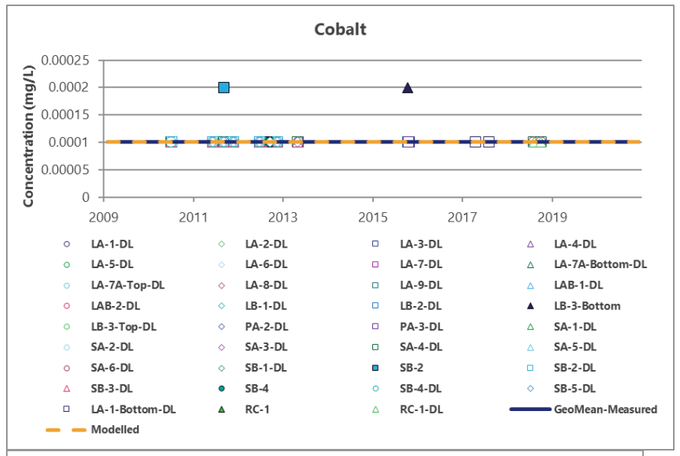
EcoMetrix INCORPORATED

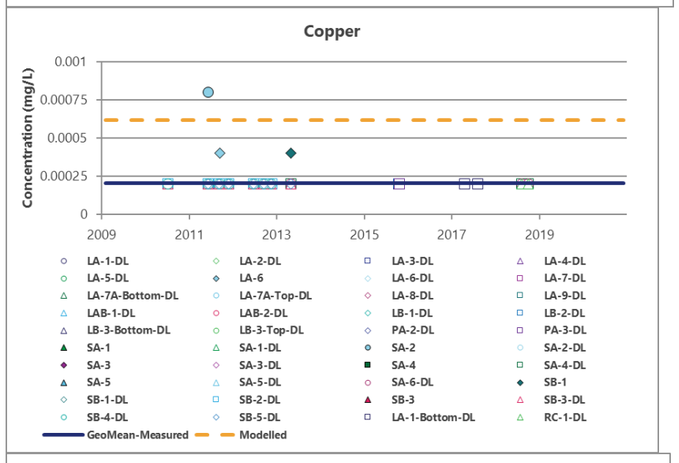
Cameco

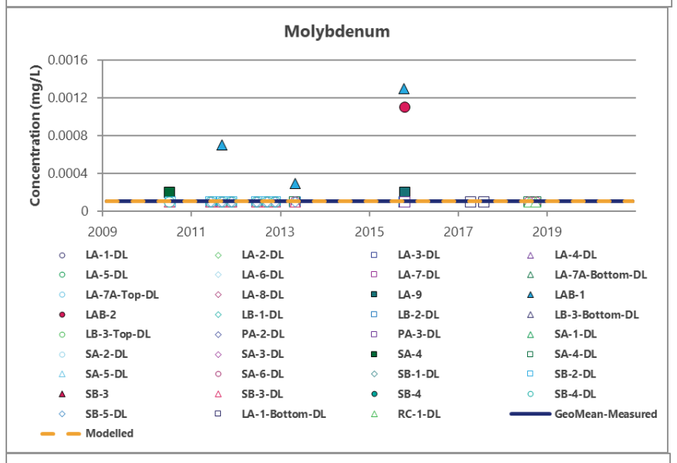
Figure 3.3-1

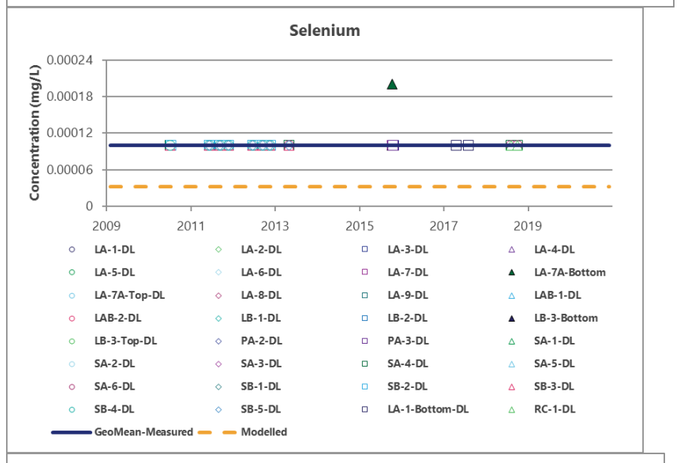

Arsenic
Concentration (mg/L)
0.0004
0.0003
0.0002
0.0001
0
2009
2011
2013
2015
2017
2019
LA-1
LA-1-DL
LA-2
LA-2-DL
LA-3
LA-3-DL
LA-4
LA-5
LA-5-DL
LA-6
LA-6-DL
LA-7
LA-7A-Bottom
LA-7A-Top-DL
LA-8-DL
LA-9
LAB-1
LAB-1-DL
LAB-2
LB-1
LB-2
LB-3-Bottom
LB-3-Top
PA-2-DL
PA-3-DL
SA-1
SA-1-DL
SA-2
SA-2-DL
SA-3
SA-3-DL
SA-4
SA-4-DL
SA-5
SA-5-DL
SA-6
SA-6-DL
SB-1
SB-1-DL
SB-2
SB-2-DL
SB-3
SB-3-DL
SB-4
SB-4-DL
SB-5
SB-5-DL
LA-1-Bottom
RC-1-DL
GeoMean-Measured
Modelled

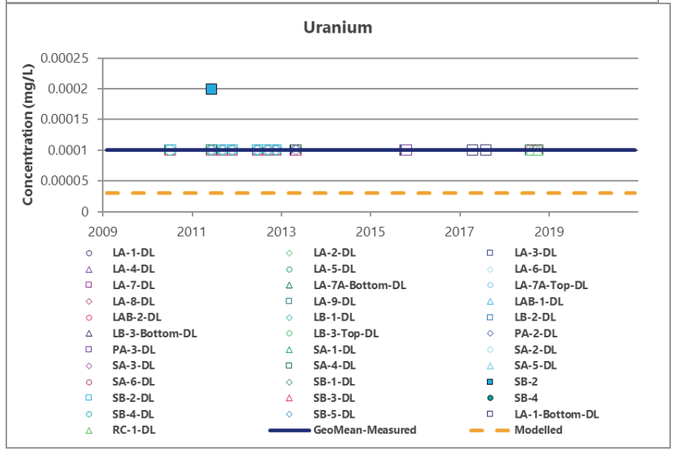

Cadmium
Concentration (mg/L)
0.00008
0.00006
0.00004
0.00002
0
2009
2011
2013
2015
2017
2019
LA-1
LA-1-DL
LA-2
LA-2-DL
LA-3-DL
LA-4
LA-4-DL
LA-5
LA-5-DL
LA-6
LA-6-DL
LA-7
LA-7-DL
LA-7A-Bottom-DL
LA-7A-Top-DL
LA-8
LA-9
LAB-1
LAB-2-DL
LB-1
LB-2
LB-2-DL
LB-3-Bottom
LB-3-Top
LB-3-Top-DL
PA-2-DL
PA-3-DL
SA-1
SA-1-DL
SA-2
SA-2-DL
SA-3
SA-3-DL
SA-4
SA-4-DL
SA-5
SA-5-DL
SA-6
SA-6-DL
SB-1
SB-1-DL
SB-2
SB-2-DL
SB-3
SB-3-DL
SB-4
SB-4-DL
SB-5
SB-5-DL
LA-1-Bottom-DL
RC-1-DL
GeoMean-Measured
Modelled

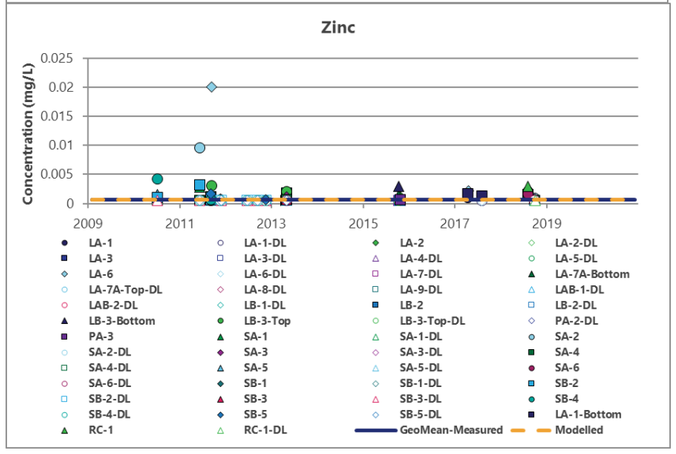

Cobalt
Concentration (mg/L)
0.00025
0.0002
0.00015
0.0001
0.00005
0
2009
2011
2013
2015
2017
2019
LA-1-DL
LA-2-DL
LA-3-DL
LA-4-DL
LA-5-DL
LA-6-DL
LA-7-DL
LA-7A-Bottom-DL
LA-7A-Top-DL
LA-8-DL
LA-9-DL
LAB-1-DL
LAB-2-DL
LB-1-DL
LB-2-DL
LB-3-Bottom
LB-3-Top-DL
PA-2-DL
PA-3-DL
SA-1-DL
SA-2-DL
SA-3-DL
SA-4-DL
SA-5-DL
SA-6-DL
SB-1-DL
SB-2
SB-2-DL
SB-3-DL
SB-4
SB-4-DL
SB-5-DL
LA-1-Bottom-DL
RC-1
RC-1-DL
GeoMean-Measured
Modelled

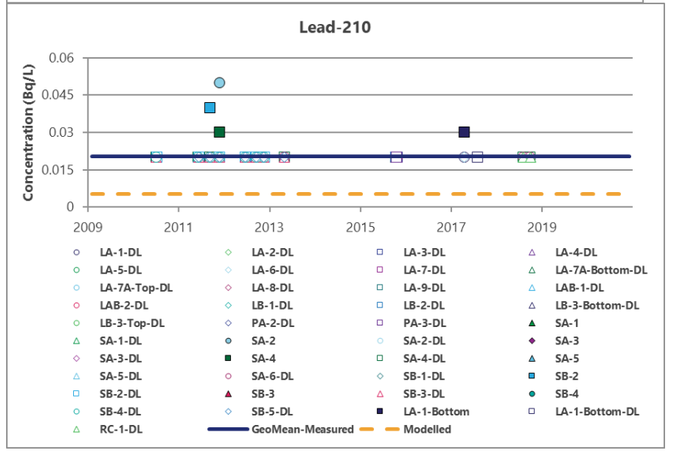

Copper
Concentration (mg/L)
0.001
0.00075
0.0005
0.00025
0
2009
2011
2013
2015
2017
2019
LA-1-DL
LA-2-DL
LA-3-DL
LA-4-DL
LA-5-DL
LA-6
LA-6-DL
LA-7-DL
LA-7A-Bottom-DL
LA-7A-Top-DL
LA-8-DL
LA-9-DL
LAB-1-DL
LAB-2-DL
LB-1-DL
LB-2-DL
LB-3-Bottom-DL
LB-3-Top-DL
PA-2-DL
SA-1
SA-1-DL
SA-2
SA-3-DL
SA-4-DL
SA-5-DL
SA-6-DL
SB-1-DL
SB-2-DL
SB-3
SB-3-DL
SB-4-DL
SB-5-DL
LA-1-Bottom-DL
RC-1-DL
GeoMean-Measured
Modelled

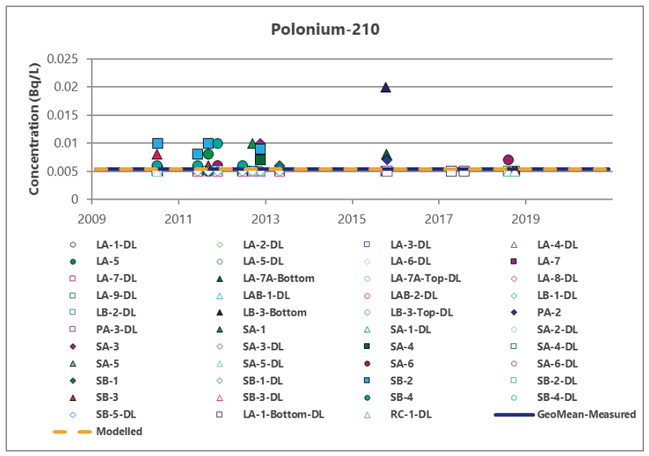

Molybdenum
Concentration (mg/L)
0.0016
0.0012
0.0008
0.0004
0
2009
2011
2013
2015
2017
2019
LA-1-DL
LA-2-DL
LA-3-DL
LA-4-DL
LA-5-DL
LA-6-DL
LA-7-DL
LA-7A-Bottom-DL
LA-7A-Top-DL
LA-8-DL
LA-9
LAB-1
LAB-2
LB-1-DL
LB-2-DL
LB-3-Bottom-DL
LB-3-Top-DL
PA-2-DL
PA-3-DL
SA-1-DL
SA-2-DL
SA-3-DL
SA-4
SA-4-DL
SA-5
SA-6-DL
SB-1-DL
SB-2-DL
SB-3
SB-3-DL
SB-4
SB-4-DL
SB-5-DL
LA-1-Bottom-DL
RC-1-DL
GeoMean-Measured
Modelled

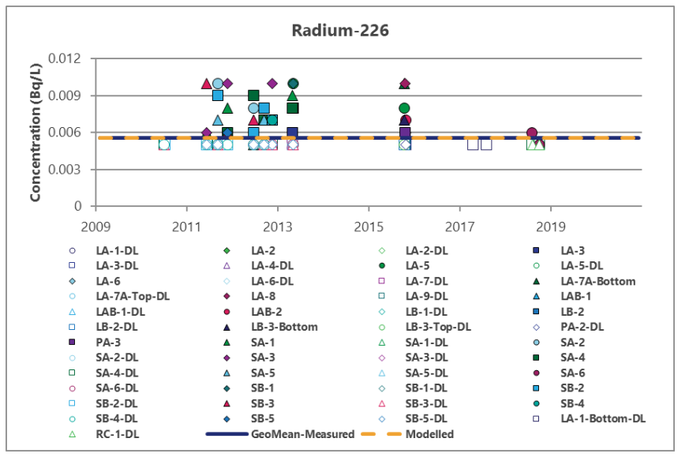

Selenium
Concentration (mg/L)
0.00024
0.00018
0.00012
0.00006
0
2009
2011
2013
2015
2017
2019
LA-1-DL
LA-2-DL
LA-3-DL
LA-4-DL
LA-5-DL
LA-6-DL
LA-7-DL
LA-7A-Bottom
LA-7A-Top-DL
LA-8-DL
LA-9-DL
LAB-1-DL
LAB-2-DL
LB-1-DL
LB-2-DL
LB-3-Bottom
LB-3-Top-DL
PA-2-DL
PA-3-DL
SA-1-DL
SA-2-DL
SA-3-DL
SA-4-DL
SA-5-DL
SA-6-DL
SB-1-DL
SB-2-DL
SB-3-DL
SB-4-DL
SB-5-DL
LA-1-Bottom-DL
RC-1-DL
GeoMean-Measured
Modelled


Uranium
Concentration (mg/L)
0.00025
0.0002
0.00015
0.0001
0.00005
0
2009
2011
2013
2015
2017
2019
LA-1-DL
LA-2-DL
LA-3-DL
LA-4-DL
LA-5-DL
LA-6-DL
LA-7-DL
LA-7A-Bottom-DL
LA-7A-Top-DL
LA-8-DL
LA-9-DL
LAB-1-DL
LAB-2-DL
LB-1-DL
LB-2-DL
LB-3-Bottom-DL
LB-3-Top-DL
PA-2-DL
PA-3-DL
SA-1-DL
SA-2-DL
SA-3-DL
SA-4-DL
SA-5-DL
SA-6-DL
SB-1-DL
SB-2
SB-2-DL
SB-3-DL
SB-4
SB-4-DL
SB-5-DL
LA-1-Bottom-DL
RC-1-DL
GeoMean-Measured
Modelled


Zinc
Concentration (mg/L)
0.025
0.02
0.015
0.01
0.005
0
2009
2011
2013
2015
2017
2019
LA-1
LA-1-DL
LA-2
LA-2-DL
LA-3
LA-3-DL
LA-4-DL
LA-5-DL
LA-6
LA-6-DL
LA-7-DL
LA-7A-Bottom
LA-7A-Top-DL
LA-8-DL
LA-9-DL
LAB-1-DL
LAB-2-DL
LB-1-DL
LB-2
LB-2-DL
LB-3-Bottom
LB-3-Top
LB-3-Top-DL
PA-2-DL
PA-3
SA-1
SA-1-DL
SA-2
SA-2-DL
SA-3
SA-3-DL
SA-4
SA-4-DL
SA-5
SA-5-DL
SA-6
SA-6-DL
SB-1
SB-2
SB-2-DL
SB-3
SB-3-DL
SB-4
SB-4-DL
SB-5
SB-5-DL
LA-1-Bottom
LA-1-Bottom-DL
RC-1
RC-1-DL
GeoMean-Measured
Modelled


Lead-210
Concentration (Bq/L)
0.06
0.045
0.03
0.015
0
2009
2011
2013
2015
2017
2019
LA-1-DL
LA-2-DL
LA-3-DL
LA-4-DL
LA-5-DL
LA-6-DL
LA-7-DL
LA-7A-Bottom-DL
LA-7A-Top-DL
LA-8-DL
LA-9-DL
LAB-1-DL
LAB-2-DL
LB-1-DL
LB-2-DL
LB-3-Bottom-DL
LB-3-Top-DL
PA-2-DL
PA-3-DL
SA-1
SA-1-DL
SA-2
SA-2-DL
SA-3
SA-3-DL
SA-4
SA-4-DL
SA-5
SA-5-DL
SA-6-DL
SB-1-DL
SB-2
SB-2-DL
SB-3
SB-3-DL
SB-4
SB-4-DL
SB-5-DL
LA-1-Bottom
LA-1-Bottom-DL
RC-1-DL
GeoMean-Measured
Modelled





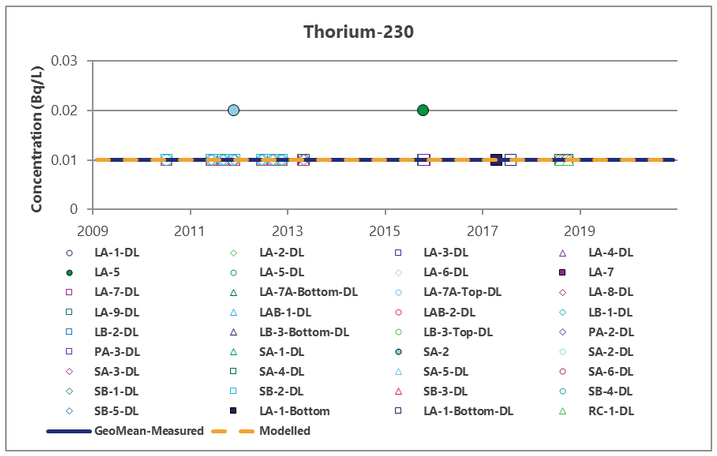
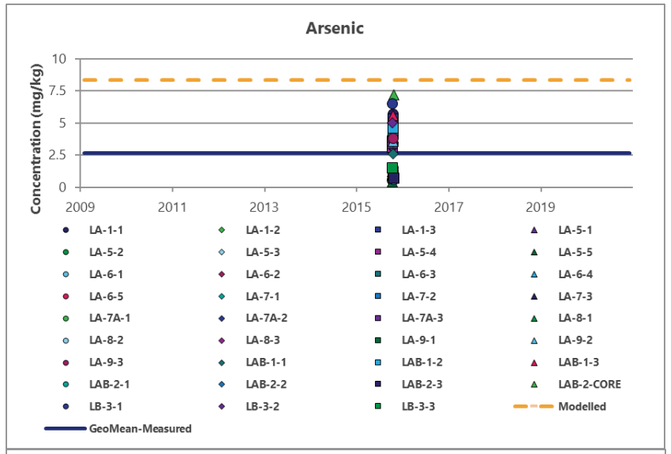
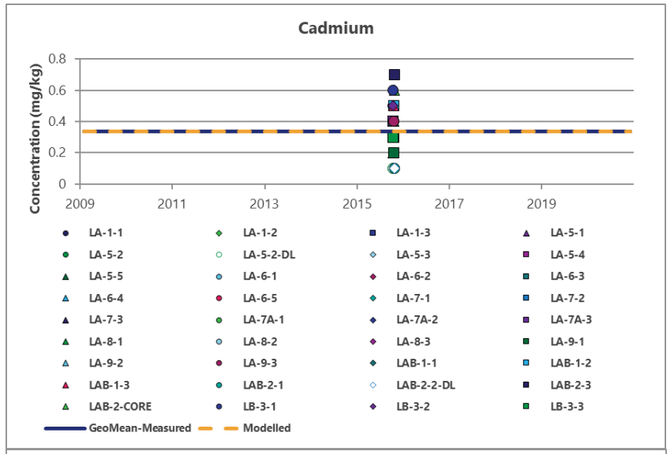
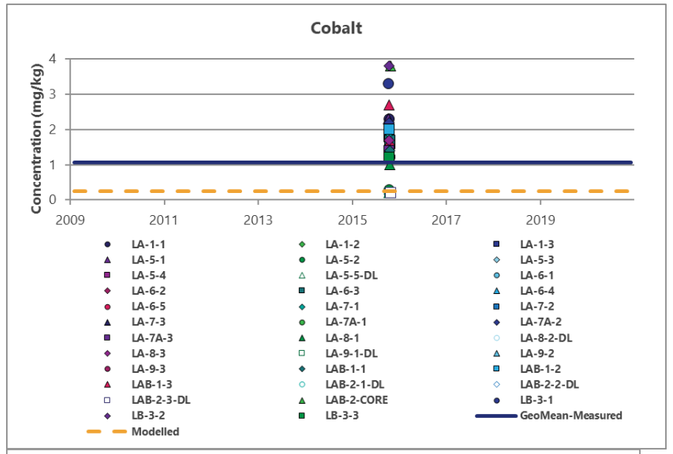
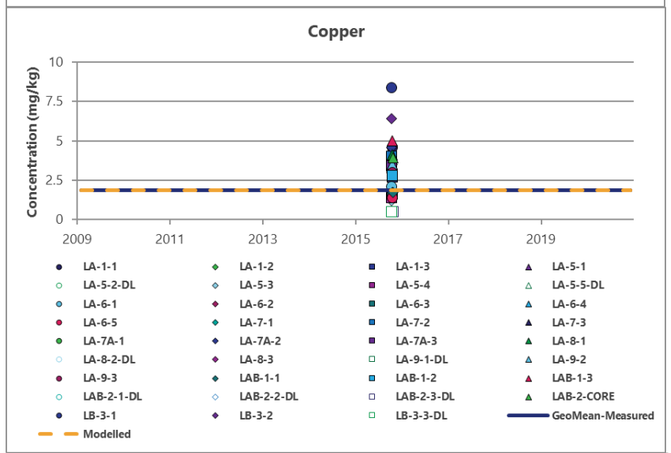


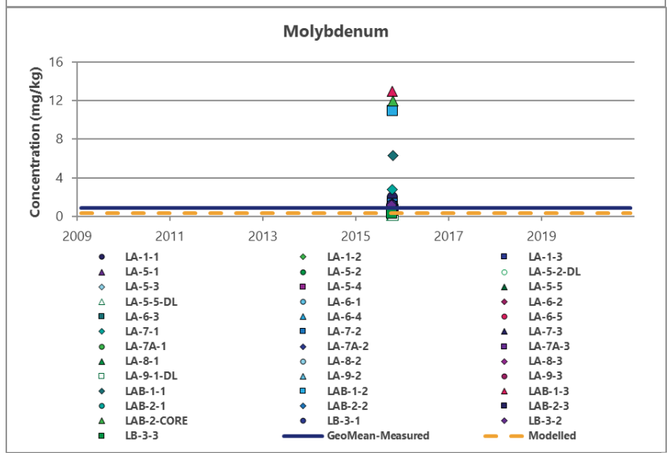
Figure IR-101-3: Selected and Observed Wheeler River Water Quality

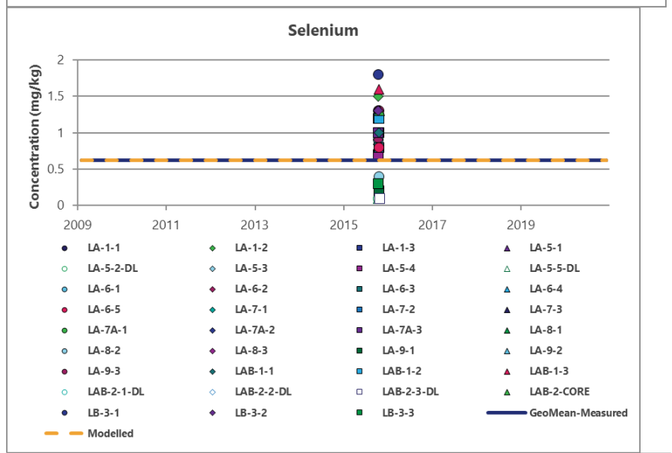

Arsenic
Concentration (mg/kg)
10
7.5
5
2.5
0
2009
2011
2013
2015
2017
2019
LA-1-1
LA-1-2
LA-1-3
LA-5-1
LA-5-2
LA-5-3
LA-5-4
LA-5-5
LA-6-1
LA-6-2
LA-6-3
LA-6-4
LA-6-5
LA-7-1
LA-7-2
LA-7-3
LA-7A-1
LA-7A-2
LA-7A-3
LA-8-1
LA-8-2
LA-8-3
LA-9-1
LA-9-2
LA-9-3
LAB-1-1
LAB-1-2
LAB-1-3
LAB-2-1
LAB-2-2
LAB-2-3
LAB-2-CORE
LB-3-1
LB-3-2
LB-3-3
Modelled
GeoMean-Measured

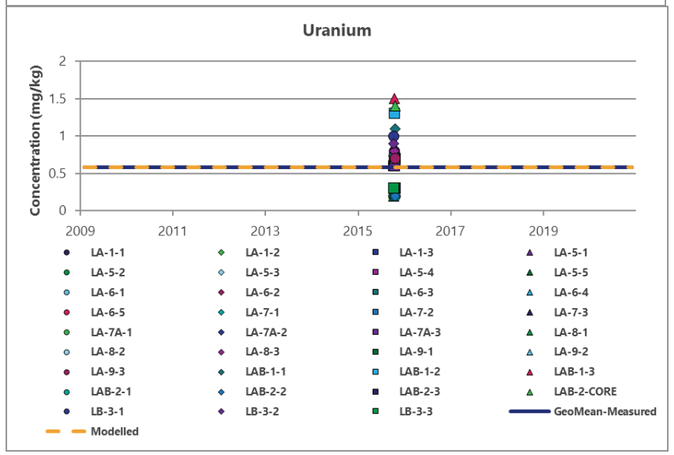

Cadmium
Concentration (mg/kg)
0.8
0.6
0.4
0.2
0
2009
2011
2013
2015
2017
2019
LA-1-1
LA-1-2
LA-1-3
LA-5-1
LA-5-2
LA-5-2-DL
LA-5-3
LA-5-4
LA-5-5
LA-6-1
LA-6-2
LA-6-3
LA-6-4
LA-6-5
LA-7-1
LA-7-2
LA-7-3
LA-7A-1
LA-7A-2
LA-7A-3
LA-8-1
LA-8-2
LA-8-3
LA-9-1
LA-9-2
LA-9-3
LAB-1-1
LAB-1-2
LAB-1-3
LAB-2-1
LAB-2-2-DL
LAB-2-3
LAB-2-CORE
LB-3-1
LB-3-2
LB-3-3
GeoMean-Measured
Modelled

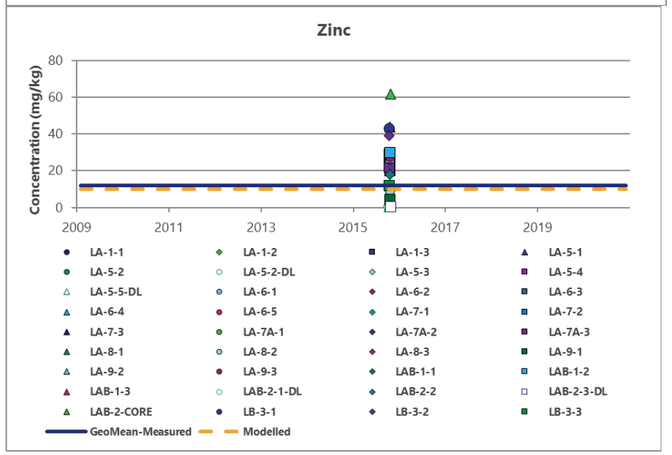

Cobalt
Concentration (mg/kg)
4
3
2
1
0
2009
2011
2013
2015
2017
2019
LA-1-1
LA-1-2
LA-1-3
LA-5-1
LA-5-2
LA-5-3
LA-5-4
LA-5-5-DL
LA-6-1
LA-6-2
LA-6-3
LA-6-4
LA-6-5
LA-7-1
LA-7-2
LA-7-3
LA-7A-1
LA-7A-2
LA-7A-3
LA-8-1
LA-8-2-DL
LA-8-3
LA-9-1-DL
LA-9-2
LA-9-3
LAB-1-1
LAB-1-2
LAB-1-3
LAB-2-1-DL
LAB-2-2-DL
LAB-2-3-DL
LAB-2-CORE
LB-3-1
LB-3-2
LB-3-3
GeoMean-Measured
Modelled

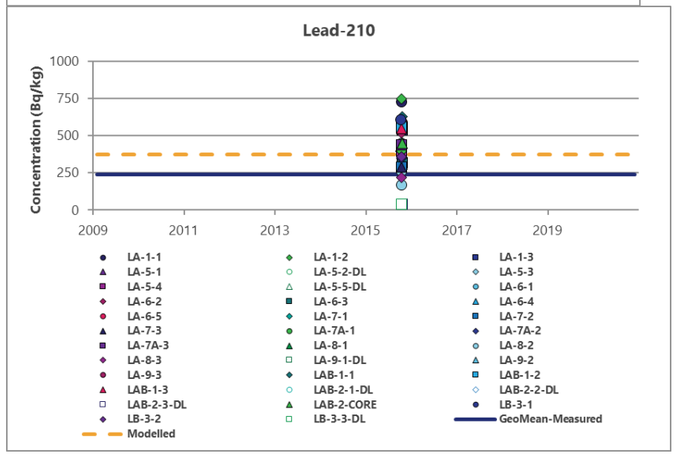

Copper
Concentration (mg/kg)
10
7.5
5
2.5
0
2009
2011
2013
2015
2017
2019
LA-1-1
LA-1-2
LA-1-3
LA-5-1
LA-5-2-DL
LA-5-3
LA-5-4
LA-5-5-DL
LA-6-1
LA-6-2
LA-6-3
LA-6-4
LA-6-5
LA-7-1
LA-7-2
LA-7-3
LA-7A-1
LA-7A-2
LA-7A-3
LA-8-1
LA-8-2-DL
LA-8-3
LA-9-1-DL
LA-9-2
LA-9-3
LAB-1-1
LAB-1-2
LAB-1-3
LAB-2-1-DL
LAB-2-2-DL
LAB-2-3-DL
LAB-2-CORE
LB-3-1
LB-3-2
LB-3-3-DL
GeoMean-Measured
Modelled

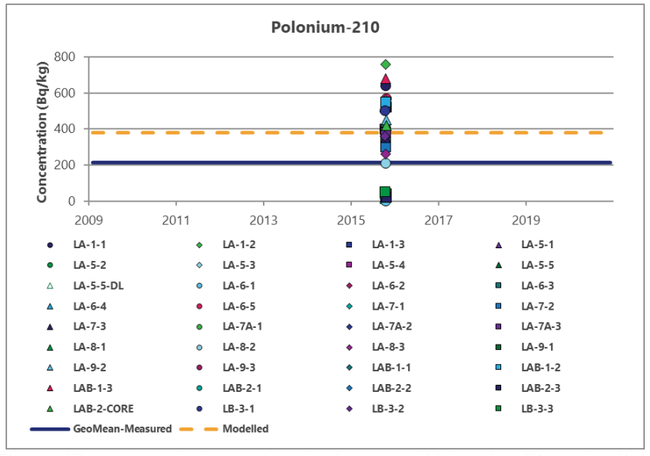

Molybdenum
Concentration (mg/kg)
16
12
8
4
0
2009
2011
2013
2015
2017
2019
LA-1-1
LA-1-2
LA-1-3
LA-5-1
LA-5-2
LA-5-2-DL
LA-5-3
LA-5-4
LA-5-5
LA-5-5-DL
LA-6-1
LA-6-2
LA-6-3
LA-6-4
LA-6-5
LA-7-1
LA-7-2
LA-7-3
LA-7A-1
LA-7A-2
LA-7A-3
LA-8-1
LA-8-2
LA-8-3
LA-9-1-DL
LA-9-2
LA-9-3
LAB-1-1
LAB-1-2
LAB-1-3
LAB-2-1
LAB-2-2
LAB-2-3
LAB-2-CORE
LB-3-1
LB-3-2
LB-3-3
GeoMean-Measured
Modelled

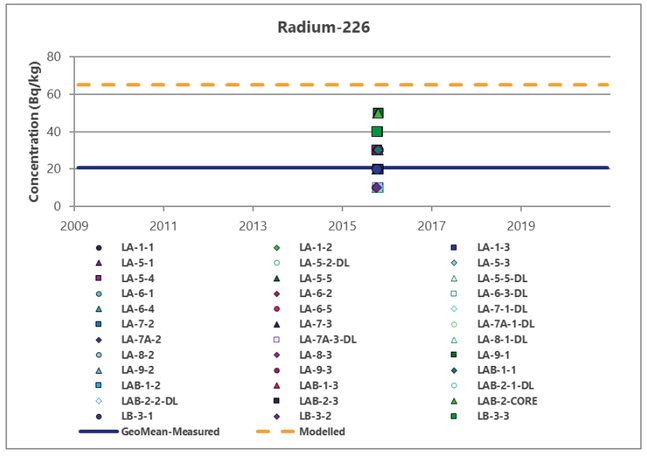

Selenium
Concentration (mg/kg)
2
1.5
1
0.5
0
2009
2011
2013
2015
2017
2019
LA-1-1
LA-1-2
LA-1-3
LA-5-1
LA-5-2-DL
LA-5-3
LA-5-4
LA-5-5-DL
LA-6-1
LA-6-2
LA-6-3
LA-6-4
LA-6-5
LA-7-1
LA-7-2
LA-7-3
LA-7A-1
LA-7A-2
LA-7A-3
LA-8-1
LA-8-2
LA-8-3
LA-9-1
LA-9-2
LA-9-3
LAB-1-1
LAB-1-2
LAB-1-3
LAB-2-1-DL
LAB-2-2-DL
LAB-2-3-DL
LAB-2-CORE
LB-3-1
LB-3-2
LB-3-3
GeoMean-Measured
Modelled


Uranium
Concentration (mg/kg)
2
1.5
1
0.5
0
2009
2011
2013
2015
2017
2019
LA-1-1
LA-1-2
LA-1-3
LA-5-1
LA-5-2
LA-5-3
LA-5-4
LA-5-5
LA-6-1
LA-6-2
LA-6-3
LA-6-4
LA-6-5
LA-7-1
LA-7-2
LA-7-3
LA-7A-1
LA-7A-2
LA-7A-3
LA-8-1
LA-8-2
LA-8-3
LA-9-1
LA-9-2
LA-9-3
LAB-1-1
LAB-1-2
LAB-1-3
LAB-2-1
LAB-2-2
LAB-2-3
LAB-2-CORE
LB-3-1
LB-3-2
LB-3-3
GeoMean-Measured
Modelled


Zinc
Concentration (mg/kg)
80
60
40
20
0
2009
2011
2013
2015
2017
2019
LA-1-1
LA-1-2
LA-1-3
LA-5-1
LA-5-2
LA-5-2-DL
LA-5-3
LA-5-4
LA-5-5-DL
LA-6-1
LA-6-2
LA-6-3
LA-6-4
LA-6-5
LA-7-1
LA-7-2
LA-7-3
LA-7A-1
LA-7A-2
LA-7A-3
LA-8-1
LA-8-2
LA-8-3
LA-9-1
LA-9-2
LA-9-3
LAB-1-1
LAB-1-2
LAB-1-3
LAB-2-1-DL
LAB-2-2
LAB-2-3-DL
LAB-2-CORE
LB-3-1
LB-3-2
LB-3-3
GeoMean-Measured
Modelled


Lead-210
Concentration (Bq/kg)
1000
750
500
250
0
2009
2011
2013
2015
2017
2019
LA-1-1
LA-1-2
LA-1-3
LA-5-1
LA-5-2-DL
LA-5-3
LA-5-4
LA-5-5-DL
LA-6-1
LA-6-2
LA-6-3
LA-6-4
LA-6-5
LA-7-1
LA-7-2
LA-7-3
LA-7A-1
LA-7A-2
LA-7A-3
LA-8-1
LA-8-2
LA-8-3
LA-9-1-DL
LA-9-2
LA-9-3
LAB-1-1
LAB-1-2
LAB-1-3
LAB-2-1-DL
LAB-2-2-DL
LAB-2-3-DL
LAB-2-CORE
LB-3-1
LB-3-2
LB-3-3-DL
GeoMean-Measured
Modelled





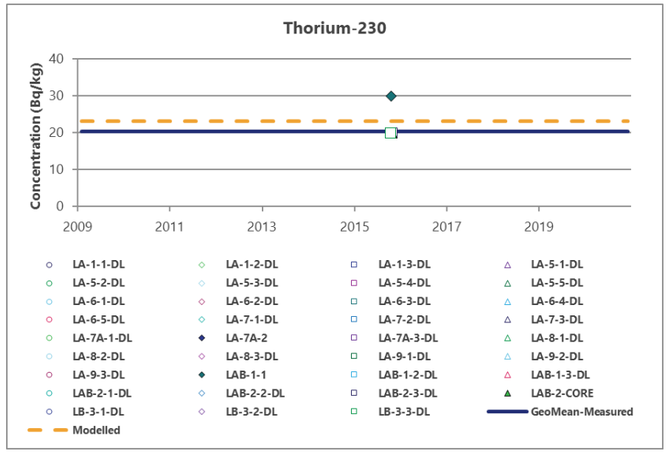


Figure IR-101-4: Selected and Observed Wheeler River Sediment Quality

Grain Size

EIS Section 8.4.3.2.1 states that grain size in the top 0-2 cm of sediment was predominantly clay-size fractions followed by silt (Whitefish Lake North, McGowan Lake, and Russell Lake). In Whitefish Lake South, grain size was predominantly clay, followed by sand and then silt. Data from the Key Lake Operation, located 35 km southwest of the Project, and McArthur River Operation, located 35 km northeast of the Project, were used as part of regional data for the Wheeler River Project. Based on the 2015 Environmental Performance Report (EPR) for the Key Lake Operation, sediment grain size in the top 0-2 cm, was predominantly silt followed by clay, and a small amount of sand (Figure IR-101-1). Based on the 2015 EPR for the McArthur River Operation, sediment grain size in the top 0-2 cm was predominantly silt and clay, followed by sand (Figure IR-101-2).

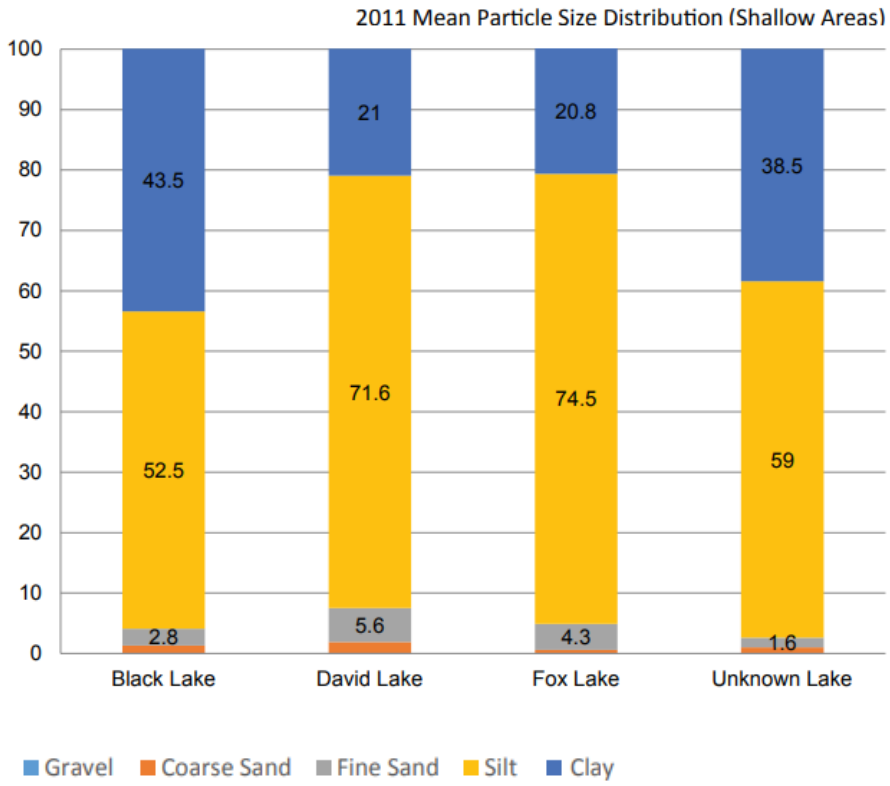


Figure IR-107-1: Grain Size Distribution in Shallow Areas in David Creek Drainage (Ecometrix, 2015a)

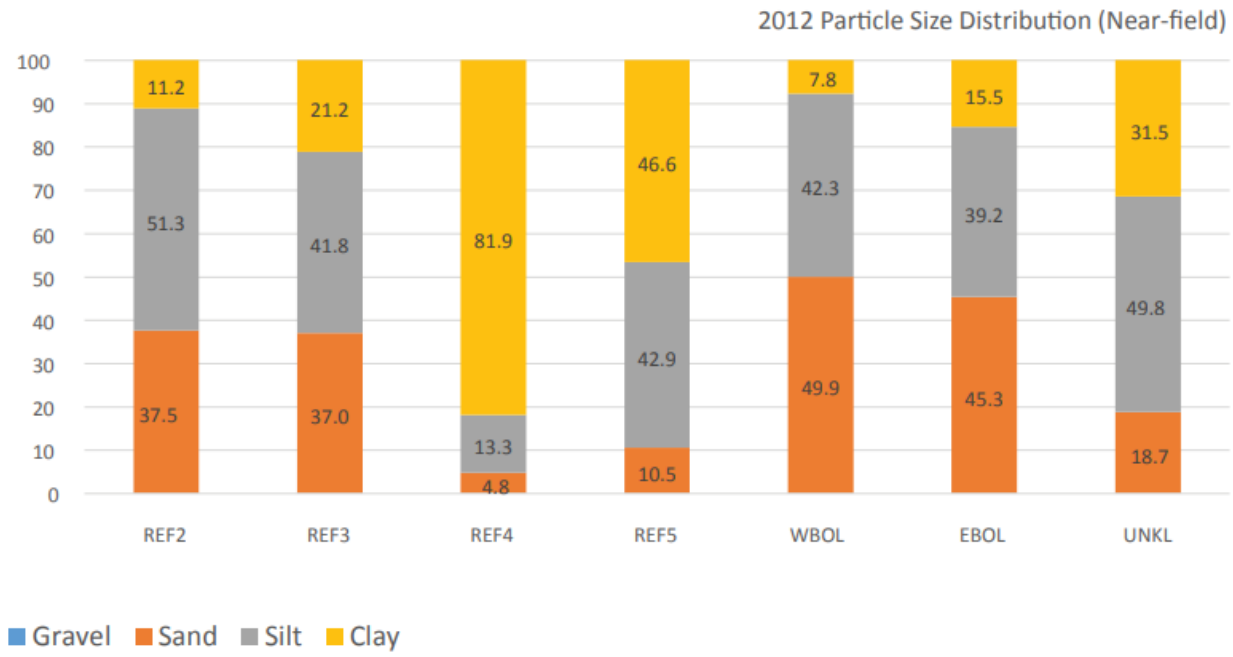


Figure IR-107-2: Grain Size Distribution in Shallow Areas in Reference and Exposure Sediment in McArthur River Operation Area (Ecometrix, 2015b)

References:

Cameco. 1996. McArthur River Project, Environmental Impact Statement. Addendum Report (including Appendices).

Conor Pacific (Conor Pacific Environmental Technologies Inc.). 2000. McArthur River Pre-milling Baseline for the Key Lake Study Area, 1998/1999. Prepared for Cameco Corporation, Saskatoon, SK.

EcoMetrix. 2013. Millennium IMPACT Model 2012. Report prepared for Cameco Corporation. In: Cameco. 2013. Millennium Project Environmental Impact Statement, Annex K.

EcoMetrix. 2015a. Key Lake IMPACT Model 2015 Update. Report prepared for Cameco Corporation. In: Cameco, 2015.

EcoMetrix. 2015b. McArthur River IMPACT Model 2015 Update. Report prepared for Cameco Corporation. In: Cameco. 2015.

EMA (Environmental Management Associates). 1992. McArthur River Project- Wildlife and Habitat Investigations 1991-1992. Prepared for Cameco Corporation, Saskatoon, Sask.

Golder (Golder Associates Ltd.). 1994a. McArthur River Study Area and Proposed McArthur River/Key Lake Haul Road Winter Wildlife Survey. Report prepared for Cameco Corporation, Saskatoon, Saskatchewan. March.

Golder. 1994b. McArthur River Terrestrial Studies, 1993. Report prepared for Cameco Corporation, Saskatoon, Saskatchewan.

IES (Integrated Environmental Sciences Inc.). 1983a. Baseline studies of aquatic sediments and macrophytes, fish, soil and terrestrial vegetation at Key Lake, Saskatchewan. Prepared for Key Lake Mining Corporation.

IES. 1983b. Additional baseline data for Delta Lake, Saskatchewan.

KLMC (Key Lake Mining Corporation). 1979. Key Lake Project Environmental Impact Statement. Volumes 1, 2 and 3, including Appendices.

TAEM (Terrestrial & Aquatic Environmental Managers Ltd.). 1993a. Aquatic Biological Resources of the McArthur River Uranium Project Area, Saskatchewan. A report prepared for Cameco Corporation, Saskatoon, Saskatchewan. Appendix 12C of the 1995 McArthur River EIS.

TAEM. 1993b. Surface Water Hydrology Baseline Investigations McArthur River Uranium Project. A report prepared for Cameco Corporation, Saskatoon, Saskatchewan. Appendix 6G of the 1995 McArthur River EIS.

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TO:	FROM:
Denison Mines – Janna Switzer	Ecometrix
REF:	**DATE:**
Wheeler River Project EIS – Appendix 8-F: Wetland Effects Assessment Report	3 October 2024

1.0 Introduction

On October 21, 2022, Denison Mines Corp. (Denison) submitted a draft Environmental Impact Statement (EIS) for the proposed Wheeler River Project (the Project). Based on their initial review, the Canadian Nuclear Safety Commission indicated that the submission contained the required information to proceed with the Federal-Indigenous Review Team (FIRT) technical review of the draft EIS. On March 20, 2023, the FIRT provided Denison with a list of information requests (IRs) for Denison to respond to and eventually submit a final EIS document. Responses to these IRs were provided in July and August of 2023. Additional FIRT IRs were provided to Denison on December 5, 2024. Of these IR-101 was not adequately answered and additional information was requested. This appendix was initially included in the January 2024 revised draft EIS and has been updated in October 2024 in response to Round 4 IR-101.

This appendix provides additional information to address IR-101 provided by Environment Canada and Climate Change (ECCC) as part of the second and fourth round of FIRT comments. The comment included a request for a further summary of wetland characterization information from available sources, baseline information pertaining to water quality and sediment quality, and assessment of potential effects to wetlands within the LSA for all phases of the Project and provide further information on mitigation measures and monitoring that would be applied for the protection of wetlands.

2.0 Scope of the Assessment

This section addresses the potential effects of the Project on the Fish and Fish Habitat VC for which wetland habitats are considered a component. The purpose of this assessment is to assess potential changes to wetlands (as represented by the Fish and Fish Habitat VC) in consideration of all phases of the Project at the Project Area, local, and regional study area scales. Pathways affecting wetlands are directly associated with potential changes to the Surface Water Quantity (hydrology), Surface Water Quality, Sediment Quality, and Benthic Invertebrates VCs. Changes to

hydrology, water quality, sediment quality, and benthic invertebrate communities may directly affect wetlands as both fish and wildlife habitat and food resources. The assessment approach reflects these connections within the environment, as the significance determination for the Surface Water Quantity and Surface Water Quality VCs was conducted at the receptor VC level.

The Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs are interrelated, to varying extents, and are linked to other VCs, including:

Surface Water Quality – surface water contributes to local moisture regimes, and surface water quality can influence the persistence of Vegetation and Ecosystems, Listed Plant Species, and Wetlands.

Surface Water Quantity – surface water contributes to local moisture regimes, and surface water quantity contributes to site drainage and discharge, which can influence the persistence of Vegetation and Ecosystems, Listed Plant Species, and Wetlands.

Sediment Quality – Vegetation and Ecosystems, Listed Plant Species, and Wetlands contribute to ecosystem form and function that stabilize riparian areas and influence quality of surface water runoff to aquatic systems.

This appendix will focus on the interrelations between these VCs as they apply to Wetland function.

Pathways that are of interest include those associated with site clearing and the potential for erosion-driven mobilization of suspended sediment into local surface waters; groundwater interactions with surface water features including wetlands; the establishment of new subwatershed boundaries and the resulting effects of effluent discharge to the receiving environment; and the potential overprinting of wetland habitat by Project infrastructure.

2.1 Key indicators and Measurable Parameters

The KIs for the wetland component of the Fish and Fish Habitat VC include potential changes in surface water quantity, surface water quality, and available wetland habitat from baseline conditions. The rationale for each KI and associated MPs is summarized in Table 1.

Table 1: Key Indicators and Measurable Parameters for the Wetlands Valued Component

Key Indicator	Rationale for Key Indicator	Measurable Parameter
Change in available wetland habitat from baseline conditions	• Project activities may result in a change in the extent of Wetlands. • Of provincial and federal management concern • Contributes to biodiversity and habitat for wildlife species and listed plant species. • Cultural importance. • Contributes to biodiversity, maintenance of hydrologic cycles, nutrient cycling, water quality, and carbon storage. • Sensitive to disturbance. • Historically addressed for other mining projects in northern Saskatchewan.	Aerial extent (m^2 or ha) of overprinted wetland habitat.
Change to water levels or flows from baseline conditions	Project activities are expected to result in changes to local hydrology. A reduction or increase in flows may result due to the elimination or redirection of subwatershed area and through Project water management (i.e., water taking, storage, and effluent discharge). These changes in flow to the environment may alter stream flows, lake levels and such feature interactions (inundation) with wetland features required for fish and wildlife during all life stages.	Changes in water levels (m) or percent changes to flow conditions (%).
Change in surface water quality from baseline conditions	Changes in water quality are regulated (subsection 36(1) of the *Fisheries Act* and the MDMER). Changes that may occur as a result of the Project include: • mobilization of solids into local watersheds; and • deposition of deleterious substances into the receiving environment as a result of mine effluent and/or surface runoff.	Change in the concentration of constituents that are directly related to Project activities, measured as a mass of a chemical per unit volume in water (e.g., mg/L).

2.2 Spatial and Temporal Boundaries

The areas used to assess the effects of the Project on the Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs are (Figure 1):

Project Area: the area within which the Project and all components/activities are located (i.e., the area of maximum physical disturbance). The Project Area is considered to be a conservative estimate of the area of direct disturbance effects on VCs in this assessment.

Vegetation LSA: the area that surrounds the Project Area where all direct effects and most indirect effects are likely to occur on the Vegetation and Ecosystems, Listed Plant Species, and

Wetlands VCs. The Vegetation LSA is defined as the Project Area plus a 250 m buffer along roads and a 500 m buffer around all other infrastructure (1,161.8 ha).

Terrestrial RSA: the area that surrounds and includes the Vegetation LSA, established to assess the potential, largely indirect effects of the Project on Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs in a regional context. The Terrestrial RSA (40,173.6 ha) is defined as a minimum 8 km buffer around the Vegetation LSA and has been delineated to capture all indirect effects of the Project on the Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs and provide context for the type, distribution, extent, and prevalence of plant species and ecosystems in the region. The Terrestrial RSA also defines the area within which cumulative effects are likely to occur (i.e., CEA boundary).

Temporal boundaries identify when an effect is expected to occur in relation to specific Project phases and activities. The temporal boundaries are based on the timing and duration of Project activities, with the associated interactions with each VC and KI (where applicable). In the EA, the temporal boundaries are described as appropriate for each activity and cumulatively for the life of the Project.

The temporal boundaries for the EA represent the timeframes that the Project is expected to interact with and potentially affect Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs. The temporal boundaries are aligned with the Project development schedule as described in the EIS: Construction; Operation; Decommissioning; and Post-Decommissioning.

3.0 Existing Conditions

Wetlands are defined as "land that is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly drained soils, hydrophytic vegetation and various kinds of biological activity which are adapted to a wet environment" (National Wetlands Working Group 1997). As such, ecosites have been determined to be wetland ecosystems where these conditions are expected to occur. This includes both wetland ecosites and sparsely vegetated ecosites where the water table is within 50 cm of the ground surface (McLaughlan et al. 2010). No wetlands within the Terrestrial RSA have been designated as Ramsar Wetlands of International Importance (The RAMSAR Convention Secretariat 2022).

Project-specific investigations pertaining to the Terrestrial Environment were conducted by Omnia Ecological Consulting (Omnia; Calgary, AB) from 2017 to 2019. Details on the methods, survey parameters and assumptions, and comprehensive data summaries/findings are presented in the Project-specific baseline report (Omnia 2020; see Appendix 9-B of the EIS) and a supplementary baseline annex report completed in 2021 (EDI 2021; see Appendix 9-C of the EIS).

Project baseline studies for vegetation presented a description of the ecosystems/habitat types (i.e., ecosite classifications) within the Terrestrial RSA. Vegetation communities and ecosystems are represented by provincial ecosite classifications for the Boreal Shield Ecozone in accordance with the Field Guide to the Ecosites of Saskatchewan's Provincial Forests (McLaughlan et al. 2010). These ecosite classifications were summarized within a 1:20,000 interpreted ecosite mapping product compiled within the Terrestrial RSA with the use of the following inputs:

- 1:5,000 anthropogenic features mapping;
- historical fires data;
- provincial Predicted Ecosite Mapping;
- current and historical imagery; and
- field sampling/ground truthing sites (EIS Appendix 9-B).

As the Boreal Shield Ecozone experiences a largely natural fire regime, much of the vegetation within the Terrestrial RSA (70.6%) is comprised of post-fire regeneration (i.e., shrubby structural stages).Twenty (20) upland ecosites were identified within the RSA with relative percentages by area estimated for each ecosite code.

The assessment also identified fourteen (14) wetland ecosite types within the RSA which included swamps, bogs, fens and shallow open water ecosite codes. The area of these wetlands was also estimated to provide a relative -percent area of representation within the RSA.

This cataloguing of ecosite presence and relative area composition across the RSA provides the basis for understanding landscape change and succession over the course of the construction and operation of the Wheeler River Operation.

Waterbodies were conservatively included ~~here~~ as wetlands, as they have the potential to be classified as shallow open water wetlands (i.e., water bodies 2 m deep or less; Warner et al. 1997). Waterbodies represent the most common wetland ecosystem within the Vegetation LSA and the Terrestrial RSA, comprising 3.9% (44.9 ha) and 10.7% (4,101.9 ha), respectively. The black spruce treed bog is the second most common wetland ecosystem within the Vegetation LSA (18.2 ha, 1.6%) and the Terrestrial RSA (1,157.1 ha; 2.9%). The Labrador tea shrubby bog is the most common wetland ecosystem in the Vegetation LSA, comprising 2.0% (23.3 ha), and the second most common wetland ecosystem in the Terrestrial RSA (989.9 ha, 2.5%). All other wetland ecosites are relatively uncommon, each comprising less than 0.5% of the Vegetation LSA and Terrestrial RSA. The location, size and relative area composition of the wetland features

is provided in Table 2 and Figure 1). The initial classification and subsequent assessment of wetlands in the Terrestrial Environment (EIS Section 9) took a conservative approach in that the area of wetlands within the terrestrial study areas was likely over-estimated to assess potential changes in areal extend of wetlands.

Table 2: Summary of Wetlands

Ecosite Code[1]	Ecosite Description[1]	Structure Code[2]	Vegetation LSA (ha)	Vegetation LSA (%)	Terrestrial RSA (ha)	Terrestrial RSA (%)
Swamps						
BS16	Black spruce / balsam poplar / river alder swamp	6	--	--	8.8	<0.1
Swamps Subtotal			**--**	**--**	**8.8**	**<0.1**
Bogs						
BS17	Black spruce treed bog	5	18.2	1.6	1,157.1	2.9
BS18	Labrador tea shrubby bog	3	23.3	2.0	967.6	2.4
		3a	--	--	20.3	0.1
		3b	--	--	2.0	<0.1
		Total	23.3	2.0	989.9	2.5
BS19	Graminoid bog	2	2.8	0.2	160.5	0.4
BS19/24[3]	Graminoid bog or graminoid fen	2	0.8	0.1	1.2	<0.1
BS20	Open bog	1	0.6	<0.1	65.5	0.2
Bogs Subtotal			**45.6**	**3.9**	**2,374.2**	**5.9**
Fens						
BS19/24[3]	Graminoid bog or graminoid fen	2	0.8	0.1	1.2	<0.1
BS21	Tamarack treed fen	5	1.9	0.2	66.5	0.2
BS22	Leatherleaf shrubby poor fen	3a	-	-	28.5	0.1
BS23	Willow shrubby rich fen	3b	0.6	<0.1	20.9	0.1
BS24	Graminoid fen	2	-	-	9.0	<0.1
BS25	Open fen	1	0.4	<0.1	5.7	<0.1

Ecosite Code[1]	Ecosite Description[1]	Structure Code[2]	Vegetation LSA (ha)	Vegetation LSA (%)	Terrestrial RSA (ha)	Terrestrial RSA (%)
Fens Subtotal			**3.6**	**0.3**	**131.8**	**0.3**
Shallow Open Water						
BS26	Rush sandy shore	2	-	-	15.1	<0.1
BS27	Sedge rocky shore	2	4.2	0.4	29.3	0.1
Waterbody[4]	--	0	44.9	3.9	4,101.9	10.7
Shallow Open Water Subtotal			**49.0**	**4.2**	**4,146.3**	**10.3**
Total Wetlands[5]			**98.3**	**8.5**	**6,661.1**	**16.6**

Notes:

1 Ecosystems are described in detail in the Guide to the Ecosites of Saskatchewan's Provincial Forests (McLaughlan et al. 2010).

2 Modified from the Field Manual for Describing Terrestrial Ecosystems (BC Ministry of Environment, Lands, and Parks, and BC Ministry of Forests 1998). 0 = unvegetated; 1 = sparse / bryophyte / lichen; 2 = herb/graminoid; 3a = low shrub; 3b = tall shrub; 5 = young forest, 6 = mature forest.

3 This ecosite type is an artifact of mapping uncertainty, as baseline mappers were unable to distinguish between these ecosites due to a lack of available information (e.g., soil information, vegetation field plots, water quality data). As such, this ecosite has conservatively been split between bog and fen classifications.

4 Areas of open water <2 m deep are defined as shallow open water wetland ecosystems (National Wetlands Working Group 1997); as such, unnamed waterbodies and areas of open water observed to exhibit an average depth of <2 m (Ecometrix Incorporated 2020) have been conservatively included as wetland ecosystems.

5 Some numbers are rounded for presentation purposes. Therefore, the totals may not equal the sum of the individual values.

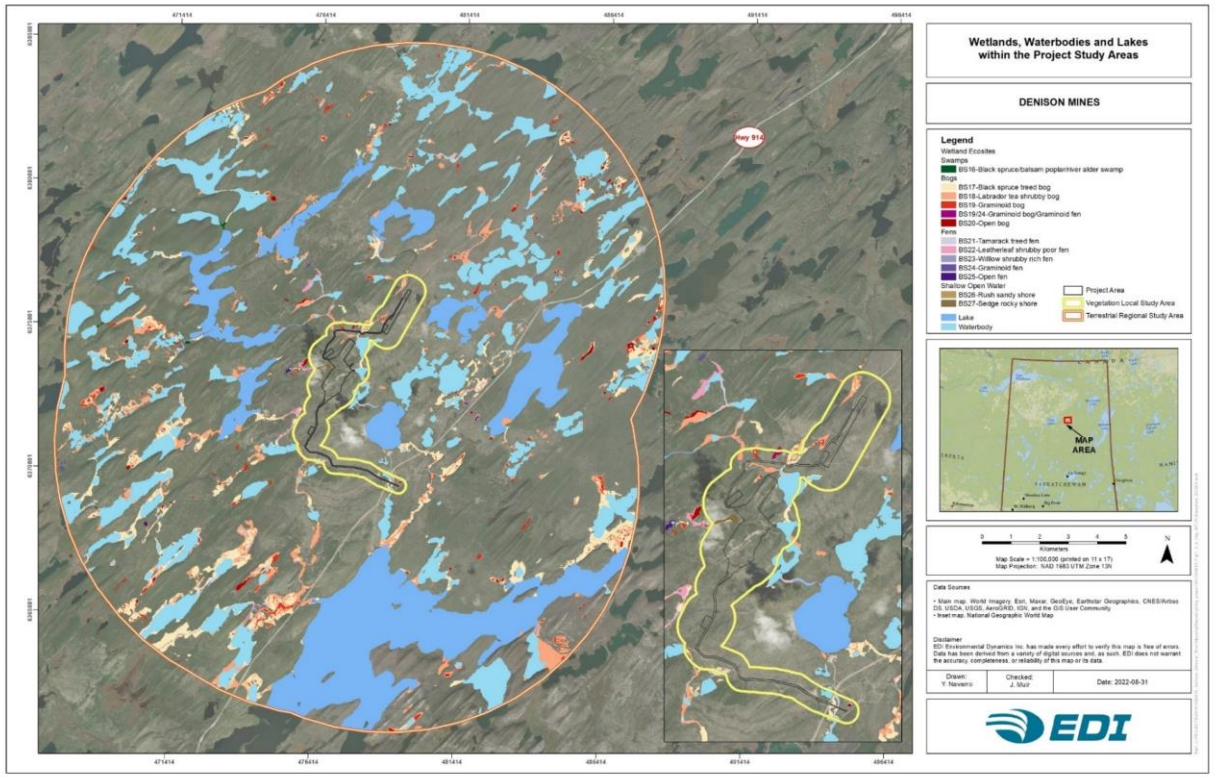


Figure 1: Wetlands, Waterbodies and Lakes within the Project Study Areas

Surface elevations for the wetland have been assessed and the information is summarized below and in the Figure 1-.

- Wetlands 1.5 km west of the Project Area range from 526-524 masl
- Waterbodies and their surrounding wetlands directly to the east of the SSA are at an elevation of between 506 and 500 masl
- Waterbodies and surrounding wetlands 2 km east of site are approximately between 499 and 497 masl
- Wetlands north of the Project Area and in the vicinity of the proposed air strip range from 514-508 masl.
- Wetlands situated further north of the Project Area in the LSA were at an elevation of approximately 526 masl
- Southern wetlands that will interact with the proposed hydro corridor extension for the mine have an elevation of 491masl
- Most wetland evaluated south of the Project Area had elevations ranging from 491-488 masl

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Wetland depth, presence of fish or fish habitat, water quality and sediment quality are not currently available for the non-waterbody wetlands (i.e. those not identified as a lake or watercourse in Section 8 of the EIS). However, Denison is committed to conducting field surveys to collect this data prior to the initiation of construction of the Operation. This will allow for baseline information to be available to compare future changes and assess the success of mitigation measures and the predicted effects or lack thereof.

For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA. Refer to Appendix A below for additional information on the in-lake wetlands.

DATE: 3 October 2024

TO: Denison Mines – Janna Switzer

REF: Wheeler River Project EIS – Appendix 8-F: Wetland Effects Assessment Report

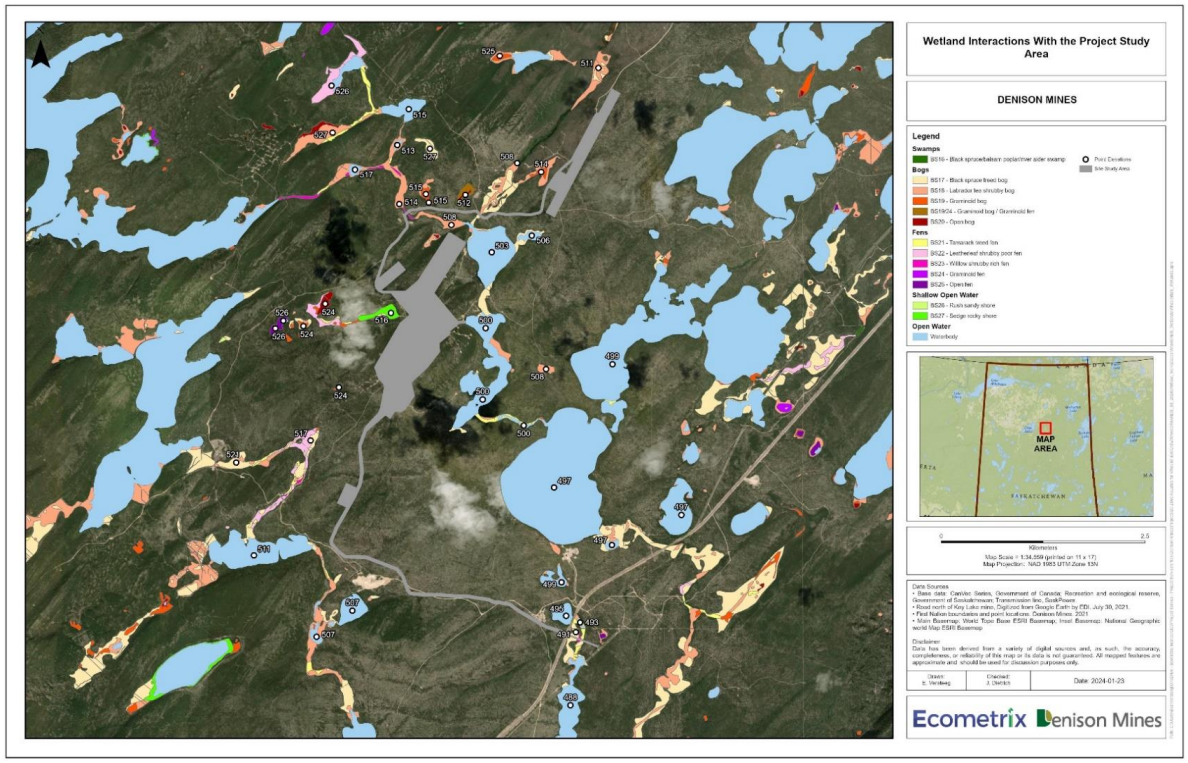


Figure 2: Elevations of wetland features in the LSA

4.0 Assessment of Project Related Effects

4.1 Potential Interactions Between the Project and Valued Component/Key Indicators

The Project will require the Construction, Operation, and Decommissioning of several components (as described in Section 2 of the EIS). Potential interactions between these Project components and activities and Fish and Fish Habitat in the form of Wetlands and their associated KIs are summarized by Project phase and activity in Table~~Table 4~~.

Potential interactions in Table~~Table 9.2-9~~ are ranked as:

Primary Interaction (✓): Project activity is expected to interact with the VC / KI which may result in an adverse effect on the VC (i.e., a measurable or detectable change in the MP) and is further considered in the effects assessment as the primary contributor to potential adverse effects.

Other Interaction (✓): Project activity is expected to interact with the VC / KI. While the interaction is further considered in the effects assessment, it is not expected to be a primary contributor to potential adverse effects.

No Interaction: Project activity is not expected to interact with the VC or the KI, no adverse effects are expected, and rationale is provided for not considering this potential interaction further.

Table 4: Potential Project Interactions for Wetlands Valued Component

Project Phase/Activity	Wetlands Valued Component and Key Indicator
Development of access roads and air strip	✓
Site preparation and earthworks; clearing, leveling and grading of the Project Area	✓
Power generation - generators	✓
Installation of main substation and distribution of power around site	✓
Wellfield and freeze hole drilling; ground freezing	✓
Batch plant operation (concrete); crusher at borrow area	✓
Development of surface infrastructure (camp, operations centre, plants, ponds, pads and support facilities)	✓
Waste management (composting, domestic and industrial landfill operation, recycling)	
Water management (including treatment and site runoff)	✓
Groundwater supply	✓

Project Phase/Activity	Wetlands Valued Component and Key Indicator
Surface water withdrawal	✓
Fuel management (e.g., propane for comfort heating; vehicle and aircraft fuel)	✓
On-site and off-site operation of vehicles and transportation of materials	✓
Air transportation for workers	✓
Regulatory site inspections	✓
Engagement – site visit from Interested Parties	✓
Operation of the ISR wellfield	
Wellfield and freeze wall drilling	✓
Operation and expansion of freeze wall	✓
Batch plant operation (grout and cement); crusher in borrow area	✓
Expansion of pond and pads	✓
Operation of the processing plant and production of uranium concentrate	
Water withdrawal from groundwater or surface water body	✓
Management of surface water (including seepage and site runoff)	✓
Water treatment, both domestic and industrial	
Water release to surface water body	✓
Waste management (composting, domestic and industrial landfill operation, recycling)	
Hazardous waste management (temporary storage, handling, and off-site transportation)	✓
Storage and disposal of drill waste rock, process precipitates and industrial wastewater treatment plant precipitates	✓
On-site and off-site operation of vehicles and transport of materials	✓
Power supply – primarily power from the grid, also generators and back-up generators	✓
Package and transport of nuclear substances	✓
Fuel management (e.g., propane for comfort heating; vehicle and aircraft fuel)	✓
Air transportation for workers	✓
Progressive decommissioning and reclamation	✓
Regulatory site inspections	✓

Project Phase/Activity	Wetlands Valued Component and Key Indicator
Engagement – site visit from Interested Parties	✓
Site water management, treatment, and release	✓
Mining horizon remediation and thawing of freeze wall	✓
Process water treatment and release	✓
Closure of ISR and freeze wells and related infrastructure	✓
Decontamination of surface facilities and injection, recovery and monitoring wells	
Asset removal (including site power transmission lines and electrical infrastructure)	✓
Demolition and disposal of non-salvageable surface infrastructure and materials	✓
Remediation of contaminated areas (wellfield, pads, ponds, domestic wastewater treatment location, and process plant area)	✓
Generators	✓
Waste management (composting and landfill operation)	
Decommissioning of landfills; hazardous materials management (temporary storage and off-site disposal)	✓
On-site and off-site operation of vehicles and transportation of materials	✓
Reclamation of disturbed areas	✓
Regulatory site inspections	✓
Engagement – site visit from Interested Parties	✓
Environmental monitoring	✓
Regulatory site inspections	✓
Engagement - Site visit from Interested Parties	✓

1 Operational activities include maintenance.

4.2 Potential Project-related Effects

Based on the timing and nature of the interactions identified in Table 4, the following adverse effects have a potential to occur on the Wetland VC (Table 5). The key indicator of effects to wetlands is the change in areal extent of wetlands in the study area.

Table 5: Potential Project-related Effects on Wetlands Valued Component During all Project Phases

Project Phase/Potential Effect	Wetlands Valued Component and Key Indicator
Construction	
Direct disturbance / Overprinting	✓
Mobilization of suspended materials	✓
Introduction and/or Proliferation of Invasive Plants	✓
Changes in Water Quantity (water levels or flow)	✓
Edge Effects	✓
Changes to Water Quantity and Quality	✓
Dust Deposition	✓
Operation	
Direct disturbance / Overprinting	✓
Mobilization of suspended materials	✓
Edge Effects	✓
Introduction and/or Proliferation of Invasive Plants	✓
Controlled Discharge	✓
Changes in Water Quantity (water levels or flow)	✓
Controlled Discharge / Water Quality	✓
Dust Deposition	✓
Decommissioning	
Direct disturbance / Overprinting	✓
Mobilization of suspended materials	✓
Edge Effects	✓
Introduction and/or Proliferation of Invasive Plants	✓
Controlled Discharge	✓
Changes in Water Quantity (water levels or flow)	✓
Controlled Discharge / Water Quality	✓
Dust Deposition	✓
Post-Decommissioning	

Project Phase/Potential Effect	Wetlands Valued Component and Key Indicator
Direct disturbance	✓
Introduction and/or Proliferation of Invasive Plants	✓
Edge Effects	✓
Changes to Water Quantity and Quality	✓
Dust Deposition	✓

4.3 Mobilization of Suspended Materials

Construction

The primary effect pathway during Construction relates to the mobilization of suspended material into natural surface water features including wetlands as a result of land disturbance and clearing. The mobilization of suspended material into natural surface water features is readily mitigatable by virtue of the mine development plan and through the implementation of standard water management and sediment control practices. Water management infrastructure (e.g., collection ditches, ponds, pumping stations) and various aspects of the water management and sediment control management systems will be put into place coincident with the initiation of construction activities. Waters (e.g., runoff) associated with areas under development will be collected and stored within management infrastructure (e.g., clean waste rock pond, see Figure 2.2-14 in Section 2 of the EIS). In the event that releases to the natural environment are necessary, they would only occur once it is safe to do so (i.e., suspended solid levels in the water would be at acceptable levels). No downstream effects on surface waters, natural sediments, fish and fish habitat including wetlands are expected.

Operation

During Operation, mobilization of suspended materials will be managed through the development and operation of water management infrastructure and implementation of surface water management through the Surface Water Management Program. Releases of contact water to the natural environment will be directed through applicable collection ponds, the IWWTP, and the Effluent Monitoring and Release Ponds. No specific discharge is expected to wetland features in the Project Area. Discharge will only occur once it is safe to do so (i.e., suspended solids levels in the water would be at acceptable levels). Denison may employ active means (e.g., filtering), if required, to achieve low TSS levels in discharge, in addition to passive means, such as settling and clarification in the IWWTP to manage TSS in the effluent stream to low levels. No

downstream effects on surface waters, natural sediments, or fish and fish habitat including wetlands are expected.

Decommissioning and Post-Decommissioning

During Decommissioning and Post-Decommissioning, the site-wide water management system will continue to operate such that Denison will maintain control of the site aspect affected water through the IWWTP. Surface drainage during Decommissioning activities will continue to be directed to the system of collection ponds, the IWWTP, and the Effluent Monitoring and Release Ponds to facilitate the control of suspended solids and achieve low TSS levels in the discharge, thereby minimizing any potential for adverse changes to water quality, sediment quality, and fish and fish habitat including wetland features.

4.4 Overprinting of Wetlands as Fish Habitat

For the purposes of this assessment the bogs and fens within the area can be assumed to provide supporting fish habitat to the adjacent lake and river water bodies in the vicinity of the LSA.

Bogs are predicted to be the wetland class most affected by the Project, with 0.4 ha (less than 0.1%) of mapped bog ecosystems within the Terrestrial RSA expected to be disturbed within the Project Area during Construction. Fens are the next most affected, with 0.1 ha (0.1%) anticipated to be disturbed during Construction (Figure 3). Less than 0.1 ha (less than 0.1%) of shallow open water wetlands within the Terrestrial RSA are also anticipated to be affected by the Project.

Within these wetland classes, the wetland ecosite expected to be most affected is the willow shrubby rich fen (ecosite BS23) with direct disturbance to 0.1 ha predicted to occur within the Project Area (0.5% of the BS23 ecosite within the Terrestrial RSA). The remaining ecosites anticipated to be directly affected by the Project are locally abundant, with direct disturbance expected to affect <0.1% of these ecosites within the Terrestrial RSA (Table 2).

Investigation of the potential overprinting of wetland features as a result of the Project it is evident that wetland loss is avoidable. The interaction of the Project with wetlands is isolated to those areas where stream crossings for access roads and hydro-line connections are proposed (Figure 3). With the use of single span bridges and implementation of best management practices, direct wetland disturbance associated with the crossings of Kratchkowsky Creek and Hart Creek is expected to be avoided. It should be noted that SaskPower proposes to tap the existing I3P 138 kV line near Highway 914 and build approximately 4.5 km of new 138 kV line from the I3P tap to the Project site. SaskPower will be responsible for conducting activities such as line routing, environmental studies, and permitting, public consultation, and engineering design work as applicable to the load interconnection. As such, wetland disturbance related to the SaskPower Hydro Corridor is expected to be addressed through the SaskPower permitting process.

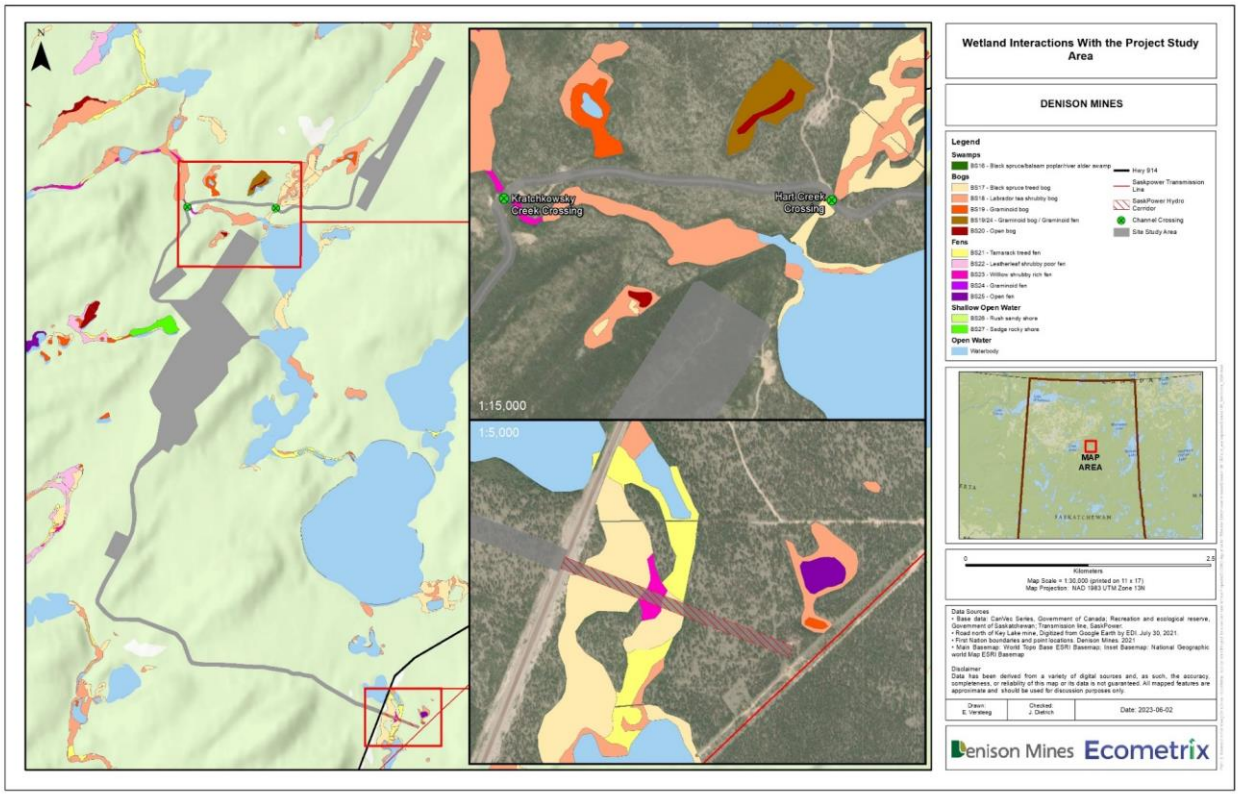


Figure 3: Denison Wheeler River Project Area and Wetland Feature Distribution

4.5 Controlled Discharge to Receiving Environments

According to the site water balance (Figure 2.2-14 in Section 2 of the EIS), there is no planned discharge to Whitefish Lake during Construction. Other than LA-5 (Whitefish Lake) no other controlled discharge will occur to the natural environment and no wetlands will be impacted as a result.

4.6 Change in Water Levels and Flow

As detailed in Section 8.1 of the EIS, the projected withdrawal and discharge rates proposed for the Project are the largest influence on the hydrological effects of the Project. The largest predicted change in streamflow rate is -3.1% at the LA-5 and SA-2 nodes (immediately downstream of the Project) during Operation and Decommissioning, as projected against the 5th percentile low flow dataset in March. Lake levels and wetlands are expected to deviate less than ±0.01 m due to all Project influences. All Project influences on the environment are expected to return to baseline conditions during Post-Decommissioning. These changes are within the range of fluctuation of environmental flows and water levels and are unlikely to affect fish passage or life history environmental cues.

4.7 Introduction and/or Proliferation of Invasive Plants

Vegetation clearing and soil disturbance during Construction are expected to create conditions suitable for the introduction and proliferation of invasive plants. Vehicles and construction equipment can inadvertently transport seeds and other invasive plant propagules in tires or the undercarriage to previously unaffected areas. The effects of invasive plants on native vegetation diversity are well documented and recognized as the second greatest threat to listed species after habitat loss (Enserink 1999). Competition with native species can lead to a reduction in the growth and vigour of native species (including Wetlands), as well as changes in the diversity, structure and function of ecosystems and habitats.

The potential for the introduction and proliferation of invasive plants by transport on vehicles and equipment is expected to continue throughout Operation during wellfield and freeze wall drilling, expansion of ponds and pads, drill waste rock, process precipitates and industrial wastewater treatment plant precipitates, on-site and off-site operation of vehicles and transport of materials, package and transport of nuclear substances, and air transportation for workers (i.e., landing and taking off of airplanes). Progressive decommissioning and reclamation has the potential to introduce invasive plants on vehicles and equipment and if seed used for revegetation is not supplied from a native seed source (Polster 2003) with a certificate of analysis indicating an absence of invasive plant seeds.

The potential for the introduction and proliferation of invasive plants is expected to continue throughout Decommissioning (e.g., during closure of the ISR and freeze wells and infrastructure,

asset removal, demolition and disposal of non-salvageable surface infrastructure and materials, remediation of contaminated areas, reclamation of disturbed areas, and operation of vehicles and transportation of materials). The potential for the introduction and proliferation of invasive plants is expected to continue throughout Post-Decommissioning, but at lower levels due to reduced vehicle traffic.

4.8 Edge Effects

Edge habitat refers to an area on either side of a border between vegetation communities. Edges between vegetation communities often result in altered microclimatic conditions that can influence environmental conditions further away from the edge (Bannerman 1998). Edge effects are expected to extend into areas of native vegetation and habitats at the interface of disturbed areas and undisturbed native ecosystems, and could include altered microclimatic conditions that can influence quality in habitat away from the edge (Bannerman 1998). Where edge effects occur, Wetlands may experience changes in light intensity, temperature, wind, moisture, relative humidity, and patterns of snow accumulation and melt relative to undisturbed conditions. This can, in turn, affect plant health and alter natural disturbance regimes (e.g., blowdown), plant population persistence, and the structure and function of ecosystems and habitats. If changes to microclimatic conditions or vegetative structure at an edge exceed a species habitat preference or physiological tolerance, then edge habitat may result in lower occupancy or use, reduced survival, or lowered reproductive success.

Edge effects at the interface of disturbed areas and native ecosystems are expected to occur along the edges of the Project Area resulting from vegetation clearing during site preparation and earthworks during Construction. Edge effects are expected to continue throughout Operation, Decommissioning, and Post-Decommissioning, decreasing over time as revegetation and tree growth within reclaimed areas of the Project create a gradual structural transition at forest edges, aided by natural encroachment.

4.9 Long-Term Transport of Groundwater Solutes to Whitefish Lake in Future Centuries

During the 'future centuries' scenario as described in Section 8.3.1.3 of the EIS, remediation works will be completed and the site naturalized, thereby restoring drainage patterns to report to surface waterbodies. As indicated in Section 7 of the EIS, groundwater plumes may develop from residual mass remaining post-mining based on bench-scale lab tests of core flushing, and numerical modelling of reactive fate and transport. The results of this was described in Section 8.3.4.2.5 with respect to Fish and Fish Habitat and therefore wetlands.

The results of the numerical modelling (as provided in Section 7 and Appendix 10-A in Section 10 of the EIS) support the conclusion that with the implementation of appropriate mitigation during the decommissioning and restoration phases of the Project, the residual effects of the

Project on the intermediate Groundwater VC will not result in an adverse effect on surface water. Dissolved constituent concentrations emanating over hundreds to thousands of years in the future from the deep Ore Zone to Whitefish Lake are expected to remain below fresh water environmental quality criteria in Whitefish Lake.

Although the precise location of the groundwater discharge to the surface is somewhat uncertain, the groundwater transport scenarios that have been evaluated (Appendix 7-C of the EIS) to date suggest groundwater discharge impacted from mining will most likely be relegated to Whitefish Lake. The discharge to Whitefish Lake is generally predicted to occur along the eastern shore of the lake, as this is interpreted to be the eastern edge of the underlying desilicified zone. The Laborador Tea Shrubby Bog habitat located on the eastern shore of Whitefish Lake may be in the zone of influence of groundwater discharge, yet chemically will remain below freshwater environmental quality criteria. Groundwater impacts to other surrounding wetlands will be negligible as groundwater is not predicted to discharge within any area beyond the central portion of Whitefish Lake.

4.10 Indirect Effects

Indirect disturbance associated with the potential to adversely affect BS19/24 includes the introduction and/or proliferation of invasive plants, edge effects, changes to water quantity and quality, and dust deposition during all Project phases (as described in Section 9.2.4.2.1). Wetland ecosites BS19/24 (graminoid bog/fen) and BS25 (open fen) are peatland ecosystems typically characterized by high water tables (i.e., a very moist or very wet moisture regime), while ecosite BS27 (sedge rocky shore) is a sparsely vegetated ecosystem predominated by rocky substrates, typically occurring adjacent to lakes and ponds (McLaughlan et al. 2010). Because these ecosystems rely on high water tables and existing waterbodies, alteration of water quantity would be expected to have the highest potential to cause an adverse effect. Therefore, maintenance of wetland hydrology is expected to be the most effective mitigation to sustain these wetland ecosites within the Terrestrial LSA throughout the Project lifespan.

5.0 Mitigation Measures

Mitigation measures specific to the wetlands, discussed in the following subsection are applicable during all Operation phases and expected to be effective immediately following implementation and managed through the EMP.

Disturbance Reduction

- Wherever possible, wetlands will be avoided through Project design and instituting proper buffers.

- Disturbance to vegetation and soils will be avoided by clearly delineating Project Area boundaries (e.g., with the use of fencing, staking, or flagging), adhering to construction plans and schedules, and by restricting off-site machine use.
- Wetland boundaries in the proximity of planned disturbances will be clearly delineated (e.g., with the use of fencing, staking, or flagging) to facilitate avoidance to the extent practicable.
- Should they occur, areas prone to potential instability and areas in proximity to water bodies and drainage features will be identified and appropriate setbacks will be established and maintained.
- Temporary workspaces or laydown areas will be sited and constructed within existing disturbance or on previously compacted soils, where practicable. In areas requiring clearing only, grubbing will be avoided, and roots and groundcover will be retained to the extent feasible.
- Pre-construction listed plant surveys will be completed within the Project Area.
- Listed plants located adjacent to planned disturbances will be clearly delineated (e.g., with the use of fencing, staking, or flagging) to facilitate avoidance to the extent practicable and reduce the potential for accidental encroachment outside of the Project footprint.
- Should Listed Plants be identified within the Vegetation LSA prior to Construction, site- and species-specific mitigation measures to avoid and/or limit Project effects will be determined by a Qualified Vegetation Ecologist. Specific mitigation measures will depend on the species, its life history characteristics, time of year, and the location of the occurrence in relation to Project activities.
- Herbicide use will be avoided within 100 m of any known listed plant occurrences. Where herbicide use is unavoidable, use will be restricted to direct application instead of broadcast spraying and completed by qualified personnel.

Soil Handling and Reclamation

- Construction activities will be sequenced (i.e., site clearing, grading preparations, major earthworks and construction of infrastructure/facilities) so that surface vegetation, mineral soil and organic matter can be salvaged for later use in Project Decommissioning.
- Soil resources within the Project Area will be stripped/salvaged and stockpiled within the Project Area in accordance with relevant soil management BMPs, i.e., providing guidance on ground-truthing soil conditions, flagging potential hazards and sensitivities, and

modifying practices in relation to environmental conditions and avoiding or minimizing inadvertent/incidental disturbance.

- A soil monitoring program/protocol (or equivalent) will be undertaken to verify soil salvage volumes and reclamation suitability (Section 9.1.8.2).
- Soil stockpiling locations will be sited to reduce soil handling and travel distances and designed to minimize the potential for soil degradation and downgradient effects, e.g., having defined height and width that optimize soil storage and stockpile stability, and having integrated erosion control measures and surface water management features (if/where necessary). Sediment and erosion control measures will be implemented in accordance with BMPs and commensurate to site conditions and sensitivities.
- Sediment and erosion control measures and surface water management features will be installed and maintained at the Project. Erosion controls (e.g., sediment fencing, check-damns and/or sediment ponds) will be installed as necessary and at the discretion of construction personnel commensurate to site conditions and sensitivities to manage/mitigate erosion and sedimentation.
- Progressive reclamation and ecosystem-based revegetation will be conducted on disturbed areas as soon as practicable with the use of suitable native species and in accordance with the Reclamation and Closure Plan.

Surface Water Management

- Snow melt and runoff will be controlled within the Project Area to prevent the potential release of contaminated runoff from affecting vegetation in adjacent areas.
- Sediment and erosion control measures will be implemented in accordance with the EMS.
- Surface water management features (e.g., culverts and ditches) will constructed and maintained (as per Project design specification) along access roads and facility sites to facilitate surface drainage continuity and hydrologic connectivity—especially in proximity to wetlands, water crossings, and waterbodies.
- Hydrologic connectivity is expected to be maintained across the Project Area with the engineering, construction, and maintenance of surface water management features (e.g., culverts and ditches) as appropriate and as per Project design specifications along access roads and at facility sites.

Invasive Plant Management

- Equipment and vehicles will arrive at the Project Area clean, and will be inspected for soil, plant material, and seeds, and cleaned as appropriate, to limit the potential for the introduction of invasive plants and noxious weeds.
- Areas with a high risk for the potential spread of invasive plants and noxious weeds (i.e., within or adjacent to existing infestations) will be avoided to the extent practicable; if work must occur in these areas, invasive plant management will be implemented before starting work.
- Gravel, fill, straw matting, or similar materials to be used for erosion control will be inspected to minimize the potential for seeds or propagules of invasive plants being brought to site.
- All employees and contractors on the Project will receive an employee orientation appropriate to the work they are undertaking, including instruction on the definition of invasive plants and their potential effects, mitigation measures to avoid the introduction and spread of invasive plants, and training on the presence and identification of common invasive plant species and those known to occur within the Project Area.
- Invasive plant monitoring will be conducted periodically by personnel skilled in invasive plant identification during all Project phases to assess, evaluate, and document invasive plant occurrences within the Project Area. Invasive plant surveys will be completed during a biologically appropriate time of year (e.g., when invasive plants can be identified) within areas identified as most susceptible to invasive plant introduction and spread, including roads, ROW, debris and vegetation management areas (e.g., slash piles, timber decks, exposed soil or stockpiles) and other regularly disturbed habitats.
- Three general treatment options may be used alone or in combination to control of invasive plants in the Project Area:
    - mechanical control – involves the physical removal of the plants;
    - chemical control – involves application of synthetic and/or natural herbicides; and,
    - biological control measures – involves use of living organisms (e.g., rusts, insects) to control selected invasive plant species.
- The type of treatment option selected for an invasive plant occurrence will be based on a combination of specific information including the identity of the invasive plant species and its provincial designation, the size and extent of the occurrence, time of year, the proximity of the occurrence to other susceptible areas (e.g., rare plant occurrences, wetlands, waterbodies), and the available control options. Where possible, control of

invasive plants will be completed in consultation with a qualified professional to minimize potential effects on native vegetation, ecosystems and wetlands.

- Seed used during re-vegetation will be certified weed free, with a valid "Certificate of Seed Analysis".

6.0 Residual Effects Evaluation

6.1 Residual Effects Characterization

Residual effects on the Vegetation and Ecosystems, Listed Plant Species, and Wetlands VCs have been assessed in relation to the RSA, and characterized in terms of direction, magnitude, geographic extent, frequency, duration, reversibility, context, and likelihood (Table 6). Residual effect evaluation of residual effects are provided in Tables 7, 8 and 9.

Table 6: Definitions of Effect Characteristics Considered When Determining the Significance of Residual Effects

Residual Effect Characteristic	Definition	Rating
Direction	Identifies whether the residual effect will be adverse or positive.	**Adverse** – Negative effect or effect is not desirable. *Water Quantity* – Effect moves MPs (flow or water level) in a direction detrimental to water quantity relative to baseline conditions. A Project-related increase in surface water flows and levels during flooding, or a decrease in surface water flow below environmental flow requirements. *Water Quality* – An increase in constituent concentrations attributable to the Project in comparison to baseline conditions and trends. *Wetlands / Fish Habitat* – A physical loss of available fish habitat (extent of area) in comparison to baseline conditions. **Positive** – Beneficial effect or effect is desirable.
Magnitude	The amount of change in a measurable parameter relative to baseline conditions.	**Low** ▪ measurable decrease in the spatial extent of Wetlands, but less than a 10% loss; all original wetland classes are present. ▪ A measurable change that is not within the variability of baseline conditions but below relevant water quality objectives and criteria. A Project-related change in hydrology (flows or levels) compared to baseline conditions, but where the change is <5% from baseline conditions

Residual Effect Characteristic	Definition	Rating
		Moderate ▪ measurable decrease in the spatial extent of Wetlands between 10% and 30% loss; measurable changes in the diversity of wetland classes; some original wetland classes may be absent. ▪ A measurable change in water quality that is not within the variability of baseline conditions and not within applicable guidelines, legislated requirements, and/or federal and provincial management objectives. A Project-related change in hydrology (flows or levels) compared to baseline conditions, but where the change is >5% from baseline conditions, and could, therefore, have an adverse effect on Fish and Fish Habitat within the LSA. **High** ▪ measurable decrease in the spatial extent of Wetlands greater than 30% loss; some original wetland classes are absent. ▪ monthly flows (>10%), or lake surface elevation (m) in a waterbody or watercourse that is greater than the range of natural variability and large enough that fish can no longer rely on this habitat to carry out one or more of their life processes. A measurable change in water quality that is not within the variability of baseline conditions and not within applicable guidelines, legislated requirements, and/or federal and provincial management objectives and is likely to have an adverse effect on Wetlands (Fish and Fish Habitat) within the LSA, with the effect extending beyond the LSA.
Geographic Extent	The geographic area within which the residual effect is expected to occur.	**Project Area** – Effect is limited to the Project Area. **Local** – Effect is limited to the Vegetation LSA. **Regional** – Effect extends beyond the Vegetation LSA into the Terrestrial RSA. **Beyond Regional** – Effect extends beyond the Terrestrial RSA.
Duration	Length of time over which the residual effect is expected to persist.	**Short-term** – Less than 3 years (i.e., effect happens during Construction only). **Medium-term** – 3 years to 38 years (i.e., effect happens from Construction through to the end of Post-Decommissioning). **Long-term** – More than 38 years (i.e., effect extends beyond Post-Decommissioning).
Frequency	How often the residual effect is expected to occur.	**Infrequent** – Effect occurs several times at sporadic intervals. **Frequent** – Effect occurs many times on a regular basis. **Continuous** – Effect occurs continuously.

Residual Effect Characteristic	Definition	Rating
Reversibility	Whether or not the residual effect can be reversed once the activity causing the residual effect ceases.	**Fully Reversible** – A residual effect that diminishes to baseline conditions. **Partially Reversible** – A residual effect that partially diminishes to baseline conditions. **Irreversible** – A residual effect that will not diminish to baseline conditions.
Context	The extent to which the VC or KI has been affected by past and present environmental and socio-economic processes and conditions, its potential sensitivity to the Project-related residual effect, and its ability to recover from that effect (i.e., resilience)	**Low** – VC/KI has high resilience to stress or ecological change. This resilience can be a result of the ecological characteristics of the species or ecosystem, and/or a lack of historic and ongoing anthropogenic or natural disturbance. No listed species present. **Moderate** – VC/KI has moderate resilience to stress or ecological change. This resilience can be a result of the ecological characteristics of the species or ecosystem, and/or an intermediate level of historic or ongoing anthropogenic or natural disturbance with the capacity to assimilate more change. Presence of listed species **High** – VC/KI has weak resilience to stress or ecological change. This resilience can be a result of the ecological characteristics of the species or ecosystem, and/or a high level of historic or ongoing anthropogenic or natural disturbance. Presence of *SARA*-listed species
Likelihood	Likelihood that the residual effect will occur including consideration of the likelihood that the mitigation will be successful.	**Likely** – A moderate to high probability that the residual effect will occur. **Unlikely** – A low probability that the residual effect will occur.

Table 7: Wetland Fish and Fish Habitat – Summary of the Residual Effect Characteristics for Surface Water Quality

Residual Effect Characteristic	Rating	Summary Rationale for Rating
Direction	Adverse	The Project (specifically the discharge of effluent to the natural environment) will cause a change in the concentration of constituents, as measured as a mass of a chemical per unit volume in water (e.g., mg/L). Surface water quality in the local receiving environment will be adversely affected by effluent discharge to the aquatic environment, thereby providing a pathway to adversely affect surface waters. However, no discharge is planned to wetlands outside of Whitefish Lake.
Magnitude	Low	The magnitude of the residual effect is predicted to be low as constituents that may be introduced as part of Project activities are expected to remain below criteria for the protection of aquatic life and human health.
Geographic Extent	Local	The geographic extent of the residual effect is predicted to be confined to the immediate waterbody adjacent to the Project (i.e., Whitefish Lake). The estimated mixing zone is less than 5 m, implementing an effluent discharge configuration that promotes mixing.
Duration	Long-term	The residual effect is expected to last between 3 to 38 years (i.e., effect expected during Construction through to the end of Post-Decommissioning).
Frequency	Continuous	For the purposes of this EIS, a conservative scenario was identified, with effluent discharge being considered as continuous during Operation and Decommissioning.
Reversibility	Fully reversible	Surface water quality is expected to return to pre-development levels following Post-Decommissioning as Project-related sources will cease to operate.
Context	Low	Wetland health is expected to be resilient to changes in surface water quality in the context of this assessment, as COPC meet protective criteria even at the extreme low water scenario. Therefore, under applicable mitigative measures and average flow conditions, the contextual resilience of the aquatic system to respond to change is considered to be great.
Likelihood	Likely	A high probability exists that a change in water quality from background conditions will occur, but be restricted to Whitefish Lake and not other surrounding wetland features.

Table 8: Wetland Fish and Fish Habitat – Summary of the Residual Effect Characteristics for Change in Area Extent

Residual Effect Characteristic	Rating	Summary Rationale for Rating
Direction	Adverse	Impacts to wetlands in the LSA from physical disturbance or overprinting are expected to be minor in nature and relegated to wetlands located at stream crossings for access roads and the hydro-line corridor. In both cases the approach to design will be one of avoidance and minimal disturbance with clear span bridges and minimal clearing required for hydro-line installation where avoidance of open water areas can be met.
Magnitude	Low	The magnitude of the residual effect is predicted to be low. Less than 0.1% of Wetlands within the Terrestrial RSA are predicted to be directly affected as a result of Project Construction, and up to 1.5% may be indirectly affected during all Project phases.
Geographic Extent	Local	The residual effect is expected to be limited to the LSA, specifically to wetlands located at stream crossings for access roads and the hydro-line corridor
Duration	Long-term	Once natural drainage patterns are re-established following Operation, the structure and function of Wetlands altered as a result of indirect Project effects are expected to re-establish after Post-Decommissioning (more than 38 years).
Frequency	Frequent	While direct affects to specific Wetlands will occur over a short time period during Construction, Wetland alteration by indirect effects is anticipated to occur frequently throughout Construction, Operation, and Decommissioning, and infrequently during Post-Decommissioning.
Reversibility	Partially Reversible	Wetland effects are predicted to be partially reversible during Decommissioning once natural hydrologic conditions are reinstated. Alterations to wetland extent, structure and/or function as a result of indirect Project effects during all Project phases are predicted to be reversible over time once natural hydrologic conditions are reinstated and edge effects, dust, water quality changes, and invasive plant propagule pressure are reduced at the end of Decommissioning.
Context	Moderate	Wetlands can exhibit low resilience and high susceptibility to disturbance; however, disturbance is common within the Terrestrial RSA, and existing Wetlands have been historically disturbed by access roads and exploration activities.
Likelihood	Likely	The infrastructure associated with the bridges and the hydro-line are likely to affect the localized area for which they span in a limited way.

Table 9: Wetland Fish and Fish Habitat – Summary of the Residual Effect Characteristics for Change in Surface Water Quantity (Hydrology)

Residual Effect Characteristic	Rating	Summary Rationale for Rating
Direction	Adverse	Water quantity (flow and level) will be reduced in LA-5 as a result of the overprinting of its reporting drainage area by mine infrastructure and through site water balance. Water taking has an additional potential to reduce water levels in LA-5 and associated wetlands.
Magnitude	Low	The magnitude of the residual effect is predicted to be low. Under all scenarios, the Project-related change in hydrology (flows or levels) compared to baseline conditions is less than 5% of baseline conditions, and generally less than 3%.
Geographic Extent	Local	The residual effect is expected to be limited to the LSA, specifically the lakes and wetlands within proximity to the Project site (i.e., LA-5, LA-6, and LA-1).
Duration	Moderate	The residual effect is expected to last between 3 to 38 years (i.e., effect expected during Construction through to the end of Post-Decommissioning).
Frequency	Continuously	Although the mine is unlikely to require water taking on a continuous basis, this has been assessed as a bounding scenario and, as such, must be considered as a continuous effect.
Reversibility	Fully reversible	Surface water hydrology is expected to return to pre-development levels following Post-Decommissioning.
Context	Moderate	Surface water flow regimes are variable, and it is this variability that provides for morphological form to be maintained and for ecological reliance (i.e., wetlands, fish habitat). Some change to environmental flows is tolerated by wetland biota.
Likelihood	Low	Due to the localized nature and low magnitude of the effect on surface water hydrology, the likelihood of an effect is considered to be very low; therefore, the likelihood of an effect on Wetlands is expected to be low.

6.2 Significance and Confidence

The residual effect of change in the areal extent of the Wetlands VC as a result of the Project is not expected to result in a change to the wetlands KI that will alter its integrity within the Terrestrial RSA to the point where it is not sustainable or unavailable to contribute to ecological functions**.**

The threshold for significance for the Wetlands VC relates to predicted changes in the concentrations of water quality parameters, where changes could result in exceedances of

relevant water quality benchmarks that are protective of aquatic biota in waterbodies that receive mine-affected drainage. The threshold for significance for Wetlands also includes predicted changes in surface water flows greater than baseline environmental flows and direct habitat loss.

The significance of the residual effects on the Wetlands VC has been deemed **not significant**. Following mitigation, the residual effects are not expected to cause a change in Wetland habitat (or associated KIs) to the extent that they might alter the ecological integrity of the VC in the LSA beyond an acceptable level.

The predicted confidence with respect to the Wetlands VC is high as the mobilization of suspended materials can be readily mitigated, making the effects prediction relative to this effect pathway easily understood.

Confidence in the assessment of predicted effects on water levels or flow is quite high due to available hydrological data for the LSA. Uncertainty is minimal with the assumptions that the water withdrawal and discharge scenarios presented herein represent the bounding case, and hydrogeological modelling projections are not changed (Section 8.1 of the EIS).

Potential effects on water quality as a result of Project discharges to local receiving environments were assessed by way of numerical modeling. The in-lake wetlands will be subject to the same processes by which constituents are expected to accumulate in all lake sediments. That is sediments are in dynamic equilibrium with the water with the relationship between the two defined by the Kd (partition coefficient). The Kds used in the EIS are not habitat specific; they are derived from years of water and sediment data collected in the Athabasca Basin. The Kds would include a variety of habitats (e.g., nearshore vegetated littoral zones, depositional habitats) from which water and sediment quality data have been collected. These predictions are generally considered conservative in nature because the assumptions on which they are based are conservative. For example:

- The assessment is based on a continuous (year-round) discharge at an expected average effluent rate of 0.0101 m^3/s (36.5 m^3/hr) throughout Construction, Operation, and Decommissioning, despite the likelihood that effluent discharge will not be continuous and will only discharge when site water balance requires, based on water storage capabilities.
- The constituents in effluent discharge have been estimated conservatively. Presented discharge concentrations provided herein include contingency factors of one to three times.

- Baseline water quality is defined by the 95th percentile concentrations of individual constituents. Such an assumption is conservative as it constrains the assimilative capacity associated with the receiving environment. By definition, the assimilative capacity of a receiving environment is equal to the incremental difference between the existing baseline condition and the assessment benchmark (i.e., water quality criterion) on which the evaluation is based. Use of the 95th percentile concentration, rather than a measure of central tendency (i.e., 50th percentile, geomean), means that the incremental change in a given constituent concentration that can be assimilated by the receiving environment (whereby use of the receiving environment is protected) is relatively small in magnitude.

Due to the conservative nature of the assumptions on which the numerical assumptions are based, a high degree of confidence can be assumed.

6.3 Summary of Project Related Residual Adverse Effects

The results of the characterizations for these residual effects are summarized in Table 10. The residual effects of the Project on the Wetland KIs were predicted to be **not significant**. Thus, the residual effects of the Project on the Wetlands VC are predicted to be **not significant**.

Table 10: Summary of Project-related Residual Effects

Valued Component	Residual Effect	Project Phase	Direction	Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context	Likelihood	Significance
Wetlands	Change in Water Quality	C, O, D	A	L	L	LT	C	FR	L	L	NS
	Change in Water Level or Flow	C, O, D	A	L	L	MT	C	FR	L	L	NS
	Change in the Areal Extent of Wetlands	C, O, D	A	L	L	LT	F	PR	M	L	NS

[1] Direction: Adverse (A), Positive (P)
Magnitude: Low (L), Moderate (M), High (H)
Geographic Extent: Local (L), Regional (R), Beyond Regional (BR)
Duration: Short-term (ST), Medium-term (MT), Long-term (LT)
Frequency: Infrequent (IF), Frequent (F), Continuous (C)
Reversibility: Fully Reversible (FR), Partially Reversible (PR), Irreversible (IR)
Context: Low (L), Moderate (M), High (H)
Likelihood: Unlikely (U), Likely (L)
Significance: Not-Significant (NS), Significant (S)
Level of Confidence: High (H), Moderate (M), Low (L)

7.0 Cumulative Effects

The cumulative effects are discussed in detail in Section 9.2.7 of the EIS and are not re-examined herein.

8.0 Summary

Bogs are predicted to be the wetland class most affected by the Project, with 0.4 ha (less than 0.1%) of mapped bog ecosystems within the Terrestrial RSA expected to be disturbed within the Project Area during Construction. Fens are the next most affected, with 0.1 ha (0.1%) anticipated to be disturbed during Construction. Less than 0.1 ha (less than 0.1%) of shallow open water wetlands within the Terrestrial RSA are also anticipated to be affected by the Project.

Within these wetland classes, the wetland ecosite expected to be most affected is the willow shrubby rich fen (ecosite BS23) with direct disturbance to 0.1 ha predicted to occur within the

Project Area (0.5% of the BS23 ecosite within the Terrestrial RSA). The remaining ecosites anticipated to be directly affected by the Project are locally abundant, with direct disturbance expected to affect <0.1% of these ecosites within the Terrestrial RSA.

Investigation of the potential overprinting of wetland features as a result of the Project it is evident that wetland loss is avoidable. The interaction of the Project with wetlands is relegated to those areas where stream crossings for access roads and hydro-line connections are proposed.

Avoidance through design as well as mitigation measures to control sedimentation to wetland features during construction, operation and decommissioning phases. Water quantity and quality are not expected to cause impacts to wetlands as the change in surface water feature levels and flow are nearly negligible and water will not be discharged to wetlands save for Whitefish Lake, for which effluent will not be released unless meeting criteria for the protection of aquatic life.

Residual effects on the Wetlands VC resulting from the Project were identified and assessed as **not significant**. Existing provincial legislation (Environmental Management and Protection Act [Government of Saskatchewan 2010] and the Water Security Agency Act [Government of Saskatchewan 2019b]) requires written approval (i.e., Aquatic Habitat Protection Permits) prior to any works within a wetland.

To further supplement existing information that exists for the LSA wetlands, Denison is committed to undertaking wetland surveys including the collection of water quality, sediment quality, benthic invertebrates and fish and fish habitat surveys prior to the construction of the operation to provide an updated baseline for assessing the success of mitigation measures and to assess potential effects of the project on wetlands. These locations will then be further considered as part of the EMP for continued monitoring for these media and biota.

9.0 References

Bannerman, S. 1998. *Biodiversity and Interior Habitats: The Need to Minimize Edge Effects*. Part 6 of 7. Extension Note 21. Biodiversity: Management Concepts in Landscape Ecology. British Columbia Ministry of Forests Research Program. 8 pp.

Chen, J. 1991. *Edge effects: microclimatic pattern and biological responses in old-growth Douglas-fir forests*. PhD. University of Washington, Seattle, WA.

Ecometrix Incorporated. 2020. *Wheeler River Project: Baseline Aquatic Environment Study*. Prepared for Denison Mines Corporation. Mississauga, Ontario. 948 pp.

EDI Environmental Dynamics Inc. (EDI) 2021. *Wheeler River Project Annex Report - Soil, Vegetation and Wildlife*. Prepared for Denison Mining Corp., Saskatoon, SK.

Enserink, M. 1999. Biological invaders sweep in. *Science* 285(5,435): 1,834–1,836.

Government of Saskatchewan. 2010. *Environmental Management and Protection Act*, 2010, E-10.22. https://publications.saskatchewan.ca/#/products/31893 (accessed August 2021).

Government of Saskatchewan. 2019b. *The Water Security Agency Act*. Chapter W-8.1, formerly Chapter S-35.03 of the *Statutes of Saskatchewan, 2005* (effective May 27, 2005).

Kremsater, L., and F.L. Bunnell. 1999. Edge effects: Theory, evidence and implications to management of western North American forests. pp. 117–153. *Forest fragmentation: wildlife and management implications*. Brill, Leiden, Netherlands.

MacKenzie, W., and J. Shaw. 2000. Wetland classification and habitats at risk in British Columbia., *Proceedings of a Conference on the Biology and Management of Species and Habitats at Risk, 15–19 Feb. 1999*. Volume Two., 520 pp. BC Ministry of Environment, Lands and Parks, Victoria BC and University College of the Caribou, Kamloops, British Columbia.

McLaughlan, M. S., R. A. Wright, and R. D. Jiricka. 2010. *Field Guide to the Ecosites of Saskatchewan's Provincial Forests*. Saskatchewan Ministry of Environment, Forest Service, Prince Albert, SK. 343 pp.

Omnia Ecological Services (Omnia). 2020. *Terrestrial Environment Wildlife and Vegetation Baseline Inventory*. Prepared for Denison Mines. January 2020 Update. Calgary, AB. 265 pp.

DATE: 3 October 2024

TO: Denison Mines – Janna Switzer

REF: Wheeler River Project EIS – Appendix 8-F: Wetland Effects Assessment Report

Appendix A Orientation for CNSC Round 4 IR reviewers: Whitefish Lake (middle basin) inflow to McGowan Lake inflow

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DATE: 3 October 2024

TO: Denison Mines – Janna Switzer

REF: Wheeler River Project EIS – Appendix 8-F: Wetland Effects Assessment Report

During a June 14, 2024 meeting to discuss Round 3 IR-101, the F~~f~~ederal-Indigenous R~~r~~eview tTeam indicated the wetlands of interest are those located within the nearshore environments of Whitefish Lake (Upper, Mid and Lower) as these lakes will directly receive treated effluent during operation.

The purpose of this appendix is to facilitate the CNSC's review of Denison's Round 4 response to IR-101 by summarizing information on the in-lake wetlands of interest.

While some of these in-lake areas were conservatively classified as wetlands in the terrestrial assessment (EIS Section 9), from an aquatic perspective, these in-lake wetlands of interest are littoral / nearshore zones in the lake and connecting channels. These in-lake wetland areas of interest are not cut-off from or isolated from the main basin of the lake. As such, it can be assumed that the lake environment is likely to be as depositional as the nearshore environment. The lakes of interests are very shallow (on average 1.5 m in depth) and therefore deposition may be as likely in the "offshore" environment as the nearshore.

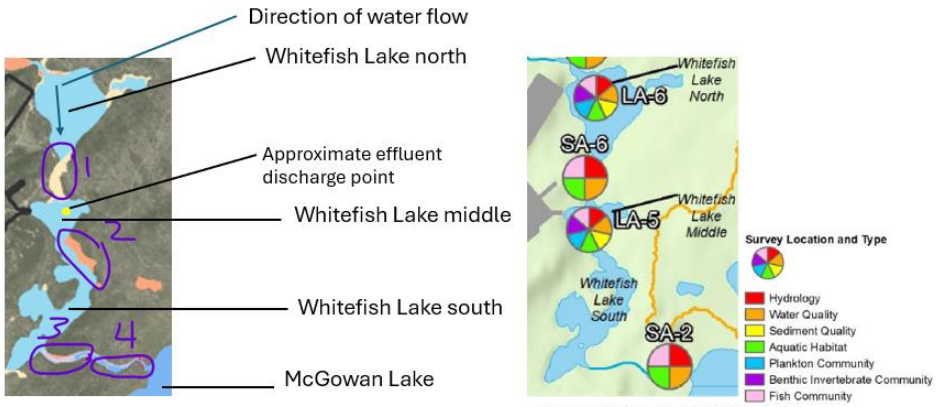
This appendix provides a summary of four general areas (see marked up wetland map image below with areas circled and numbered in purple) from the inflow to Whitefish Lake (middle basin) to the inflow to McGowan Lake. An excerpt from Section 8~~'s~~ Figure 8.2-4 is also provided to orient the reviewer to the water quality, biota, and sediment sampling locations within these areas (refer to EIS Section 8 for details). The four areas shown in the wetland image are reviewed in the balance of this appendix with photographs and text / descriptive excerpts from the EIS to provide a general site orientation to the reviewers.

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DATE: 3 October 2024

TO: Denison Mines – Janna Switzer

REF: Wheeler River Project EIS – Appendix 8-F: Wetland Effects Assessment Report



(Excerpt from EIS Figure 8.2-4)



Legend

Wetland Ecosites

Swamps

- BS16-Black spruce/balsam poplar/river alder swamp

Bogs

- BS17-Black spruce treed bog
- BS18-Labrador tea shrubby bog
- BS19-Graminoid bog
- BS19/24-Graminoid bog/Graminoid fen
- BS20-Open bog

Fens

- BS21-Tamarack treed fen
- BS22-Leatherleaf shrubby poor fen
- BS23-Willlow shrubby rich fen
- BS24-Graminoid fen
- BS25-Open fen

Shallow Open Water

- BS26-Rush sandy shore
- BS27-Sedge rocky shore

- Lake
- Waterbody

- Project Area
- Vegetation Local Study Area
- Terrestrial Regional Study Area

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Notes from Appendix 8-B, Appendix F (2019): SA-6 (Outflow from LA-6) SA-6 is the outflow from LA-6 and is equipped with a stage recording datalogger. The sensor and sensor housing at this location were replaced in August. Stage and discharge data for SA-6 are presented in Table 6 and the rating curve is shown as Figure 6. The cross-section is shown in Photo 11 for the July field program and Photo 12 is from the August field program.	Photo 11: SA-6 - July Field Program 	Photo 12: SA-6 - August Field Program 

Notes from Appendix 8-D (2016)

4.6 SA-6
Station SA-6 is situated on the connecting channel between the north and south basins of Whitefish Lake, LA-6 (upstream) and LA-5 (downstream), respectively (see Figure 1-8). At this location the watercourse is 3rd order.

4.6.3 Aquatic Habitat
The surveyed reach (390 m) included the entire length of stream between the two lake basins. Mean wetted channel width, water depth and water velocity were 14 m, 0.7 m and 0.2 m/s, respectively. The banks were stable and the channel was meandering (see Appendix C, Photo 11). The stream gradient was low and stream morphology was primarily runs (75%) and pools (20%), with some flats (5%). The canopy was partly open.Instream cover was diverse, afforded by deep pools, aquatic macrophytes, boulders, logs and trees, and undercut banks. Substrates were comprised of 85% sand, 10% boulder and 2% silt. Observed aquatic vegetation included sedges, pondweed and horsetail (see Appendix C, Photo 12). Moderate algae growth and slight sediment were observed overlying the substrate and no barriers to fish migration were observed. The surrounding terrain was 50% upland and 50% lowland forest and observed riparian vegetation included jack pine, black spruce, sweet gale, and Labrador tea. Snails (Gastropoda), mayfly nymphs (Hexagenia sp.) and dragonfly nymphs were observed. Stream habitat characteristics are detailed in Appendix A, Table A-15.

4.6.4 Fish Community
A summary of the fish community is presented in Table 4-4. Detailed fish catch data including fishing effort and numbers of each species collected are presented in Appendix A, Tables A-13, A-16. Within a 150-m stretch of the reach, 1,531 seconds of electrofishing effort was expended during the fall 2016 survey, resulting in the capture of 24 fish from species. Twelve YOY and 3 adult Spottail Shiner, 4 YOY and 2 juvenile Burbot, 2 adult Ninespine Stickleback and 1 YOY Longnose Sucker were captured. The CPUE was 0.94 fish/minute of electrofishing. Three adult White Sucker, 1 adult Walleye, and 3 juvenile and 3 adult Northern Pike were captured by gillnet during the spring 2017 survey. In addition, 6 adult Northern Pike and 2 adult White Sucker were observed. The list of fish species identified during baseline surveys was reviewed by Bobby John, and is considered inclusive and comprehensive (Denison, 2020).



Photo 11: Stream station SA-6 looking downstream (12 September 2016). This drainage area A station is situated on the connecting channel between lakes LA-6 (upstream) and LA-5 (downstream).



Photo 12: Stream station SA-6 looking downstream (12 September 2016). Suitable spawning habitat for Northern Pike occurred near the inlet to lake LA-5, and adult pike were observed in the vicinity during the May 2017 spawning survey.



SA-6 facing upstream, March 2018.

Notes from Appendix 8-B, Appendix D (2011):

SA-6
Streamflow monitoring Station SA-6 drains from LA-6 and is upstream of SA-2. The stream section at this monitoring site is characterized by a sandy substrate, slow, deep, and laminar flow, and vertical banks. Although the right bank is well defined, high, and vegetated with trees, sand, and moss, the left bank is low lying with muskeg, shrubs and black spruce. The cross-section has a width of approximately 14 m. SA-6 produces a very
good stage-discharge relationship and hydrograph.



Photo 6: SA-6 looking upstream. Photo taken May 13, 2011.

DATE: 3 October 2024

TO: Denison Mines – Janna Switzer

REF: Wheeler River Project EIS – Appendix 8-F: Wetland Effects Assessment Report

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Legend

Wetland Ecosites

Swamps
- BS16-Black spruce/balsam poplar/river alder swamp

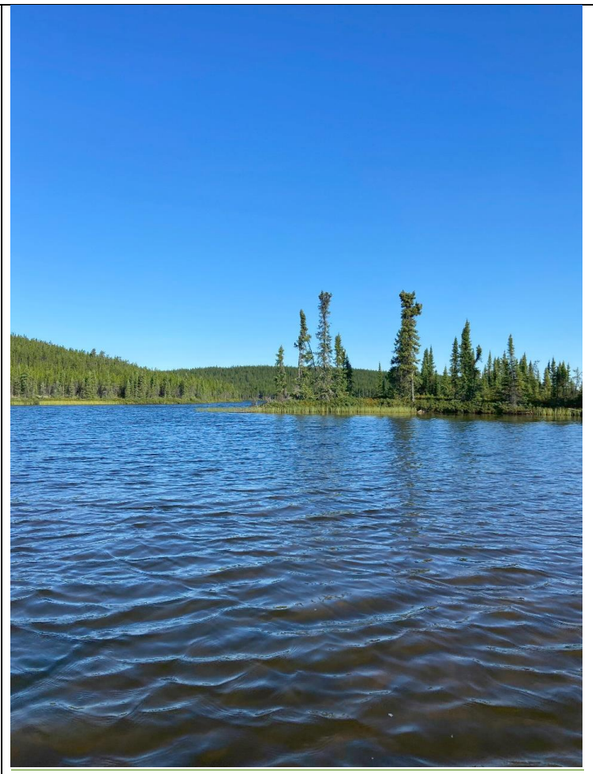
Bogs
- BS17-Black spruce treed bog
- BS18-Labrador tea shrubby bog
- BS19-Graminoid bog
- BS19/24-Graminoid bog/Graminoid fen
- BS20-Open bog

Fens
- BS21-Tamarack treed fen
- BS22-Leatherleaf shrubby poor fen
- BS23-Willlow shrubby rich fen
- BS24-Graminoid fen
- BS25-Open fen

Shallow Open Water
- BS26-Rush sandy shore
- BS27-Sedge rocky shore

- Lake
- Waterbody

- Project Area
- Vegetation Local Study Area
- Terrestrial Regional Study Area

Area of interest in Whitefish Lake, August 16, 2024		
Appendix 8-D: LA-5: 3.5.4 Aquatic Habitat An aquatic habitat assessment was undertaken by Golder in August 2012 (Appendix F). Shoreline vegetation at LA-5 consisted mainly of shrubs and black spruce with upland jack pine forest. The typical substrate observed for LA-5 was sand and organic matter. Shoreline slopes ranged from shallow to steep. Cover types for aquatic biota included emergent and submergent vegetation, interstitial spaces in coarse substrate, overhanging vegetation and woody debris. Observations made during the 2016-19 baseline studies were similar, confirming the earlier survey data.		

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Photo A: Shrubs and black spruce on shore with cobble/boulder as substrate



Photo B: Shoreline Emergent Vegetation

REFERENCE

DIGITIZED FROM FIELD SKETCH
NTS MAPSHEET 74H/06, 74H/11
NAD83 UTM ZONE 14

150 0 150
SCALE 1:7,500 METRES

PROJECT
DENISON MINES CORPORATION
WHEELER RIVER PROJECT

TITLE
HABITAT MAP
LAKE LA5

Golder Associates Saskatoon, Saskatchewan

PROJECT		12-1362-0050	FILE No.
DESIGN			SCALE AS SHOWN REV. 0
CADD	BDS	16/01/13	
CHECK	BDH	27/05/13	**FIGURE: D2**
REVIEW	BLC	27/05/13	

DATE: 3 October 2024

TO: Denison Mines – Janna Switzer

REF: Wheeler River Project EIS – Appendix 8-F: Wetland Effects Assessment Report

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Legend - Lakes, Wetlands, Ponds

Substrate Types	
Cl	Clay
Sl	Silt
Sa	Sand
Gr	Gravel
Co	Cobble
Bo	Boulder
Bd	Bedrock
Or	Organic

Habitat Features		
XXXX	BD	Beaver Dam
	MD	Man-Made Dam
	BL	Beaver Lodge
	BG	Boulder Garden
		Bridge
		Culvert
	DP	Debris Pile
	EM	Emergent Vegetation
		Flow Direction
	ISC	Instream Cover
	IV	Instream Vegetation
	INV	Inundated Vegetation
	LWD	Large Woody Debris
	LE	Ledge
	LJ	Log Jam
	LS	Landslide
	ML	Multiple Island
	OHV	Overhanging Vegetation
	OHC	Overhead Cover
	RW	Root Wad
		Sand Bar
	SIL	Singular Island
	SWD	Small Woody Debris
	SM	Submergent Vegetation
	UCB	Undercut Bank
	USB	Unstable Bank

Sample Type Symbols		
		Water
		Sediment
		Benthic
		Fish

Bank/Upland Vegetation Types		
	BA	Bare Ground
	OT	Open Tundra
	MU	Muskeg/Bog
	DF	Deciduous Forest
	CF	Coniferous Forest
	MW	Mixedwood Forest
	GS	Grassland
	GF	Grass/Forbs
	GF/SH	Grass/Forbs/Shrubs
	SE	Sedge
	SH	Shrubs
	EM	Emergent Vegetation
	MO	Moss
	OR	Organic

Bank Slope	
	Shallow Slope (0-5%)
	Intermediate Slope (6-30%)
	Steep Slope (31-70%)
	Very Steep Slope (>70%)

Bank Instability Ratings	
A	Aggrading
E	Eroding
S	Slumping
G	Gullying

Capture Methods		
	BP	Electrofishing - Backpack
	EF	Electrofishing - Boat
	GN	Gill Net
	SN	Seine
	FF	Fish Fence
	MT	Minnow Trap
	AN	Angling
	HN/TN	Hoop Net/Trap Net

General	
80 C	Photo Location/Direction
	Habitat Type Divider
	Fish Bearing/Potential Bearing Watercourse
	Width
	Depth

Site Summary Symbol

Lake (L), Wetland (W) or Pond (P)
Surface Area (ha)
Main Shoreline Perimeter (m)
Max Depth (m)
Secchi Depth (m)
Dissolved Oxygen (mg/L)
Conductivity (µS/cm)
pH

Fish Species

Notes:
ha = hectares
m = metres
mg/L = milligrams per litre
µS/cm = microsiemens per centimetre
Max depth was the depth recorded at sampling locations.



Legend

Wetland Ecosites

Swamps

- BS16-Black spruce/balsam poplar/river alder swamp

Bogs

- BS17-Black spruce treed bog
- BS18-Labrador tea shrubby bog
- BS19-Graminoid bog
- BS19/24-Graminoid bog/Graminoid fen
- BS20-Open bog

Fens

- BS21-Tamarack treed fen
- BS22-Leatherleaf shrubby poor fen
- BS23-Willlow shrubby rich fen
- BS24-Graminoid fen
- BS25-Open fen

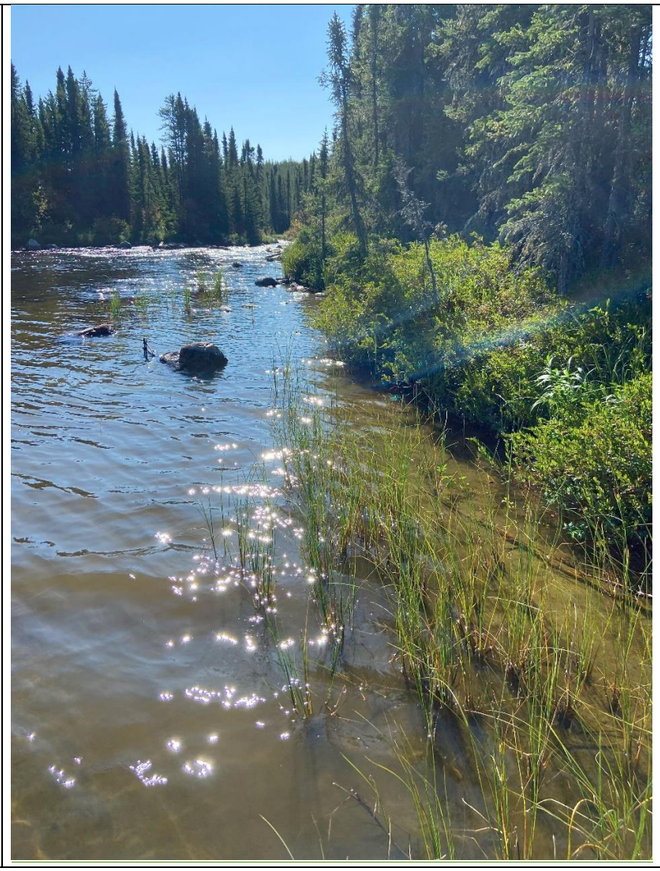
Shallow Open Water

- BS26-Rush sandy shore
- BS27-Sedge rocky shore

- Lake
- Waterbody

- Project Area
- Vegetation Local Study Area
- Terrestrial Regional Study Area

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Area of interest at outlet of Whitefish Lake, August 16 2024: This area has stable banks and the substrate primarily composed of sand and detritus. The surrounding terrestrial vegetation was Black Spruce, Blue Spruce, and Jack Pine. The aquatic vegetation was Bur-reed and Potamogeton.		

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Legend

Wetland Ecosites

Swamps

- BS16-Black spruce/balsam poplar/river alder swamp

Bogs

- BS17-Black spruce treed bog
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Shallow Open Water

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- Lake
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Notes from Appendix 8-B, Appendix F (2019): SA-2 (Northwest Flow into McGowan Lake) Station SA-2 is located to the northwest of McGowan Lake. A datalogger is not installed at this location. During the 2019 monitoring program it was learned that the cross-section had been moved in 2016 creating a discrepancy in water levels. The old cross-section was identified during the August field program and sufficient data are available to correct the July 2019 measurement (Table 2 and Figure 2). The original cross-section will be used for measurements in future field monitoring programs. Photo 3 is taken of the cross-section used during the July field program while Photo 4 is the original cross-section used in August.	*Photo 3: SA-2 - July Field Program* 	*Photo 4: SA-2 - August Field Program* 

Notes from Appendix 8-D (2016):

4.2 SA-2
Stream station SA-2 is situated within the Icelander River watershed, on the northwest tributary of McGowan Lake (LA-1), immediately upstream of the lake, approximately 800 m downstream of Whitefish Lake (LA-6) (see Figure 1-8). At this location the stream is 3rd order.

Aquatic Habitat
Mean wetted channel width, water depth and water velocity for the 285 m long surveyed reach were 9 m, 0.35 m and 1 m/s, respectively. The stream banks were stable and the channel was meandering with some braiding (see Appendix C, Photo 3). Within the surveyed reach, the stream gradient was mainly high to moderate. The stream morphology was mostly riffles (90%), with minor runs (5%) and pools (5%). The canopy was dense to partly open. Instream cover was primarily afforded by boulders and undercut banks, with minor contributions from logs and trees, deep pools and aquatic macrophytes. Substrates were comprised of 45% boulder, 40% cobble and 5% gravel, with trace amounts of sand and silt. Aquatic vegetation included sedges and horsetail (Equisetum sp.). Algal growth was moderate and no sediment were observed overlying the substrate. No barriers to fish migration were observed in the reach. The surrounding terrain was 90% upland and 10% lowland forest and observed riparian vegetation included jack pine, black spruce, alder (Alnus sp.), sweet gale, Labrador tea (Ledum groenlandicum) and willow. Stonefly nymphs and caddisfly larvae (Trichoptera) were observed. Stream habitat characteristics are detailed in Appendix A, Table A-15.

4.2.4 Fish Community
A summary of the fish community is presented in Table 4-4. Detailed fish catch data including fishing effort and numbers of each species collected are presented in Appendix A, Tables A-13, A-16. During the fall 2016 survey, 1,271 seconds of electrofishing effort was expended within a 285-m reach, resulting in the capture of 97 fish from 6 species. Slimy Sculpin were the most abundant species encountered, with 16 YOY, 19 juveniles and 35 adults collected. One YOY, 7 juvenile and 5 adult Lake Chub, 2 YOY and 5 juvenile Burbot, 2 YOY and 1 juvenile Northern Pike, 1 juvenile and 1 adult Arctic Grayling and 2 juvenile White Sucker were also captured. In addition, Walleye was observed but not captured. CPUE was 4.58 fish/minute of electrofishing. Eighteen adult White Suckers were captured by gillnet at this location during the spring 2017 survey. The list of fish species identified was reviewed by Bobby John, and is considered inclusive and comprehensive.



Photo 3: Stream station SA-2 looking upstream (16 September 2016). This drainage area A station is situated on the northwest tributary of lake LA-1, immediately upstream of the lake, approximately 800 m downstream of lake LA-6.



Photo 4: Stream station SA-2 looking downstream (16 September 2016). Use of the reach by White Sucker and Walleye for spawning was observed during the May 2017 spawning survey.



SA-2 facing upstream, March 2018.

Notes from Appendix 8-B, Appendix D (2011): SA-2 Streamflow monitoring station SA-2 flows into the northwest end of LA-1. The monitoring station at SA-2 is located several meters downstream of the transition between an upstream meandering channel and a downstream riffle section. The monitoring site has a cross-section width of approximately 11 m, is relatively shallow with high velocity flow. The substrate is primarily composed of boulders and cobble, with well-defined and stable vertical banks vegetated with shrubs and trees. SA-2 produces a fair stage-discharge relationship; however the slope is nearly linear, so it may overestimate low and high flows. Further measurements at extreme flows would help verify the accuracy of this rating curve.	 Photo 2: SA-2 looking downstream. Photo taken July 30, 2011.

IR-107

- Department: CNSC, ECCC
- Project Effects Link: Aquatic environment
- Reference to EIS, appendices, or supporting documentation: Section 8.2.3.3, Existing Surface Water Quality

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, June 28, 2024)	IR (ROUND 4, Sept. 16, 2024)	Denison Response (ROUND 4, October 11, 2024)
IR-107	-	**Context:** Under the methodology and metrics section (8.2.3.1) it is stated baseline water quality was sampled in 2016, 2018, and 2019. Looking at the data in Appendix A of Appendix 8D it seems that some waterbodies have little data available for baseline characterization. For example, Whitefish Lake only has 3 and 5 samples taken between its two sample stations, with sampling frequency seeming intermittent. **Rationale:** The amount of data available for baseline water quality characterization does not seem sufficient to adequately characterize the baseline and the variation it would experience. An effective baseline characterization is vital to ensure water quality is indeed not being affected by the project. In addition, it is not clear if data quality objectives were applied to determine baseline information was adequate. To meet CEAA 2012 requirements, and CNSC expectations outlined in REGDOC 2.9.1, Environmental Principles Assessments and Protection Measures, the applicant is required to complete a characterization of the baseline environment. As described in REGDOC 2.9.1 Appendix B.2, Characterization of the Baseline Environment for Environmental Assessment Under CEAA 2012, the "baseline information should be sufficient to support the use of an aquatic dispersion model to conduct the site-specific ERA and to support an assessment of the effects of the environment on the facility or activity" In addition, the "applicant or licensee should include an assessment of any limitations or gaps in the quality and extent of baseline data and methods, as well as the method(s) by which they have been addressed."	Please clarify what data quality objectives were used for the baseline characterization data. Please provide justification whether the number of datapoints collected with inconsistent frequency in baseline surface water characterization is sufficient to meet data quality objectives and to adequately characterize the baseline, and whether Denison is confident that the data collected is enough for a robust water quality baseline characterization. **Suggestions for mitigation and follow-up measures:** CNSC recommends that additional water samples are collected and analyzed at a consistent frequency to ensure a robust baseline	Surface water quality was sampled through 2016, 2018, and 2019 on a monthly basis which is generally consistent with federal requirements for assessing potential impacts through EA. Hydrological assessment has occurred from 2011 to 2019. Mean Annual Discharge (MAD) (m^3/s) as measured at the Water Survey Canada (WSC) Wheeler River Watershed Station (06DA005) during 2016, 2018 and 2019 was 17.07, 17.34 and 19.23, respectively, all of which were slightly above the 43 year (1977 to 2019) average of 16.82. The MAD in 2016 and 2018 can be considered near average, with 2019 being considered an average-high flow year, but well below the maximum observed for the timeseries (27.62 m^3/s). Since this period, there have been no land use changes within the area that would constitute a major change in water quality. Baseline water quality samples were collected during years of average to average-high flows in the Wheeler River system and therefore representative of background conditions for assessment of potential impacts in the EIS. Additional conservatism was included in the impact assessment by using the 95th percentile values for baseline parameter concentrations when modelling potential effluent effects. As such, the surface water quality data collected are suitable for the intended purpose of assessing potential impacts and the additional conservativisms that were included as part of the assessment were precautionary. Given the above, Denison feels strongly that the baseline water quality data collected are suitable for the purposes of the EIS and the application of additional conservatisms in the use of the data provide a conservative (i.e., protective) framework for evaluating potential effects. Denison commits to the collection of additional surface water quality baseline data prior to project development starting to ensure updated baseline information is available for identification of any changes that might influence estimates of Project impacts. These data will be used to support permitting and licensing through updates to the ERA.	This response has not been accepted. From the baseline water quality data table (Table A-1 of Appendix 8D) it remains unclear that water quality was sampled on a monthly basis in 2016, 2018, and 2019, mainly due to Table A-1 referring to specific sampling dates, instead of an mean value of 12 samples/year. It is also unclear which federal requirements Denison is referring to using in their response. Staff are supportive of continued baseline monitoring to maintain an accurate dataset of baseline conditions. CNSC and ECCC staff have the following expectations: 1. Provide the monthly monitoring data referenced in the response or indicate where it can be found within the EIS and its appendices. 2. Confirm which federal requirements were used when assessing potential impacts through EA. 3. Confirm which data quality objectives were used to establish the baseline, provide references if available 4. Incorporate the additional available baseline data collected into the analysis and conclusions of the finalized EIS and ERA to increase the robustness of the established baseline.	The response to this IR is provided in Attachment IR-107 (below).	Before this IR is accepted, the Proponent is requested to provide the statistical correlation analysis to confirm that data is correlated. Additionally, the four expectations set out in the rationale for status have not been adequately responded to. The Proponent should incorporate the following information into the EIS and ERA: 1. Provide raw baseline data (perhaps in an appendix). 2. Provide summary statistics for baseline datasets, which at a minimum should include: mean, standard deviation, 95th percentiles, minimum, maximum, and number of samples. Present summary statistics by season (i.e., freshet, summer, fall and under-ice), and include comparisons to relevant water quality guidelines. 3. Identify potential gaps in baseline datasets, and indicate how data gaps will be addressed. Describe the planned baseline monitoring to be conducted including, but not limited to, addressing any data gaps. 4. Demonstrate that the combined existing baseline data and planned baseline monitoring will yield dataset(s) that provide robust water quality baseline characterization of seasonal conditions (i.e., freshet, summer, fall, under-ice during winter), including a range of flow conditions. The Proponent should also incorporate the additional baseline data collected into the analysis and conclusions of the finalized EIS and ERA. Concerning the other aspects of the IR, these responses are accepted based on Denison's commitment to conduct periodic sampling prior to construction to strengthen existing environmental data. CNSC staff will review this information to ensure EA predictions remain valid and recommend collecting samples in the fall to spring timeframe, as samples from these seasons is sparse in the current dataset.	Information specific to the statistical correlation or consistency in data between waterbodies during baseline investigations is provided in Attachment IR-107-R3 (below). Additionally, the four expectations outlined by ECCC are discussed herein. 1. All raw baseline data was provided in Appendix A-1 of Appendix 8-D of the EIS. 2. Appendix A-1 of Appendix 8-D included the following: mean, SD, 75th percentile, 95th percentile, minimum, maximum, sample size (n) and screening against criteria by date. 3. Denison and its SME does not consider that there are data gaps per se, as it concerns the data used for the purpose of the EIS. Denison and its SME feel strongly that the baseline water quality data collected are suitable for the purposes of the EIS and the application of additional conservatisms in the use of the data provide a conservative (i.e., protective) framework for evaluating potential effects. The data are spatially robust (in that they cover various sampling nodes in potentially affected watersheds that at this time are all subject to the same land use (or lack thereof) and samples have been collected during multiple seasons. Denison is in agreement that regular water quality data collection should be instituted and commits (Commitment 8-48 to beginning such periodic sampling prior to construction to provide a more robust dataset and following the CCME Guidance Manual for Optimizing Water Quality Monitoring Program Design (2015). Sampling will be conducted monthly during the open water period and twice under ice. Any new water quality data will be integrated into Denison's application for a licence to operate, along with updated effluent quality data 4. As noted above, information specific to the statistical correlation or consistency in data between waterbodies during baseline investigations is provided in Attachment IR-107-R3 (below). Given the above (as well as the information provided in Attachment IR-107-R3), Denison and its SME do not feel additional analyses with additional baseline data are needed at this time, as suggested by ECCC, to inform EIS conclusions. Nevertheless, Denison will commit to update the analysis and predictions incorporating any new data collected during pre-construction baseline and licensing for operations, but there is no expectation that there would be any change to the EIS conclusions (see IRs 113, 114 and 115 for more detail in his regard).	Denison has addressed item 1 in the IR Round 3 requests, but has not adequately addressed items 2, 3 and 4. In Appendix A-1 of Appendix 8-D Denison has provided summary statistics; however, these summary statistics are for the pooled dataset and not for individual waterbodies and watercourses. Summary statistics should be provided for each individual waterbody/watercourse so that within and between-lake variation can be identified. Denison has not acknowledged or discussed current gaps and limitations in the baseline data and studies and has not demonstrated how the current baseline data is sufficiently robust to characterize natural variation. It is not clear how Denison meets the requirements of the Generic Guidelines for the Preparation of an Environmental Impact Statement – Pursuant to the Canadian Environmental Assessment Act, 2012 (referred to as "The Guidelines" from this point forward). In The Guidelines Section 8.1 Baseline Environment, it states: > "The EIS will include a description of the environment, including the components of the existing environment and environmental processes, their interrelations and interactions, and the variability in these components, processes, and interactions over time scales appropriate to the EIS. In characterizing the environmental effects of the project, the proponent will consider the current baseline environment and environmental trends within the project area." Denison currently has only conducted three water quality sampling events with one sample each in LA-5, on August 8th, 2012, April 1st, 2014, and September 10th, 2016. Not only is most of the data over 10 years old, but sampling was also only conducted in two seasons. It is not possible to adequately characterize environmental processes, trends and natural variation with the current dataset, and pooling data from multiple lakes further reduces the understanding of these factors. The correlation analysis that Denison provided in their supplemental information Round 3 response did not contain a statistical analysis comparing baseline data between sampled lakes in the LSA and RSA, therefore no determination could be made regarding the similarities between waterbodies. A comparison of mean percent differences between pooled datasets does not conclude that there is no significant difference without supporting statistical tests. Additionally, at no point was LA-5 the primary receiving waterbody compared individually to other waterbodies, LA-5 data continued to be pooled with data from other lakes to form the Key Assessed Lakes pooled dataset, which was then compared to the full LSA dataset. Pooling data, use of reference lake data with exposure lake data in pooled datasets, and use of the geometric mean are all uncertainties and data limitations that should be acknowledged and addressed as minimizing the ability to detect natural variation, including seasonal variation, within-lake	*Note: Denison and the CNSC had a number of meetings and discussions on this Round 4 IR between Sept. 16, 2024 and October 9, 2024. The response provided here is focused on the central questions coming out of these discussions.* Routine surface water quality sampling has started at the Wheeler River Project site. Denison made the commitment to collect additional pre-operational surface water quality data in commitment 8-48 and this work has been initiated. The list of surface water quality sampling stations, sample frequency, and analyte list is included in Attachment IR-107 (Round 4). For the CNSC's consideration, a comparison of June, July, August, and September 2024 water samples collected at Whitefish Lake (LA-5) is provided in Attachment IR-107 (Round 4) Table 1. As shown in the table, the results collected in 2024 are within the range (minimum to maximum) of pooled results for both the full LSA dataset and key assessed lakes. The majority of minor differences between recently collected samples and pooled datasets are related to differences in analytical detection limits. We note that a low-level trace metal analysis was used in 2024 and this resulted in lower detection limits for some parameters compared to previous results. We note that pooling of data to establish a background is not an uncommon approach. For example, such an approach is contemplated by Guidance on the Site-Specific Application of Water Quality Guidelines in Canada: Procedures for Deriving Numerical Water Quality Objectives (CCME 2003). This procedure acknowledges the use of "regional" data to derive background concentrations assuming the sites from which data are used "… are generally located nearby the site under consideration but have not been adversely affected by human activities." This description is accurate for the Wheeler River Project aquatic LSA which is in an unimpacted, remote area of Saskatchewan's boreal forest. We refer the reviewer to Appendix 10-A, Appendix A Section 3.2 for consideration of modelled average water baseline concentrations of COPCs and a comparison to measured values. The plots show trends over time for selected COPCs and the generally good agreement between the measured and modelled concentrations. Based on the data presented and methodology provided in relevant guidance, the baseline water quality data collected are suitable for the purposes of the EIS and the application of additional conservatisms in the use of the data provide a conservative (i.e., protective) framework for evaluating potential effects. As shown in Attachment IR-107 (Round 4) Table 2, surface water quality sampling will be conducted monthly during the open water period and twice

										variation at sampling sub-stations, year-to-year variation and between-lake variation. The requests below will serve to satisfy the principles of the Precautionary Approach and address these deficiencies. <u>In order to resolve this IR, Denison are expected to:</u> 1. Meet the requirements of the CNSC's guiding principles for protection of the environment REGDOG 2.9.1 Section 2.1 that "the licensee's license application shall demonstrate (through performance assessments, monitoring or other assessments) that their environmental protection measures are assessed against performance indicators and targets that are based on sound science", Denison should provide a statistical analysis including a power analysis comparing LA-5 baseline water quality data individually to other waterbody water quality data to determine if there is a statistically significant difference between water quality at various sites in the LSA. Denison should provide the methodology they will use to conduct the statistical analysis and power analysis for CNSC review and acceptance prior to completing the analysis. Pending the results of the statistical analysis: a. If the statistical analysis demonstrates that there is not enough statistical power to detect a significant difference between waterbodies, or that there is enough power and a significant difference between LA-5 and other waterbodies in the LSA, Denison will be required to provide additional baseline data to update the modelling during the EA process and update risk and significance conclusions as needed. b. If the statistical analysis demonstrates that there is enough statistical power to detect a significant difference and that there is no statistical difference between LA-5 and the other waterbodies in the LSA, then Denison will not be required to provide further baseline data for the purposes of the EA, however Denison will still be expected to conduct further baseline characterization as per their commitments to collect more baseline data. Denison is also expected to still satisfy the other requirements in this IR. 2. If currently available, incorporate any existing new data (post-2019) into the baseline dataset and update the analysis for submission in the finalized	under ice. Per CNSC licensing requirements, the new water quality data along with updated effluent quality data will be integrated into the environmental risk assessment used to support Denison's application for a CNSC licence to operate and prior to effluent release to Whitefish Lake.

										EIS. Modelling should incorporate: a. Near-field modelling (LA-5) should utilize the 95th percentile values of data measured at LA-5 (i.e., not the pooled dataset); and b. Far-field modelling of the downstream environment should utilize the 95th percentile values of the pooled dataset. c. Water quality predictions should be updated accordingly. 3. Provide a commitment that, prior to the detailed design phase/ licensing to construct, the Proponent will: a. Conduct additional baseline monitoring to yield dataset(s) that provide robust water quality baseline characterization of seasonal conditions (i.e., freshet, summer, fall, under-ice during winter), including data collection for a range of flow conditions, at the receiver (LA-5) and downstream monitoring locations. At a minimum, data collection should prioritize collecting baseline water quality data for the immediate receiving environment (LA-5); b. Update the baseline water quality characterization of seasonal conditions for LA-5 using the 95th percentile values of data measured at LA-5 (i.e., not the pooled dataset) and downstream environment using the 95th percentile values of location-specific data instead of pooled data. c. Update the water quality modelling and predictions of risk as needed.	

Attachment IR-107 (included in Round 2 submission)

Denison's Response:

The water quality sampling for baseline was conducted over several years from 2011 to 2019. In years 2015 and 2017 sampling did not occur. Sampling occurred during the open water period and most consistently in May, June, August, September and October. The reviewer is correct in that sampling did not occur on a monthly basis at each of the sampling locations over all years. The table below provides a summary of the periodicity of sampling as it occurred over the described period at each station.

Station ID	2011		2012			2013		2014		2016	2018		2019		Total
	May	Jun	May	Aug	Oct	Aug	Oct	Mar	Apr	Sep	Mar	Jul	Jul	Aug	
Lakes															
LA-1		1		1				1		1	1	1			6
LA-2		1						1		1					3
LA-3		1						1		1					3
LA-4								1		1					2
LA-5				1					1	1					3
LA-6				1				1		1	1	1			5
LA-7				1				1		3					5
LA-8										1					1
LA-9										1					1
LAB-1				1				1		1					3
LAB-2										1					1
LB-1										1					1
LB-2									1	1					2
LB-3				1					1	2					4
LA-1											1	1			2
Sub-Total	*0*	*3*	*0*	*6*	*0*	*0*	*0*	*7*	*3*	*17*	*3*	*3*	*0*	*0*	*42*
Streams															
SA-1	1	1	1	1	1	1	1	1					1	1	10
SA-2	1	1	1	1	1	1	1	1					1	1	10
SA-3	1	1	1	1	1	1	1	1					1	1	10
SA-4	1	1	1	1	1	1	1	1					1	1	10
SA-5	1	1	1	1	1	1	1	1					1	1	10
SA-6	1		1	1	1	1	1		1				1	1	9
SB-1	1	1	1	1	1	1	1	1							8
SB-2	1	1	1	1	1	1	1								7
SB-3	1	1	1	1	1	1	1	1							8
SB-4	1	1	1	1	1	1	1								7
SB-5	1		1	1	1	1	1	1							7
Sub-Total	*11*	*9*	*11*	*11*	*11*	*11*	*11*	*8*	*1*	*0*	*0*	*0*	*6*	*6*	*96*
Total	11	12	11	17	11	11	11	15	4	17	3	3	6	6	138

1. The table above identifies that monthly sampling was not completed at each station on an annual basis.
2. For the purposes of the EA, a statistical analysis was conducted to identify the correlation between the water quality data for LA-1, LA-5, LA-6, and McGowen Lake and the full dataset for the LSA. Datasets were highly correlated and therefore the full dataset for the LSA was used as background concentrations in the IMPACT model. This approach was taken to meet the criteria of REGDOC 2.9.1 Appendix B.2, Characterization of the Baseline Environment for Environmental Assessment Under CEAA 2012, the "baseline information should be sufficient to support the use

of an aquatic dispersion model to conduct the site-specific ERA and to support an assessment of the effects of the environment on the facility or activity".

3. Samples were collected following applicable field protocols and analysis was conducted by CALA accredited laboratories. The conceptualization of sampling in this remote location loosely followed the CCME Guidance Manual for Optimizing Water Quality Monitoring Program Design (2015). However, due to the remote nature during the baseline sampling, monthly sampling was not deemed feasible.
4. There are no additional data to add to the analysis at this time for either the near-field or far-field water quality models. It is noted that some addition sampling occurred at Whitefish Lake offshore in the general, vicinity of the proposed discharge (diffuser) location in 2022 and continued in 2023. The concentration of constituents from samples collected in 2022 and 2023 were in the range of those measured previously and as a result no changes to the outcomes of the analyses presented in the Draft EIS and its supporting documents would be expected. Denison agrees that regular water quality data collection at a wider range of sampling stations should be instituted and commits to beginning such periodic sampling prior to construction to provide a more robust dataset and following the CCME Guidance Manual for Optimizing Water Quality Monitoring Program Design (2015). These data would be used to support the licensing process and contribute to the longer term data records for the site.

Attachment IR-107 (Round 3 submission)

Water quality of the waterbodies within the local study area (LSA) of the Wheeler River Project was surveyed over the period 2011 through 2019 as part of the aquatic environment baseline studies. Generally, surface waters within the LSA are soft and have typically low levels of alkalinity, nutrients (nitrate and phosphorus), total dissolved solids, and total suspended solids. The pH of surface waters within the LSA is slightly acidic to neutral. The concentrations of metals and metalloids are similar throughout the study area. Radionuclide concentrations are low, with the majority of measurements lower than their respective laboratory detection limits.

To determine which dataset was more appropriate to be used as baseline concentrations in the IMPACT model for the purposes of the Environmental Assessment, a statistical analysis of water quality data was undertaken to identify the correlation between the water quality data for only the key assessed lakes (LA-1, LA-5, LA-6, LA-7, and Russell Lake) and the full dataset for all waterbodies surveyed within the LSA.

For the purposes of the Environmental Assessment, a statistical analysis was undertaken to identify the correlation between water quality data from the key assessed lakes (LA-1, LA-5, LA-6, LA-7 and Russell Lake) and from the full dataset for the local study area (LSA), to determine which dataset was more appropriate for use as background concentrations in the IMPACT model.

The following provides methods and results and a summary of findings of this analysis.

Water quality data for lakes and creeks in the LSA were obtained for multiple monitoring events from June 2011 to September 2019. The data consisted of measurements of chemical parameters including physical tests (e.g., major ions and metals concentrations), nutrient tests (e.g., ammonia), and radionuclides (e.g., Pb-210). Data were inputted into the Ecometrix database software Environmental Monitoring Modeling Application (EMMA) and contained indicators for when measurements were less than the reported detection limit (RDL). The parameters examined herein are those chemicals of potential concern (COPC) for purposes of the Environmental Assessment (Table 1).

For the comparison, summary statistics were generated for two datasets: the full dataset and a subset of the key assessed lakes and creeks that link the key assessed lakes. The summary statistics including the number of measured samples (N), the number of measured samples below the reported detection limit (N<RDL), the minimum, the 95th percentiles, the maximum, and the geometric mean and standard deviation were calculated for both datasets using EMMA. For measurements below RDL, the detection limit value was used when generating summary statistics. Finally, the percent difference between geometric mean values of the two datasets were calculated per COPC.

The mean percent difference of key assessed lakes relative to the full LSA dataset across all COPC's was 0% (n = 24) with a minimum absolute percent difference of 0% and an absolute maximum percent difference of 16%. There were 20/24 (83%) with an absolute maximum percent difference of 5% and 22/24 (92%) with an absolute maximum percent difference of 10% (Table 1).

These low percent differences indicated that the datasets are highly correlated and because the full dataset also contained more datapoints and waterbodies, the full dataset for all waterbodies surveyed within the LSA was deemed most appropriate to be used as baseline concentrations in the IMPACT model.

Table 1 Summary statistics and percent difference calculations for COPC water quality parameters in the full LSA dataset (shaded) and key assessed lakes (unshaded).

Category	Parameter	Units	N	N <RDL	N	N <RDL	Minimum	Minimum	95th Percentile	95th Percentile	Maximum	Maximum	Geometric Mean	Geometric Mean	Geometric SD	Geometric SD	Δ% (Geometric Mean)
Physical Tests	Specific Conductivity	µS/cm	156	0	100	0	8	8	26	26.2	47	47	17.31	17.095	1.3065	1.3474	**-1**
	Calcium	mg/L	142	0	86	0	1	1.1	2.	2.075	3.9	3.9	1.4077	1.4296	1.2471	1.2782	**2**
	Chloride	mg/L	142	7	86	1	<0.1	<0.1	0.7	0.6	0.9	0.7	<0.3223	<0.38561	1.7409	1.4232	**16**
	Magnesium	mg/L	142	1	86	0	<0.1	0.2	0.6	0.575	0.7	0.7	<0.39237	0.39888	1.2924	1.2429	**2**
	Sodium	mg/L	142	0	86	0	0.9	1.2	1.8	1.8	2.1	2.1	1.4632	1.5212	1.1545	1.1145	**4**
	Sulphate	mg/L	142	1	86	1	<0.2	<0.2	1.1	0.9	8.3	8.3	<0.68732	<0.67743	1.6206	1.7778	**-1**
	Arsenic	mg/L	142	53	86	33	<0.0001	<0.0001	0.0001	0.0001	0.0003	0.0002	<0.00010327	<0.00010081	1.1697	1.0776	**-2**
	Cadmium	mg/L	142	90	86	58	<1.00E-05	<1.00E-05	0.00003	0.00003	0.00007	0.00007	<0.000012007	<0.000012025	1.4949	1.5272	**0**
	Chromium	mg/L	142	142	86	86	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	1.	1.	**0**
	Cobalt	mg/L	142	138	86	86	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.00010098	<0.0001	1.0854	1.	**-1**
	Copper	mg/L	142	139	86	84	<0.0002	<0.0002	<0.0002	<0.0002	0.0008	0.0008	<0.00020394	<0.00020489	1.1522	1.181	**0**
	Lead	mg/L	142	135	86	83	<0.0001	<0.0001	<0.0001	<0.0001	0.0012	0.0012	<0.0001055	<0.00010595	1.3574	1.385	**0**
	Molybdenum	mg/L	142	136	86	81	<0.0001	<0.0001	<0.0001	<0.000175	0.0013	0.0013	<0.00010684	<0.00011065	1.4246	1.5624	**3**
	Nickel	mg/L	142	101	86	79	<0.0001	<0.0001	<0.0003	<0.0001	0.0006	0.0004	<0.00011447	<0.00010376	1.4116	1.2247	**-10**
	Selenium	mg/L	142	140	86	85	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0002	<0.00010049	<0.00010081	1.0599	1.0776	**0**
	Uranium	mg/L	142	141	86	86	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.00010049	<0.0001	1.0599	1.	**0**
	Vanadium	mg/L	142	110	86	78	<0.0001	<0.0001	<0.0002	<0.0001	0.0005	0.0003	<0.00010733	<0.00010129	1.2805	1.1258	**-6**
	Zinc	mg/L	142	95	86	58	<0.0005	<0.0005	<0.00278	<0.00235	0.02	0.02	<0.00068059	<0.00069751	1.8847	1.9699	**2**
Nutrients	Ammonia as N	mg/L	142	104	86	59	<0.01	<0.01	<0.0595	<0.05	1.2	0.91	<0.014626	<0.014875	2.2367	2.1715	**2**
	Nitrate	mg/L	103	70	63	45	<0.04	<0.04	<0.436	<0.35	0.66	0.6	<0.067313	<0.0661	2.4855	2.4298	**-2**
Radionuclides	Lead-210	Bq/L	142	136	86	81	<0.02	<0.02	<0.02	<0.02	0.05	0.05	<0.020402	<0.020502	1.1181	1.1306	**0**
	Polonium-210	Bq/L	142	112	86	75	<0.005	<0.005	<0.008	<0.007	0.02	0.01	<0.0053637	<0.0051995	1.2182	1.1453	**-3**
	Radium-226	Bq/L	142	98	86	59	<0.005	<0.005	<0.00995	<0.00975	0.01	0.01	<0.0055717	<0.0055727	1.2272	1.2315	**0**
	Thorium-230	Bq/L	142	138	86	82	<0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.010098	<0.010163	1.0854	1.1108	**1**

Full LSA dataset

Key assessed lakes dataset

Notes: N is number of lakes/creek sampling locations; SD is standard deviation.

Attachment IR-107 (Round 4 submission):

Attachment IR-107 (Round 4) Table 1: Summary statistics and percent difference calculations for COPC water quality parameters in the full LSA dataset (shaded) and key assessed lakes (unshaded) (from IR-107 Round 3) and updated at Round 4 to include water quality results from water samples collected at Whitefish Lake (LA-5) in June, July, August, and September 2024.

Category	Parameter	Units	N	N <RDL	N	N <RDL	Minimum	Minimum	95th Percentile	95th Percentile	Maximum	Maximum	Geometric Mean	Geometric Mean	Geometric SD	Geometric SD	Δ% (Geometric Mean)	Whitefish Lake (LA-5) June 22, 2024		Whitefish Lake (LA-5) July 18, 2024		Whitefish Lake (LA-5) August 16, 2024		Whitefish Lake (LA-5) September 10, 2024	
																		Result	Within range of previous samples	Result	Within range of previous samples	Result	Within range of previous samples	Result	Within range of previous samples
Physical Tests	Specific Conductivity	µS/cm	156	0	100	0	8	8	26	26.2	47	47	17.31	17.095	1.3065	1.3474	-1	20	Yes	15	Yes	16	Yes	14	Y
	Calcium	mg/L	142	0	86	0	1	1.1	2.	2.075	3.9	3.9	1.4077	1.4296	1.2471	1.2782	2	1.12	Yes	1.3	Yes	1.3	Yes	1.3	Y
	Chloride	mg/L	142	7	86	1	<0.1	<0.1	0.7	0.6	0.9	0.7	<0.3223	<0.38561	1.7409	1.4232	16	<1.0	Higher than max [1]	<1.0	Higher than max [1]	<1.0	Higher than max [1]	<1.0	Higher than max [1]
	Magnesium	mg/L	142	1	86	0	<0.1	0.2	0.6	0.575	0.7	0.7	<0.39237	0.39888	1.2924	1.2429	2	0.32	Yes	0.4	Yes	0.4	Yes	0.4	Y
	Sodium	mg/L	142	0	86	0	0.9	1.2	1.8	1.8	2.1	2.1	1.4632	1.5212	1.1545	1.1145	4	1.37	Yes	1.6	Yes	1.6	Yes	1.6	Y
	Sulphate	mg/L	142	1	86	1	<0.2	<0.2	1.1	0.9	8.3	8.3	<0.68732	<0.67743	1.6206	1.7778	-1	9.2	Higher than max but an order of magnitude below long-term benchmark (EIS Table 8.2-2). Additionally, compared to the pooled max, this result is within the range of method variability	0.5	Yes	0.4	Yes	0.5	Y
	Arsenic	mg/L	142	53	86	33	<0.0001	<0.0001	0.0001	0.0001	0.0003	0.0002	<0.00010327	<0.00010081	1.1697	1.0776	-2	0.000094	Lower than min	0.00011	Yes	0.00014	Yes	0.0001	Y
	Cadmium	mg/L	142	90	86	58	<1.00E-05	<1.00E-05	0.00003	0.00003	0.00007	0.00007	<0.000012007	<0.000012025	1.4949	1.5272	0	0.000005	Lower than min	<0.00002	Lower than min	0.000003	Lower than min	0.000002	Lower than min
	Chromium	mg/L	142	142	86	86	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	1.	1.	0	0.0002	Lower than min	0.00009	Lower than min	0.00064	Higher than max but below long-term benchmark (EIS Table 8.2-2). The concentration of dissolved Cr in the same sample was 0.0001 mg/L, suggesting an issue with particulates	0.0001	Lower than min
	Cobalt	mg/L	142	138	86	86	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.00010098	<0.0001	1.0854	1.	-1	0.00001	Lower than min	0.000011	Lower than min	0.000035	Lower than min	0.000014	Lower than min
	Copper	mg/L	142	139	86	84	<0.0002	<0.0002	<0.0002	<0.0002	0.0008	0.0008	<0.00020394	<0.00020489	1.1522	1.181	0	0.0001	Lower than min	<0.00007	Lower than min	<0.00007	Lower than min	<0.00007	Lower than min
	Lead	mg/L	142	135	86	83	<0.0001	<0.0001	<0.0001	<0.0001	0.0012	0.0012	<0.0001055	<0.00010595	1.3574	1.385	0	<0.00002	Lower than min	<0.00001	Lower than min	0.00002	Lower than min	<0.00001	Lower than min
	Molybdenum	mg/L	142	136	86	81	<0.0001	<0.0001	<0.0001	<0.000175	0.0013	0.0013	<0.00010684	<0.00011065	1.4246	1.5624	3	< 0.00005	Lower than min	0.00002	Lower than min	0.00002	Lower than min	0.00002	Lower than min
	Nickel	mg/L	142	101	86	79	<0.0001	<0.0001	<0.0003	<0.0001	0.0006	0.0004	<0.00011447	<0.00010376	1.4116	1.2247	-10	0.00019	Yes	0.00005	Lower than min	0.00009	Lower than min	0.00006	Lower than min
	Selenium	mg/L	142	140	86	85	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0002	<0.00010049	<0.00010081	1.0599	1.0776	0	< 0.00004	Lower than min	0.00002	Lower than min	0.00003	Lower than min	<0.00002	Lower than min
	Uranium	mg/L	142	141	86	86	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.00010049	<0.0001	1.0599	1.	0	<0.000005	Lower than min	0.000005	Lower than min	0.000005	Lower than min	0.000016	Lower than min
	Vanadium	mg/L	142	110	86	78	<0.0001	<0.0001	<0.0002	<0.0001	0.0005	0.0003	<0.00010733	<0.00010129	1.2805	1.1258	-6	<0.0002	Yes	<0.0001	Yes	<0.0001	Yes	<0.0001	Y
	Zinc	mg/L	142	95	86	58	<0.0005	<0.0005	<0.00278	<0.00235	0.02	0.02	<0.00068059	<0.00069751	1.8847	1.9699	2	<0.001	Yes	0.0003	Lower than min	0.0005	Yes	0.0004	Lower than min
Nutrients	Ammonia as N	mg/L	142	104	86	59	<0.01	<0.01	<0.0595	<0.05	1.2	0.91	<0.014626	<0.014875	2.2367	2.1715	2	<0.05	Yes	<0.01	Yes	<0.01	Yes	<0.01	Y
	Nitrate	mg/L	103	70	63	45	<0.04	<0.04	<0.436	<0.35	0.66	0.6	<0.067313	<0.0661	2.4855	2.4298	-2	<0.10	Yes	<0.04	Yes	<0.04	Yes	<0.04	Y
Radionuclides	Lead-210	Bq/L	142	136	86	81	<0.02	<0.02	<0.02	<0.02	0.05	0.05	<0.020402	<0.020502	1.1181	1.1306	0	<1	Higher than max [1]	<0.02	Yes	<0.02	Yes	<0.02	Y
	Polonium-210	Bq/L	142	112	86	75	<0.005	<0.005	<0.008	<0.007	0.02	0.01	<0.0053637	<0.0051995	1.2182	1.1453	-3	<0.010	Yes	<0.005	Yes	0.007	Yes	0.008	Y
	Radium-226	Bq/L	142	98	86	59	<0.005	<0.005	<0.00995	<0.00975	0.01	0.01	<0.0055717	<0.0055727	1.2272	1.2315	0	<0.010	Yes	<0.005	Yes	<0.005	Yes	0.005	Y
	Thorium-230	Bq/L	142	138	86	82	<0.01	<0.01	<0.01	<0.01	0.02	0.02	<0.010098	<0.010163	1.0854	1.1108	1	<0.010	Yes	0.01	Yes	<0.01	Yes	<0.01	Y

Full LSA dataset

Key assessed lakes dataset

Notes: N is number of lakes/creek sampling locations; SD is standard deviation.

Analysis of 2024 samples included low-level trace metal analysis, resulting in lower detection limits for some parameters compared to previous results.

[1] These 2024 results were higher than pooled maximum value because of a higher detection limit.

Attachment IR-107 (Round 4) Table 2: Wheeler River Project sampling locations, frequencies, and parameters for the pre-operational surface water monitoring program

Station ID	Description	Sampling frequency	Water quality and water chemistry parameters
SA4	LA6 inlet tributary	Monthly during the open water period and twice under ice.	Field water quality measurements (dissolved oxygen, pH, conductivity, temperature) and water chemistry laboratory analysis (the following analytes are currently included in surface water quality monitoring: Bicarbonate; Carbonate; Chloride; Chloride, dissolved; Hydroxide; P. alkalinity; pH; Specific conductivity; Sum of ions; Total alkalinity; Total hardness; Ammonia as nitrogen; Nitrate; Total Kjeldahl nitrogen; Mercury; Methylmercury; Organic carbon; Organic carbon, dissolved; Fluoride; Total dissolved solids; Lead-210; Polonium-210; Radium-226; Thorium-228; Thorium-230; Thorium-232; Calcium; Calcium, dissolved; Magnesium; Magnesium, dissolved; Potassium; Potassium, dissolved; Sodium; Sulfate; Sulfate, dissolved; Aluminum; Aluminum, dissolved; Antimony; Antimony, dissolved; Arsenic; Arsenic, dissolved; Barium; Barium, dissolved; Beryllium; Beryllium, dissolved; Bismuth; Bismuth, dissolved; Boron; Boron, dissolved; Cadmium; Cadmium, dissolved; Chromium; Chromium, dissolved; Cobalt; Cobalt, dissolved; Copper; Copper, dissolved; Iron; Iron, dissolved; Lead; Lead, dissolved; Lithium; Lithium, dissolved; Manganese; Manganese, dissolved; Molybdenum; Molybdenum, dissolved; Nickel; Nickel, dissolved; Rubidium; Rubidium, dissolved; Selenium; Selenium, dissolved; Silicon, soluble; Silicon, soluble, dissolved; Silver; Silver, dissolved; Strontium; Strontium, dissolved; Sulfur; Sulfur, dissolved; Thallium; Thallium, dissolved; Tin; Tin, dissolved; Titanium; Titanium, dissolved; Uranium; Uranium, dissolved; Vanadium; Vanadium, dissolved; Zinc; Zinc, dissolved; Zirconium; Zirconium, dissolved; Phosphorus; Phosphorus, dissolved. Note that metal analysis (both total and dissolved) are being done using a low-level analytical techniques)
SA5	LA6 inlet tributary		
LA6	Whitefish Lake (north)		
LA5	Whitefish Lake (south)		
LA1	McGowan Lake		
LAB1	Russell Lake		

IR- 114

- Department: ECCC, CNSC
- Project Effects Link Change to an environmental component due to hazardous contaminants
- Reference to EIS, appendices, or supporting documentation: Section 8.2.4.2.3 and Section 8.2.4.2.4

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, July 5, 2024)	IR (ROUND 4, Sept. 6, 2024)	Denison Response (ROUND 4, October 15 2024)
IR-114	-	**Context:** Tables 8.2-9, 8.2-10 and 8.2-13 demonstrate predicted maximum effluent concentrations of COPCs and maximum predicted receiving environment concentrations in the near- and far-field. General parameters such as temperature, pH, conductivity, etc. that would require Project thresholds and monitoring under the MDMER have not been provided in this table. Lead, nickel, TSS and un-ionized ammonia were not provided, despite all being Schedule 4 substances with maximum monthly concentrations under the MDMER. Aluminum, iron, nitrate, thallium, and manganese have not been provided despite being required parameters under Schedule 5 Section 4 of the MDMER for effluent characterization. For zinc, it is unclear how guidelines have been calculated when CCME thresholds can only be derived with hardness values <250 mg/L. Additionally, water quality thresholds appear to have been calculated using estimated effluent concentrations rather than receiving environment baseline concentrations. Mercury has been identified as a COPC of interest to Indigenous groups for the proposed Project. Table 8.2-8 indicates that background concentrations of mercury in LA-5 are low, and predicted effluent concentrations are also low. However, no information has been provided on background methylmercury concentrations or expected atmospheric deposition of mercury from Project related emissions. Predicted effluent concentrations of 3915 mg/L of sulphate are quite high, and sulphate is known to increase mercury methylation rates in aquatic environments. **Rationale:** A review of all modelling results for all COPCs under the MDMER will assist ECCC in understanding the potential risks to the receiving environment. ECCC recommends the use of the most stringent guidelines for the protection of aquatic biota. All water quality thresholds should be derived from receiving environment parameters to determine any baseline receiving environment and effluent COPC exceedances of water quality thresholds. Increased sulphate availability can lead to increased methylation rates of mercury and methylmercury in sediment and surface water. Methylmercury is a toxin that can bioaccumulate within the food chain and present risks to aquatic biota and wildlife consuming aquatic biota. Potential changes to methylmercury concentrations in water quality, sediment and fish tissues should be assessed due to the proposed sulphate loadings in effluent. Additionally, in accordance with the MDMERs, Denison will be required to demonstrate that their effluent quality meets the limits in the MDMER. Denison is expected to provide the predicted effluent quality for lead, nickel, and un-ionized ammonia to demonstrate compliance with the MDMERs.	1. Update all tables to include all COPCs with required monitoring under the MDMER including acute and chronic thresholds. 2. Ensure all selected water quality thresholds are derived using baseline receiving environment concentrations and use water quality guidelines that are protective of aquatic biota. 3. Provide baseline data on the concentrations of methylmercury in surface water, sediment and fish tissues (i.e., large- bodied sports fish and small-bodied forage fish) in the LSA and RSA receiving environment to establish a baseline prior to potential Project impacts. 4. Provide an assessment of risk from methylmercury to ecological receptors due to changes in sulphate concentrations in effluent, and potential deposition of mercury from Project related atmospheric emissions in the receiving environment.	See response in Attachment IR-114.	This response has not been accepted. The Proponent has not updated all tables to include missing data for mercury, aluminum, total suspended solids, iron, thallium, manganese, nitrate, and phosphorous, all of which are COPCs with monitoring requirements under the MDMER. The Proponent has not updated tables to include predictions of total hardness concentration in effluent and the receiving environment or acute water quality thresholds, and water quality thresholds have not been derived using baseline receiving environment concentrations. All water quality thresholds should be derived from receiving environment parameters to determine if any baseline receiving environment and effluent COPCs exceed water quality thresholds. Please: 1. Update all tables to include missing data for mercury, aluminum, total suspended solids, iron, thallium, manganese, nitrate and phosphorus. 2. Update tables to include predictions of total hardness concentrations (in mg/L CaCO3) in effluent and the receiving environment. 3. Update tables to include acute water quality thresholds to ensure COPCs do not have the potential to be acutely lethal at the end-of-pipe. 4. Ensure that all selected water quality thresholds are derived using baseline receiving environment concentrations and use water quality guidelines that are protective of aquatic biota.	Please see Attachment IR-114. Briefly, Tables 8.2-9, 8.2-10 and 8.2-13 have been updated in the revised Draft EIS as requested.	In response to the FIRT's previous review, Denison provided responses to the following outstanding requests from ECCC: 1. Update all tables to include missing data for mercury, aluminum, total suspended solids, iron, thallium, manganese, nitrate and phosphorus. 2. Update tables to include predictions of total hardness concentrations (in mg/L CaCO3) in effluent and the receiving environment. 3. Update tables to include acute water quality thresholds to ensure COPCs do not have the potential to be acutely lethal at the end-of-pipe. 4. Ensure that all selected water quality thresholds are derived using baseline receiving environment concentrations and use water quality guidelines that are protective of aquatic biota. The Proponent has resolved item two and four of the above, but items one and three require additional follow up. Regarding item one, further corrections to Table 8.2-13 are necessary: • There are several inconsistencies in the footnotes: o numbers 2 & 3 are missing in the footnotes at the bottom; o there is no reference to footnote 2 in the table; and o The asterisk "*", which is sometimes used to qualify the source of screening concentration, is not defined. • Screening criteria are missing for aluminum and iron, and should be sourced from CCME or SEQG rather than the MDMER as listed in the table. • Uranium-234 and uranium-238 are missing from the table, even though they have been identified as contaminants of potential concern. • Proposed screening criteria for cobalt, copper, manganese, nickel, phosphorous and un-ionized ammonia are inadequate, see comment in IR-108 & IR-108-R1.	Item 1 – further corrections to Table 8.2-13 have been made (please see updated Table 8.2-13 in Attachment IR-114-R3) as follows: • Footnotes were restructured and are provided in Attachment IR-114-R3 for each of the tables that were updated. • Screening criteria were added for aluminum and iron, and sourced from CCME or SEQG. • Uranium-234 and uranium-238 were added to the table. • Proposed screening criteria for cobalt, copper, manganese, nickel, phosphorous and un-ionized ammonia were changed as applicable and are consistent with other tables as associated with IR-108 & IR-108-R1. • Un-ionized ammonia is updated to only be provided in one line. The first line provided previously was associated with a miscalculation of the un-ionized ammonia value and was the unionized ammonia-N value. The values provided as part of Attachment IR-114-R3 should be considered correct for unionized ammonia for comparison against the guideline. • The column with screening values now is consistent across all tables that are presented as part of Section 8 and in Attachments for IRs 108/108-R1, 114 and 115. • Table 8.2-14 was updated with corrections to screening criteria necessary for this IR as well as for IR-108 and IR-115 (please see Attachment IR-114-R3). • Table 8.2-10 was updated to include the source for the short-term screening criteria value for arsenic (please see Attachment IR-114-R3 for updated Table 8.2-10.	In a supplementary submission provided on July 5th, Denison provided corrections to some tables. However, errors and conflicting information remain within and between tables. In order to resolve this IR, Denison are expected to correct the following issues: 1) Provide the following updates to Tables 8.2-8, 8.2-10, 8.2-13, and 8.2-14 to correct the errors outlined. Additionally, in Table 8.2-13 MDMER Schedule 4, the maximum authorized effluent concentration limits are not appropriate for use as short-term benchmark water quality guidelines. The Schedule 4 limits are only applicable to effluent and represent concentrations in effluent that cannot be exceeded at end-of-pipe, not to receiving environment surface water concentrations, and are not a reliable indicator of acutely lethal concentrations of constituents in receiving environment surface water. • Tables 8.2-8 and 8.2-10: A)Temperature: long-term screening criteria is "ambient temp" and should be updated to "narrative", as has been used in updated Tables 8.2-2. The narrative is already included in the footnotes of Table 8.2-8 and 8.2-10, so the tables should be updated as well. • Table 8.2-13: A) Cadmium: both short-and long-term benchmarks are erroneous and should be corrected to values found in updated Table 8.2-2. B) Chloride: long-term benchmark is erroneous and should be corrected to value found in updated Table 8.2-2. C) Iron, Lead-210, and Uranium-234 & -238: long-term benchmarks are missing and should be the same values found in updated Table 8.2-2 or Table 8.2-8. Alkalinity and nitrate have been added to the table as requested, however predicted maximum concentrations are only presented for Whitefish Lake Middle and South. The proponent should describe why there are no estimates for these parameters in other lakes, and how they intend to fill these gaps. •Table 8.2-14: A.The removal of constituents of potential concern from future centuries review need to be justified by the proponent. Otherwise, all parameters included in Table 8.2-13 should also be included in Table 8.2-14. Presently alkalinity, nitrate, uranium-234 & -238 are missing. B.Uranium: the long-term screening concentration is erroneous and should be corrected to the value found in all other tables. •Footnotes: A.The footnotes for each table should reflect what is in the table. B.All tables: acronyms used in the references that need explanations in the footnotes include: "CCME", "HC", "BC MOE", "FEQG" and "MDMER". C.All tables: explanations in the footnotes for acronyms that were not used in the tables: "SSWQO", "TKN", and "TOC".	1) The updates were completed as requested. In Table 8.2-13 MDMER Schedule 4 maximum authorized effluent limits were removed and tables updated. Tables 8.2-8 and 8.2-10 A) Table were updated to include "narrative" rather than "ambient temp" as requested. Table 8.2-13: A) Cadmium values were checked and were correct, however, chloride values were incorrect and had the cadmium footnote associated with them. This was corrected. B) Chloride long term benchmark was corrected to the value found in Table 8.2-2. C) Iron, Lead-210 and Uranium-234 and Uranium-238 long-term benchmarks were missing but have been added as per the values consistent with Table 8.2-2 and 8.2-8. D) Alkalinity and nitrate were not collected for other locations during baseline assessments. It is intended that these constituents will be added to the pre-construction water sampling suite of parameters to ensure consistency and completeness for additional analysis conducted for licencing. Table 8.2-14 A) **Nitrate**: Nitrate was not included in the Geochemical Reactive Transport Model (Appendix 7C of the Final EIS) as it is not considered a COPC associated with the ISR mining process for this project. Nitrate concentrations were below laboratory reported detection limits in the metallurgical testing, where tested, as shown in Table F-2 of Appendix 7C of the EIS. Further, nitrate concentrations are, with one exception for a groundwater monitoring well in overburden (GWR-036), below or very close to the laboratory reported detection limit, as shown in Table D-2 of Appendix 7C of the Final EIS. Baseline nitrate concentrations are low (< 0.5 mg/L) in surface water bodies assessed for the

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							• Alkalinity and nitrate have been added to the table as requested, however predicted maximum concentrations are only presented for Whitefish Lake Middle and South. The proponent should describe why there are no estimates for these parameters in other lakes, and how they intend to fill these gaps. • Un-ionized ammonia appears in two separate lines in the table with concentrations differing by 3-4 orders of magnitude and different screening values. A single line entry with accurate values should be retained. The Proponent should provide an explanation for the error in order to give the reviewer confidence that the correct values are retained. • The column with screening values does not always use the most conservative value from Table 8.2-8. See comment IR-115 for request to provide justifications. Table 8.2-14 should be updated with corrections to screening criteria necessary for this IR as well as for IR-108 and IR-115. Additional follow up for Table 8.2-10 can be found under IR-108 and IR-108-R1. In the Proponent's response to item three of the IR, Table 8.2-10 is missing the source for the short-term screening criteria value for arsenic. The Proponent should update Table 8.2-10 to include the source for the short-term screening criteria value for arsenic.		Removing these would increase clarity. D.Footnote "*" should be removed. It explains how ammonia concentration is calculated and is not referred to in Tables 8.2-8, 8.2-10 & 8.2-13. In Table 8.2-14 it is associated by cadmium, which does not make sense. E. Footnote (4) should be removed. It states the short-term screening criterion for chloride limit is "*Based on water hardness >0 to <17 mg/L*". This appears erroneous since neither the CCME guideline nor the SEQG is hardness based. F. Tables 8.2-13 & 8.2-14 do not refer to the footnotes "TDS", "narrative", (4) and (7), and removing them would help clarity. 2) CNSC/ECCC staff agree that the minor baseline exceedances of copper concentrations in water do not constitute the use of a guideline that is a magnitude of order greater than the copper FEQG. The copper FEQG guideline is the most restrictive guideline and based on current science and site-specific conditions, whereas the CCME guideline is quite dated and does not incorporate the use of site-specific environmental modifying factors. As there are background concentrations of copper that do exceed the copper FEQG, there is the potential that biota may already be stressed due to these exceedances. However, there is not currently enough baseline characterization data within the immediate receiving environment to conclude the level of risk to receptors and if there are consistent exceedances of water quality guidelines. Following the principles of the Precautionary Approach, to be conservative Denison are expected to: A) Update the screening criteria used for the EIS and ERA (and all relevant tables) to utilize the more stringent FEQG guideline of 0.0002 mg/L as calculated using the currently available baseline data. B) Update the ERA effects assessment for copper to utilize the FEQG with regards to selected Toxicity Reference Values (TRVs) and risk characterization to receptors. C) Collect further baseline data in the immediate receiving environment (LA-5) to adequately characterize copper concentrations in water and sediment quality and any potential exceedances of baseline water quality guidelines.	project, as reported in Table 8.2.2 of Chapter 8 of the final EIS. Nitrate concentrations are thus expected to remain at baseline levels in future centuries. A note has been added to Table 8.2-14 to indicate that nitrate is not a COPC in the future centuries and as such is expected to remain at baseline levels. **Alkalinity:** was included in the Geochemical Reactive Transport Model (Appendix 7C of the Final EIS) but not included in the future centuries assessment in IMPACT. Using the output from the geochemical reactive transport model (i.e., the mass flux of alkalinity, reported as "C" in Table 4-4 of Appendix 7C of the Final EIS), the approach and input parameters used in the IMPACT model (described in Appendix A to Appendix 10-A of the Final EIS), and assuming that alkalinity (as bicarbonate ion primarily at the circumneutral pH value Whitefish Lake) does not interact with the sediments, maximum alkalinity values in Whitefish Lake (LA-5) were calculated to be 8.1 mg/L as $CaCO_3$ versus the mean baseline value of 7.7 mg/L as $CaCO_3$ (Table 8.2-2 of Chapter 8 of the Final EIS). This value has been included in Table 8-2.14, is within the range of baseline alkalinity values observed in that lake (3-15 mg/L as $CaCO_3$ in Whitefish Lake South (LA-5)) and represents a 5.2 % increase from mean baseline concentrations. The alkalinity in the future centuries was not calculated for the other lakes as changes with respect to baseline conditions will be negligible (i.e., not outside of the range of values in each lake observed at baseline). **U-234 and U-238**: Uranium was modelled in the future centuries scenario and U-234 and U-238 (Bq/L) were calculated. The results have been added to Table 8.2-14. B) Uranium long-term screening value was

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										updated to be consistent with all other tables Footnotes: A) Footnotes for each table have been updated B) All table acronyms have been explained as applicable. C) Acronyms that were not used in a table were removed from the footnotes D) "*" has been removed from the document where explaining ammonia concentration calculation. E) Confirmed that this statement was correct. Footnote 4 was removed from all tables, and all footnote numbering adjusted to reflect changes. F) TDS and "Narrative" footnotes were removed. Footnote 7 was missing in the table, so was added. Footnote 4 removed from all tables. 2) A) The screening criteria used for the EIS and ERA (and all relevant tables) has been updated to utilize the more stringent FEQG guideline of 0.0002 mg/L. See Attachment IR-114 Round 4. B) The TRVs have been re-evaluated using the FEQG Biotic Ligand Model. See Attachment IR-114 Round 4. C) Denison is committed to collection of further baseline data in the immediate receiving environment (LA-5) to adequately characterize copper concentrations in water (refer to response to Round 4 IR-107 for water quality results from Whitefish Lake from June to September 2024) and sediment quality and any potential exceedances of water quality guidelines and this information will be further presented and analyzed as part of licencing.

Attachment: IR-114 (included in Round 1 Submission)

1) Please see updated Tables 8.2-9 and 8.2-10 from the draft EIS below. Water quality predictions for the well mixed portion of LA-5 for each of the three flow scenarios (described in Section 8.2.4.2.3 and Table 8.2-7 of the draft EIS) are provided in the updated Table 8.2-10 below. Predicted site discharge concentrations that exceed respective receiver WQOs are bolded. Chloride, sulphate, TDS, arsenic, cadmium, chromium, cobalt, copper, selenium, and uranium, thorium-230, radium-226, lead-210, and polonium-210 predicted discharge concentrations are above receiver WQOs. However, under all three flow scenarios, the predicted water quality for all constituents is below respective WQOs within the well mixed portion of LA-5, indicating that sufficient dilution is present within LA-5 to meet objectives. Updated Table 8.2-13 is provided below. Water quality predictions have been added for MDMER constituents listed under Schedule 4 and Schedule 5. There are no predicted exceedances of water quality guidelines for any of the COPCs during Construction, Operation, or Decommissioning

2) The predictive water quality analysis considered the effects of toxicity modifying factors, such as hardness, on water quality. Specifically, the analysis considered induced hardness - that is hardness that is derived from or includes contributions from on site sources and in this case discharge from the IWWTP. It is a reasonable in this case to utilize induced hardness since the water quality assessment directly considers the potential effect of IWWTP discharge on the receiving environment. The hardness added to the receiver from the discharge represents a constant source during periods of discharge. The effluent hardness value used in the analysis was derived from bench scale testing and is considered to be a reasonable estimate of expected hardness in effluent. With that in mind, the predictive water quality analysis reflects the water quality conditions that are anticipated to prevail in the receiver and therefore presents an appropriate platform on which to base the effects assessment.

3) The table below (IR-114 Table 1) shows a summary of baseline concentrations of total mercury in surface water within the LSA. Sediment was not analyzed for mercury during previous baseline surveys. Baseline water quality in the LSA and RSA showed no indication of total mercury present above detectable limits and as such, the potential for methyl-mercury to be detected was unlikely. Generally, 60 to 95% of total mercury concentrations in fish muscle tissues are present in the form of methyl-mercury. Table 8.5-2 of Section 8.5 of the EIS provides a full summary of tissue constituent concentrations for key species from the Icelander River and Russell Lake. A conservative approach of assuming 95% of mercury in the tissues is present in the methylated form could be used for comparative purposes. These data supplemented with more current baseline data for water, sediment and fish tissues specific to total and methyl-mercury prior to the onset of site development will provide a robust database for comparative purposes during the subsequent development and operation on site.

4) Consistent with CSA N288.1-20, Clause 5.1.5, atmospheric depositions to large water bodies such as lakes, are considered negligible; therefore, the air to surface water pathway has been excluded for the ecological risk assessment. The rationale for exclusion of atmospheric deposition to lakes and rivers is explained in detail in Section G9, Appendix G of the COG DRL Guidance Document (Hart, 2019). Typical transfer parameters from source to air and source to water are on a similar magnitude to each other. The transfer parameter from air to water is orders of magnitude lower indicating that atmospheric deposition to the lake would have a negligible effect. Rationale on the exclusion of the air to water pathway can be included in the ERA in Appendix 10-A. The

following statement will be added to Section 2.2 in Appendix A to Appendix 10-A "Atmospheric deposition to Whitefish Lake is considered negligible. This is consistent with the COG DRL guidance (COG, 2019) which shows (assuming a modest flow rate for a lake of 0.1 m/s and an assumed water depth of 10 m) that the transfer of constituents from the atmosphere to large bodies of water (including lakes and rivers) is considered negligible."

As baseline surface water did not identify measurable concentrations of total mercury in the LSA or RSA (See IR-114 Table 1 below) and deposition to large water bodies such as lakes is not likely to contribute to the methyl mercury concentration in the Wheeler River receiving waters, it is most reasonable to conclude that changes in total and methyl mercury can be adequately monitored in relation to sulphate inputs. Denison will undertake monitoring of total and methyl mercury as it relates to the discharge of sulphate to Whitefish Lake.

References: Hart, D. 2019. Derived Release Limits Guidance. COG-06-3090R4-I

Table 8.2-9: Predicted Effluent Water Quality (Updated to include MDMER Constituents)

Constituent	Unit	Discharge Concentration (max predicted)
Chloride	mg/L	**600**
Sulphate (Hardness)	mg/L	**3915**
Sulphate	mg/L	**3915**
TDS	mg/L	**6420**
TSS	mg/L	6
Arsenic	mg/L	**0.006**
Cadmium	mg/L	**0.0018**
Chromium	mg/L	**0.025**
Cobalt	mg/L	**0.0030**
Copper	mg/L	**0.022**
Lead	mg/L	0.0003
Molybdenum	mg/L	2.5
Nickel	mg/L	0.014
Selenium	mg/L	**0.042**
Uranium	mg/L	**0.057**
Vanadium	mg/L	0.059
Zinc	mg/L	0.042
Mercury	mg/L	0.000001
Ammonia (as N)	mg/L	3.9
Un-ionized Ammonia*	mg/L	0.0078
Phosphorus	mg/L	N/A
Thorium-230	Bq/L	**0.9**
Radium-226	Bq/L	**0.15**
Lead-210	Bq/L	**0.419**
Polonium-210	Bq/L	**0.15**

Note: * - Calculated value

Table 8.2-10: Near-field Receiving Water Quality Results (Updated to include MDMER Constituents)

Constituent	Unit	Screening Concentration	Source of Screening Concentration	Predicted Site Discharge Concentration	LA-5 Well Mixed (7Q10)	LA-5 Well Mixed (Monthly Low)	LA-5 Well Mixed (Average)
Chloride	mg/L	120	SEQG/CCME	**600**	10.06	6.18	4.69
Sulphate (Hardness)	mg/L	429	BC MOE*	**3915**	63.83	38.51	28.76
Sulphate	mg/L	128	BC MOE	**3915**	63.83	38.51	28.76
TDS	mg/L	500	SEQG	**6420**	131.41	90.06	74.13
TSS	mg/L	15	Schd 4 - MDMER	6	3.9	3.9	3.9
Arsenic	mg/L	0.01	SEQG/CCME	**0.006**	0.00020	0.00016	0.00014
Cadmium	mg/L	0.0003	SEQG/CCME*	**0.0018**	0.00005	0.00004	0.00003
Chromium	mg/L	0.001	SEQG/CCME	**0.025**	0.00090	0.001	0.00068
Cobalt	mg/L	0.0003	FEQG	**0.0030**	0.00015	0.00013	0.00012
Copper	mg/L	0.004	SEQG/CCME*	**0.022**	0.00055	0.00041	0.00036
Lead	mg/L	0.005	CCME	0.0003	0.0001	0.0001	0.0001
Molybdenum	mg/L	0.07	WHO	2.5	0.040	0.024	0.018
Nickel	mg/L	0.07	WHO	0.014	0.0003	0.0002	0.0002
Selenium	mg/L	0.001	SEQG/CCME	**0.042**	0.0008	0.001	0.0004
Uranium	mg/L	0.02	SEQG/CCME	**0.057**	0.0010	0.0006	0.0005
Vanadium	mg/L	0.12	FEQG	0.059	0.0011	0.0007	0.0005
Zinc	mg/L	0.1	FEQG**	0.042	0.0018	0.0015	0.0014
Mercury	mg/L	0.000026	SEQG/CCME	0.000001	0.00001	0.00001	0.00001
Ammonia (as N)	mg/L	5.74	SEQG/CCME	3.9	0.13	0.11	0.10
Un-ionized Ammonia	mg/L	1.00	MDMER Sched 4	0.0078	0.00008	0.00006	0.00006
Phosphorus	mg/L	0.015	BC MOE	N/A	0.01	0.01	0.01
Thorium-230	Bq/L	0.6	HC	**0.9**	0.024	0.019	0.016
Radium-226	Bq/L	0.11	SEQG	**0.15**	0.008	0.007	0.007
Lead-210	Bq/L	0.2	HC	**0.419**	0.026	0.024	0.023
Polonium-210	Bq/L	0.1	HC	**0.15**	0.007	0.006	0.006

Notes
(1) **Bolded values** are those that exceed the screening concentrations
Un-ionized ammonia calculated value
* Hardness induced guideline, assuming hardness >250 mg/L
** Hardness induced guideline, assuming hardness >250 mg/L, pH=7.0, DOC = 5.26 mg/L

Table 8.2-13: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water (Updated to include available MDMER Constituents)

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelander River	Russell Lake Inlet	Screening Concentration	Source of Screening Concentration
Chloride	mg/L	0.32	0.32	6.14	6.11	4.20	4.16	3.26	120	SEQG/CCME
Sulphate	mg/L	0.69	0.69	38.66	38.49	26.03	25.75	19.88	128	BC MOE
Arsenic	mg/L	0.00012	0.00011	0.00015	0.00015	0.00013	0.00013	0.00012	0.01	SEQG/CCME
Cadmium	mg/L	0.000024	0.000023	0.000040	0.000039	0.000033	0.000033	0.000030	0.0003	SEQG/CCME*
Chromium	mg/L	0.000530	0.0005	0.0007	0.0007	0.0007	0.0007	0.0006	0.001	SEQG/CCME
Cobalt	mg/L	0.000101	0.000101	0.000129	0.000128	0.000119	0.000119	0.000114	0.0003	FEQG
Copper	mg/L	0.00062	0.00062	0.00082	0.00082	0.00075	0.00075	0.00072	0.004	SEQG/CCME*
Lead	mg/L	0.000124	0.000114	0.000118	0.000130	0.000114	0.000114	0.000116	0.005	CCME
Molybdenum	mg/L	0.0001	0.0001	0.0243	0.0240	0.0158	0.0156	0.0118	0.07	WHO
Nickel	mg/L	0.00039	0.00038	0.00051	0.00050	0.00046	0.00046	0.00044	0.07	WHO
Selenium	mg/L	0.000034	0.00003	0.00043	0.00041	0.00026	0.00026	0.00020	0.001	SEQG/CCME
Uranium	mg/L	0.00003	0.00003	0.00057	0.00055	0.00034	0.00033	0.00025	0.02	SEQG/CCME
Vanadium	mg/L	0.00017	0.00015	0.00067	0.00056	0.00033	0.00033	0.00027	0.12	FEQG
Zinc	mg/L	0.00070	0.00069	0.00106	0.00103	0.00090	0.00090	0.00084	0.1	FEQG**
Ammonia (as N)	mg/L	0.01463	0.01463	0.05232	0.05215	0.03978	0.03950	0.03368	5.74	SEQG/CCME
Un-ionized Ammonia	mg/L	0.0000086	0.0000086	0.0000309	0.0000308	0.0000235	0.0000233	0.0000199	1.00	MDMER Sched 4
Thorium-230	Bq/L	0.01014	0.01012	0.01868	0.01854	0.01569	0.01563	0.01430	0.6	HC
Radium-226	Bq/L	0.0057	0.0056	0.0069	0.0067	0.0063	0.0063	0.0061	0.11	SEQG
Lead-210	Bq/L	0.0062	0.0057	0.0084	0.0083	0.0067	0.0067	0.0064	0.2	HC
Polonium-210	Bq/L	0.0063	0.0058	0.0067	0.0072	0.0062	0.0062	0.0062	0.1	HC
Mercury	mg/L	No background information or effluent concentration to model								
Aluminum		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
TSS		Will be mitigated through design and treatment and monitored as per CCME and MDMER Sched 4 criterion								MDMER Sched 4
Iron		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Thallium		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Manganese		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5
Phosphorus		Monitoring required under MDMER Schedule 5 - no criteria stipulated under this regulation								MDMER Sched 5

Notes

(1) Bolded values are those that exceed the screening concentrations

* Hardness induced guideline, assuming hardness >250 mg/L

** Hardness induced guideline, assuming hardness >250 mg/L, pH=7.0, DOC = 5.26 mg/L

Un-ionized ammonia represented by calculated values

IR-114 Table 1: Total and Dissolved Mercury Concentrations in the LSA and RSA

Parameter	Total Mercury, Dissolved	Total Mercury
Units	mg/L	mg/L
Total Count	40	59
Count (<RDL)	39	46
Minimum	<1.00E-05	<1.00E-07
5th Percentile	<1.00E-05	<8.20E-07
50th Percentile	<1.00E-05	<1.00E-05
95th Percentile	<1.00E-05	<1.00E-05
Maximum	<1.00E-05	<1.00E-05
Arithmetic Mean	<1.00E-05	<7.63E-06
StdDev	2.76E-12	3.70E-06
Std Error	0	4.81E-07
Geometric Mean	<1.00E-05	<5.38E-06
Geometric StdDev	1.	3.281

Notes:

1. The summary time is between 01-Jan-2010 and 31-Dec-2021.
2. The reporting locations are: "LA-1", "LA-1-Bottom", "LA-5", "LA-6", "LAB-1", "LAB-2", "SA-1", "SA-2", "SA-3", "SA-6".

Attachment IR-114 (included in Round 2 submission)

The requested tables have been updated to include water quality thresholds derived from receiving environment parameters (background) as well as effluent induced concentrations for completeness. Please see the tables below and updated in Section 8 of the EIS.

Table 8.2-9: Predicted Effluent Water Quality

Constituent	Unit	Predicted Discharge Concentrations (Max Expected)
General Chemistry, Nutrients and Anions		
Alkalinity	mg/L	12.4
Ammonia (as N)	mg/L	3.9
Un-Ionized Ammonia	mg/L	4.74
Hardness	mg/L (as CaCO3)	250
Conductivity	µS/cm	21.7
Nitrate	mg/L	0.249
pH	pH Unit	7
Phosphorus	mg/L	N/A
Sulphate	mg/L	2600
TDS	mg/L	6420
Temperature	deg C	16.5
TSS	mg/L	6
Chloride	mg/L	600
Metals		
Aluminum	mg/L	0.051
Arsenic	mg/L	0.006
Cadmium	mg/L	0.0018
Chromium	mg/L	0.025
Cobalt	mg/L	0.0027
Copper	mg/L	0.02
Cyanide	mg/L	NA
Iron	mg/L	0.0039
Lead	mg/L	0.0003
Manganese	mg/L	0.03
Mercury	mg/L	0.00001
Molybdenum	mg/L	2.5
Nickel	mg/L	0.0138
Selenium	mg/L	0.042
Strontium	mg/L	1.68
Thallium	mg/L	0.0006
Uranium	mg/L	0.057
Vanadium	mg/L	0.059
Zinc	mg/L	0.042
Radiological		
Lead-210	Bq/L	0.42
Polonium-210	Bq/L	0.15
Radium-226	Bq/L	0.15
Thorium-230	Bq/L	0.9
Uranium-238	Bq/L	0.7
Uranium-234	Bq/L	0.7

Table 8.2-10: Near-field Receiving Water Quality Results

Parameter	Units	Short-term Screening Criteria (background hardness)	Short-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Long-term Screening Criteria (background hardness)	Long-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Discharge Concentration (max predicted)	LA-5 Well Mixed (7Q10)	LA-5 Well Mixed (Monthly Low)	LA-5 Well Mixed (Average)
General Chemistry, Nutrients and Anions													
Alkalinity	mg/L	--	--	--	--	--	--	--		12.4	12.4	12.4	12.4
Ammonia (as N)	mg/L	--	--	--	--	5.74	5.74	SEQG/CCME	(4)	3.9	0.13	0.11	0.1
Un-Ionized Ammonia	mg/L	--	--	--	--	6.98	6.98	SEQG/CCME	(4)	4.74	0.08	0.05	0.03
Hardness	mg/L	--	--	--	--	--	--	--	--	250	9	8	7
Conductivity	µS/cm	--	--	--	--	--	--	--	--	21.7	21.7	21.7	21.7
Nitrate	mg/L	550	550	CCME		3	3	SEQG	--	0.249	0.249	0.249	0.249
pH	pH units	--	--	--	--	6.5-9.0	6.5-9.0	SEQG/CCME	--	7	7	7	7
Phosphorus	mg/L	--	--	--	--	0.02 - 0.035	0.02 - 0.035	CCME	(17)	0.03	0.0103	0.0102	0.0101
Sulphate	mg/L	--	--	--	--	128	429	BC MOE	(12)	2600	43	26	19
TDS	mg/L	--	--	--	--	500	500	SEQG	--	6420	131	90	74
Temperature	°C	--	--	--	--	ambient temp	ambient temp	--	--	16.5	15	15	15
TSS	mg/L	15	15	MDMER Schedule 4	(22)	background + 5 mg/L	background + 5 mg/L	CCME	--	6	4	4	4
Chloride	mg/L	640	640	SEQG/CCME	(6)	120	120	SEQG/CCME	(6)	600	10	6	5
Metals													
Aluminum	mg/L	--	--	--	--	0.1	0.1	SEQG/CCME	(5)	0.051	0.0	0.0	0.0
Arsenic	mg/L	0.1	0.1	[	--	0.005	0.005	SEQG/CCME	--	0.006	0.000	0.000	0.000
Cadmium	mg/L	0.00011	0.0053	SEQG/CCME	(18)	0.00004	0.00034	SEQG/CCME	--	0.0018	0.00005	0.00004	0.00003
Chromium	mg/L	--	--	--	--	0.001	0.001	SEQG/CCME		0.025	0.001	0.001	0.001
Cobalt	mg/L	--	--	--	--	0.000295	0.00149	FEQG	(10)	0.0027	0.000142	0.000125	0.000119
Copper	mg/L	0.0009	0.00004	SEQG	(19)	0.002	0.004	CCME	--	0.02	0.001	0.000	0.000
Cyanide	mg/L	--	--	--	--	--	--	--	--	N/A	0.0	0.0	0.0
Iron	mg/L	--	--	--	--	0.3	0.3	SEQG/CCME	--	0.0039	0.178	0.179	0.180
Lead	mg/L	--	--	--	--	0.001	0.007	SEQG/CCME	(8)	0.0003	0.000	0.000	0.000
Manganese	mg/L	0.501	15	CCME	(3)	0.26	0.64	SEQG/CCME	(3)	0.03	0.020	0.020	0.020
Mercury	mg/L	--	--	--	--	0.000026	0.000026	CCME	--	0.00001	0.000010	0.000010	0.000010
Molybdenum	mg/L	--	--	--	--	0.07	0.07	WHO	(16)	2.5	0.04	0.02	0.02
Nickel	mg/L	--	--	--	--	0.07	0.07	WHO	(16)	0.0138	0.00	0.00	0.00
Selenium	mg/L	--	--	--	--	0.001	0.001	CCME	--	0.042	0.001	0.001	0.000
Strontium	mg/L	--	--	--	--	205	2.5	FEQG	(11)	1.68	0.04	0.03	0.03
Thallium	mg/L	--	--	--	--	0.0008	0.0008	SEQG/CCME	--	0.0006	0.0002	0.0002	0.0002
Uranium	mg/L	0.033	0.033	CCME		0.015	0.015	SEQG/CCME	--	0.057	0.001	0.001	0.001
Vanadium	mg/L	--	--	--	--	0.12	0.12	FEQG	(13)	0.059	0.0011	0.0007	0.00
Zinc	mg/L	0.008	0.204	CCME	(9)(20)	0.007	0.058	CCME	(9)(23)	0.042	0.002	0.001	0.001
Radiological													
Lead-210	Bq/L	--	--	--	--	0.2	0.2	HC	--	0.42	0.026	0.024	0.023
Polonium-210	Bq/L	--	--	--	--	0.1	0.1	HC	--	0.15	0.007	0.006	0.006
Radium-226	Bq/L	--	--	--	--	0.11	0.11	SEQG	--	0.15	0.008	0.007	0.007
Thorium-230	Bq/L	--	--	--	--	0.6	0.6	HC	--	0.9	0.024	0.019	0.016
Uranium-238	Bq/L	--	--	--	--	3	3	HC	--	0.7	0.013	0.008	0.006
Uranium-234	Bq/L	--	--	--	--	3	3	HC	--	0.7	0.013	0.008	0.006

Notes:

(1) Saskatchewan Water Quality Objectives, SEQG on-line (https://envrbrportal.crmp.saskatchewan.ca/seqg-search/), SEQG for the protection of aquatic life were selected, based on total concentrations, a temperature of 15°C and a pH of 7.0.

(2) Hardness dependent WQOs are for very soft water (hardness <25 mg $CaCO_3$/L). Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

(3) Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life - Manganese, Appendix B - Canadian Water Quality Guidelines Calculator (pH = 7.5, hardness = 15 mg/L). Guideline is based on dissolved manganese. Benchmark = exp(0.878[ln(hardness)] + 4.76) where the benchmark is expressed in dissolved manganese concentration (µg/L), and hardness is measured as CaCO3 equivalents in mg/L.

(4) Total ammonia-N calculated from the total ammonia guideline for a temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf)

(5) Based on a pH of >6.5.

(6) Based on water hardness >0 to <17 mg/L.

(7) Based on water hardness >0 to <82 mg/L.

(8) Based on water hardness >0 to ≤60 mg/L equation used at hardness of 5.26. At hardness >180 mg/L, the CWQG is 7 µg/L

(9) Guideline is based on dissolved zinc.

(10) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and site-specific baseline hardness of 15 mg/L.

(11) ECCC 2020. Federal Environmental Quality Guidelines Strontium. July.

(12) BC MECCS 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf

(13) Environment Canada 2016. Federal Environmental Quality Guidelines, Vanadium. May.

(14) Health Canada 2020. Guidelines for Canadian Drinking Water Quality Summary Table. September. https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/summary-table-EN-2020-02-11.pdf

(15) BC MECCS 2020. Source Drinking Water Quality Guidelines, Guideline Summary Ministry of Environment & Climate Change Strategy Water Protection & Sustainability Branch .

(16) WHO 2017. Guidelines for Drinking Water Quality. Fourth Edition Incorporating The First Addendum.

(17) Framework - guideline for meso-eutrophic waterbody 20-35 µg/L

(18) Based on water hardness of >0 to <5.3 mg/L

(19) Based on hardness of 5 mg/L (Short-term equation is $(e^{(0.979123[\ln(\text{hardness})]-8.64497)})*1000$ (SEGQ via AEP 1996b)

(20) Based on benchmark = exp(0.833[ln(hardness mg·L-1)] + 0.240[ln(DOC mg·L-1)] + 0.526). Site-specific background hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6). Site-specific DOC is 2.2 (arithmetic mean for LA-5 and LA-6), induced hardness of 250.5 used as upper limit of extrapolation available.

(21) based on water hardness of > 250 mg/L ($CaCO_3$) (251 mg/L)

(22) MDMER Schedule 4 - maximum authorized monthly mean concentration

(23) Bold numbers indicate exceedance of long-term criteria

SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.

CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

SSWQO – Saskatchewan Surface Water Quality Objectives.

DOC – Dissolved organic carbon.

TDS – Total dissolved solids.

TKN – Total Kjeldahl Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.

Table 8.2-13: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelander River	Russell Lake Inlet	Screening Criteria	Source of Screening Concentration	Notes
Alkalinity(1)	mg/L	NE	NE	12.4	12.4	NE	NE	NE	--	--	
Aluminum	mg/L	0.01766	0.01616	0.01835	0.02226	0.01500	0.01499	0.01614		MDMER Sched 5	(5)
Ammonia (as N)	mg/L	0.01463	0.01463	0.05232	0.05215	0.03978	0.0395	0.03368	5.74	SEQG/CCME	(4)
Un-ionized Ammonia	mg/L	0.01770	0.01770	0.06331	0.06310	0.04813	0.04780	0.04075	6.98	SEQG/CCME	(4)
Arsenic	mg/L	0.00012	0.00011	0.00015	0.00015	0.00013	0.00013	0.00012	0.005	SEQG/CCME	
Cadmium	mg/L	0.000024	0.000023	0.00004	0.000039	0.000033	0.000033	0.00003	0.0003	SEQG/CCME*	
Chloride	mg/L	0.32	0.32	6.14	6.11	4.2	4.16	3.26	120	SEQG/CCME	(6)
Chromium	mg/L	0.00053	0.0005	0.0007	0.0007	0.0007	0.0007	0.0006	0.001	SEQG/CCME	
Cobalt	mg/L	0.000101	0.000101	0.000129	0.000128	0.000119	0.000119	0.000114	0.0003	FEQG	(10)
Copper	mg/L	0.00062	0.00062	0.00082	0.00082	0.00075	0.00075	0.00072	0.004	SEQG/CCME*	
Iron	mg/L	0.0467	0.0424	0.0470	0.0567	0.0400	0.0400	0.0425		MDMER Sched 5	
Lead	mg/L	0.000124	0.000114	0.000118	0.00013	0.000114	0.000114	0.000116	0.005	CCME	(8)
Lead-210	Bq/L	0.0062	0.0057	0.0084	0.0083	0.0067	0.0067	0.0064	0.2	HC	
Manganese	mg/L	0.001674	0.001524	0.001722	0.001867	0.001593	0.001590	0.001593	0.64	SEQG/CCME	(3)
Mercury	mg/L	0.0000053	0.0000053	0.0000053	0.0000053	0.0000053	0.0000053	0.0000053	0.000026	CCME	
Molybdenum	mg/L	0.0001	0.0001	0.0243	0.024	0.0158	0.0156	0.0118	0.07	WHO	(16)
Nickel	mg/L	0.00039	0.00038	0.00051	0.0005	0.00046	0.00046	0.00044	0.07	WHO	(16)
Nitrate(1)	mg/L	NE	NE	0.249	0.249	NE	NE	NE	3	SEQG	
Phosphorus(1)	mg/L	<0.01	<0.01	0.01	0.01	0.01	<0.01	<0.01	0.02 - 0.035	CCME	(17)
Polonium-210	Bq/L	0.0063	0.0058	0.0067	0.0072	0.0062	0.0062	0.0062	0.1	HC	
Radium-226	Bq/L	0.0057	0.0056	0.0069	0.0067	0.0063	0.0063	0.0061	0.11	SEQG	
Selenium	mg/L	0.000034	0.00003	0.00043	0.00041	0.00026	0.00026	0.0002	0.001	SEQG/CCME	
Sulphate	mg/L	0.69	0.69	38.66	38.49	26.03	25.75	19.88	128	BC MOE	(12)
Thallium	mg/L	9.97E-05	9.96E-05	1.04E-04	1.04E-04	1.03E-04	1.03E-04	1.02E-04	0.0008	SEQG/CCME	
Thorium-230	Bq/L	0.01014	0.01012	0.01868	0.01854	0.01569	0.01563	0.0143	0.6	HC	
TSS	mg/L	1.60	1.60	1.65	1.65	1.63	1.63	1.63	background + 5 mg/L	CCME	
Un-ionized Ammonia	mg/L	0.0000086	0.0000086	0.0000309	0.0000308	0.0000235	0.0000233	0.0000199	1	MDMER Sched 4	
Uranium	mg/L	0.00003	0.00003	0.00057	0.00055	0.00034	0.00033	0.00025	0.02	SEQG/CCME	
Vanadium	mg/L	0.00017	0.00015	0.00067	0.00056	0.00033	0.00033	0.00027	0.12	FEQG	(13)
Zinc	mg/L	0.0007	0.00069	0.00106	0.00103	0.0009	0.0009	0.00084	0.007	FEQG	(9)

Notes

Notes

Estimates of mercury concentration are based on 50% of the detection limit in both background and effluent.

(1) Estimated from near-field model

NE = No estimate for this lake for this parameter

Saskatchewan Water Quality Objectives, SEQG on-line (https://envrbrportal.crmp.saskatchewan.ca/seqg-search/), SEQG for the protection of aquatic life were selected, based on total concentrations, a temperature of 15°C and a pH of 7.0.

Hardness dependent WQOs are for very soft water (hardness <25 mg $CaCO_3$/L). Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

(4) Total ammonia-N calculated from the total ammonia guideline for a temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf)

(5) Based on a pH of >6.5.

(6) Based on water hardness >0 to <17 mg/L.

(7) Based on water hardness >0 to <82 mg/L.

(8) Based on water hardness >0 to ≤60 mg/L equation used at hardness of 5.26. At hardness >180 mg/L, the CWQG is 7 µg/L

(9) Guideline is based on dissolved zinc.

(10) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and site-specific baseline hardness of 15 mg/L.

(11) ECCC 2020. Federal Environmental Quality Guidelines Strontium. July.

(12) BC MECCS 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf

(13) Environment Canada 2016. Federal Environmental Quality Guidelines, Vanadium. May.

(14) Health Canada 2020. Guidelines for Canadian Drinking Water Quality Summary Table. September. https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/summary-table-EN-2020-02-11.pdf

(15) BC MECCS 2020. Source Drinking Water Quality Guidelines, Guideline Summary Ministry of Environment & Climate Change Strategy Water Protection & Sustainability Branch .

(16) WHO 2017. Guidelines for Drinking Water Quality. Fourth Edition Incorporating The First Addendum.

(17) Framework - guideline for meso-eutrophic waterbody 20-35 µg/L

Attachment IR-114 (Round 3 submission)

Updated tables as requested by ECCC for the following:

- Table 8.2-8;
- Table 8.2-10;
- Table 8.2-13; and,
- Table 8.2-14.

Table** Error! No text of specified style in document.**-1: Summary of Background Water Quality Screening Criteria

Parameter	Units	Short-term Screening Criteria (background hardness)	Short-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Long-term Screening Criteria (background hardness)	Long-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note
General Chemistry, Nutrients and Anions									
Alkalinity	mg/L	--	--	--	--	--	--	--	
Ammonia (as N)	mg/L	--	--	--	--	5.74	5.74	SEQG/CCME	(2)
Un-Ionized Ammonia	mg/L	--	--	--	--	0.019	0.019	SEQG/CCME	
Hardness	mg/L	--	--	--	--	--	--	--	--
Conductivity	µS/cm	--	--	--	--	--	--	--	--
Nitrate	mg/L	550	550	CCME		3	3	SEQG	--
pH	pH units	--	--	--	--	6.5-9.0	6.5-9.0	SEQG/CCME	--
Phosphorus	mg/L	--	--	--	--	0.004-0.01	0.004-0.01	CCME	(10)
Sulphate	mg/L	--	--	--	--	128	429	BC MOE	
TDS	mg/L	--	--	--	--	500	500	SEQG	--
Temperature	°C	--	--	--	--	ambient temp	ambient temp	--	--
TSS	mg/L	15	15	MDMER Schedule 4	(11)	background + 5 mg/L	background + 5 mg/L	CCME	--
Chloride	mg/L	640	640	SEQG/CCME	(4)	120	120	SEQG/CCME	
Metals									
Aluminum	mg/L	--	--	--	--	0.1	0.1	SEQG/CCME	(1)
Arsenic	mg/L	0.1	0.1	MDMER Schedule 4		0.005	0.005	SEQG/CCME	--
Cadmium	mg/L	0.00011	0.0053	SEQG/CCME	(3)	0.00004	0.00034	SEQG/CCME	--
Chromium	mg/L	--	--	--	--	0.001	0.001	SEQG/CCME	(5)
Cobalt	mg/L	--	--	--	--	0.00078	0.00149	FEQG	(15)(16)
Copper	mg/L	0.0009	0.00004	SEQG	(6)	0.002	0.004	CCME	(7)
Cyanide	mg/L	--	--	--	--	--	--	--	--
Iron	mg/L	--	--	--	--	0.3	0.3	SEQG/CCME	--
Lead	mg/L	--	--	--	--	0.001	0.007	SEQG/CCME	
Manganese	mg/L	0.501	15	CCME	(8)	0.21	0.64	SEQG/CCME	(9)
Mercury	mg/L	--	--	--	--	0.000026	0.000026	CCME	--
Molybdenum	mg/L	--	--	--	--	0.073	0.073	CCME	
Nickel	mg/L	--	--	--	--	0.025	0.025	CCME	
Selenium	mg/L	--	--	--	--	0.001	0.001	CCME	--
Strontium	mg/L	--	--	--	--	2.5	2.5	FEQG	
Thallium	mg/L	--	--	--	--	0.0008	0.0008	SEQG/CCME	--
Uranium	mg/L	0.033	0.033	CCME		0.015	0.015	SEQG/CCME	--
Vanadium	mg/L	--	--	--	--	0.12	0.12	FEQG	
Zinc	mg/L	0.008	0.204	CCME	(12)(13)	0.013	0.058	CCME	(14)
Radiological									
Lead-210	Bq/L	--	--	--	--	0.2	0.2	HC	--
Polonium-210	Bq/L	--	--	--	--	0.1	0.1	HC	--
Radium-226	Bq/L	--	--	--	--	0.11	0.11	SEQG	--
Thorium-230	Bq/L	--	--	--	--	0.6	0.6	HC	--
Uranium-238	Bq/L	--	--	--	--	3	3	HC	--
Uranium-234	Bq/L	--	--	--	--	3	3	HC	--

Notes:

All parameters listed as total concentrations unless otherwise specified

Saskatchewan Water Quality Objectives, SEQG on-line (https://envrbrportal.crmp.saskatchewan.ca/seqg-search/), SEQG for the protection of aquatic life were selected, based on total concentrations

Bold numbers indicate exceedance of long-term criteria

Bold and italicized indicate exceedance of short-term criteria and long-term criteria.

SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.

CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

SSWQO – Saskatchewan Surface Water Quality Objectives.

DOC – Dissolved organic carbon.

TDS – Total dissolved solids.

TKN – Total Kjeldahl Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.

Narrative – Temperature - Maximum Weekly Average Temperature: Thermal additions to receiving waters should be such that the maximum weekly average temperature is not exceeded. Short-term Exposure to Extreme Temperature: Thermal additions to receiving waters should be such that the short-term exposures to maximum temperatures are not exceeded. Exposures should not be so lengthy or frequent as to adversely affect the important species.

* A pH of 7 and a temperature of 15^{o}C were assumed to convert total ammonia to un-ionized ammonia in accordance with CCME (2002).

(1) Long-term criterion for aluminum based on CCME/SEQG of 0.1 mg/L for dissolved aluminum when pH is greater than 6.5.

(2) Total ammonia-N calculated from the total ammonia guideline for an average annual temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH, Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf).

(3) Based on water hardness of >0 to <5.3 mg/L (Site-specific background hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

(4) Based on water hardness >0 to <17 mg/L.

(5) Guideline specific to Chromium VI for conservative comparison to baseline water quality

(6) Based on hardness of 5.26 mg/L (Short-term equation is ($e^{[0.979123[\ln(\text{hardness})]-8.64497}$)*1000 (SEGQ via AEP 1996b)

(7) Federal Water Quality Guideline for Copper Biotic Ligand Model (BLM) Tool and User Manual, (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6)

(8) Short Term Guideline is based on dissolved manganese. Benchmark = exp(0.878[ln(hardness)] + 4.76) where the benchmark is expressed in dissolved manganese concentration (µg/L), and hardness is measured as CaCO3 equivalents in mg/L. (Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

(9) Long-term guideline for manganese based on Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life - Manganese, Appendix B - Canadian Water Quality Guidelines Calculator (pH = 6.61, hardness = 5.26 mg/L.

(10) Framework provides Trigger Ranges for Total Phosphorus (µg/L) - guideline for oligotrophic waterbody 4 - 10 µg/L

(11) MDMER Schedule 4 - maximum authorized monthly mean concentration

(12) Guideline is based on dissolved zinc.

(13) Short term guideline is based on Benchmark = exp(0.833[ln(hardness mg·L-1)] + 0.240[ln(DOC mg·L-1)] + 0.526). (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6). Note – extrapolated for value outside the hardness range.

(14) Long term guideline is based on CWQG = exp(0.947[ln(hardness mg·L-1)] - 0.815[pH] + 0.398[ln(DOC mg·L-1)] + 4.625). (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6). Note – extrapolated for value outside the hardness range.

(15) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and lowest hardness for equation of 52 mg/L

(16) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt. Based on equation and hardness of 250 mg/L for equation of FWQG = exp{(0.414[ln(hardness)] – 1.887}.

Table 8.2-10: Near-field Receiving Water Quality Results

Parameter	Units	Short-term Screening Criteria (background hardness)	Short-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Long-term Screening Criteria (background hardness)	Long-term Screening Criteria (Hardness induced [>250 mg/L])	Source	Note	Discharge Concentration (max predicted)	LA-5 Well Mixed (7Q10)	LA-5 Well Mixed (Monthly Low)	LA-5 Well Mixed (Average)
General Chemistry, Nutrients and Anions													
Alkalinity	mg/L	--	--	--	--	--	--	--		12.4	12.4	12.4	12.4
Ammonia (as N)	mg/L	--	--	--	--	5.74	5.74	SEQG/CCME	(2)	3.9	0.13	0.11	0.1
Un-Ionized Ammonia	mg/L	--	--	--	--	0.019	0.019	SEQG/CCME		0.0129	0.0004	0.0003	0.0003
Hardness	mg/L	--	--	--	--	--	--	--	--	250	9	8	7
Conductivity	µS/cm	--	--	--	--	--	--	--	--	21.7	21.7	21.7	21.7
Nitrate	mg/L	550	550	CCME		3	3	SEQG	--	0.249	0.249	0.249	0.249
pH	pH units	--	--	--	--	6.5-9.0	6.5-9.0	SEQG/CCME	--	7	7	7	7
Phosphorus	mg/L	--	--	--	--	0.004-0.01	0.004-0.01	CCME	(10)	0.01	0.005	0.005	0.005
Sulphate	mg/L	--	--	--	--	128	429	BC MOE		2600	43	26	19
TDS	mg/L	--	--	--	--	500	500	SEQG	--	6420	131	90	74
Temperature	°C	--	--	--	--	ambient temp	ambient temp	--	--	16.5	15	15	15
TSS	mg/L	15	15	MDMER Schedule 4	(11)	background + 5 mg/L	background + 5 mg/L	CCME	--	6	4	4	4
Chloride	mg/L	640	640	SEQG/CCME	(4)	120	120	SEQG/CCME		600	10	6	5
Metals													
Aluminum	mg/L	--	--	--	--	0.1	0.1	SEQG/CCME	(1)	0.051	0.01	0.01	0.01
Arsenic	mg/L	0.1	0.1	MDMER Schedule 4		0.005	0.005	SEQG/CCME	--	0.006	0.0002	0.0002	0.0001
Cadmium	mg/L	0.00011	0.0053	SEQG/CCME	(3)	0.00004	0.00034	SEQG/CCME	--	0.0018	0.00005	0.00004	0.00003
Chromium	mg/L	--	--	--	--	0.001	0.001	SEQG/CCME	(5)	0.025	0.001	0.001	0.001
Cobalt	mg/L	--	--	--	--	0.00078	0.00149	FEQG	(15)(16)	0.0027	0.000142	0.000125	0.000119
Copper	mg/L	0.0009	0.00004	SEQG	(6)	0.002	0.004	CCME	(7)	0.02	0.001	0.0004	0.0004
Cyanide	mg/L	--	--	--	--	--	--	--	--	N/A	--	--	--
Iron	mg/L	--	--	--	--	0.3	0.3	SEQG/CCME	--	0.0039	0.178	0.179	0.180
Lead	mg/L	--	--	--	--	0.001	0.007	SEQG/CCME		0.0003	0.000	0.000	0.000
Manganese	mg/L	0.501	15	CCME	(8)	0.21	0.64	SEQG/CCME	(9)	0.03	0.020	0.020	0.020
Mercury	mg/L	--	--	--	--	0.000026	0.000026	CCME	--	0.00001	0.000010	0.000010	0.000010
Molybdenum	mg/L	--	--	--	--	0.073	0.073	CCME		2.5	0.04	0.02	0.02
Nickel	mg/L	--	--	--	--	0.025	0.025	CCME		0.0138	0.0003	0.0002	0.0002
Selenium	mg/L	--	--	--	--	0.001	0.001	CCME	--	0.042	0.001	0.001	0.000
Strontium	mg/L	--	--	--	--	2.5	2.5	FEQG		1.68	0.04	0.03	0.03
Thallium	mg/L	--	--	--	--	0.0008	0.0008	SEQG/CCME	--	0.0006	0.0002	0.0002	0.0002
Uranium	mg/L	0.033	0.033	CCME		0.015	0.015	SEQG/CCME	--	0.057	0.001	0.001	0.001
Vanadium	mg/L	--	--	--	--	0.12	0.12	FEQG		0.059	0.0011	0.0007	0.00
Zinc	mg/L	0.008	0.204	CCME	(12)(13)	0.013	0.058	CCME	(14)	0.042	0.002	0.001	0.001
Radiological													
Lead-210	Bq/L	--	--	--	--	0.2	0.2	HC	--	0.42	0.026	0.024	0.023
Polonium-210	Bq/L	--	--	--	--	0.1	0.1	HC	--	0.15	0.007	0.006	0.006
Radium-226	Bq/L	--	--	--	--	0.11	0.11	SEQG	--	0.15	0.008	0.007	0.007
Thorium-230	Bq/L	--	--	--	--	0.6	0.6	HC	--	0.9	0.024	0.019	0.016
Uranium-238	Bq/L	--	--	--	--	3	3	HC	--	0.7	0.013	0.008	0.006
Uranium-234	Bq/L	--	--	--	--	3	3	HC	--	0.7	0.013	0.008	0.006

Notes:

All parameters listed as total concentrations unless otherwise specified

Saskatchewan Water Quality Objectives, SEQG on-line (https://envrbrportal.crmp.saskatchewan.ca/seqg-search/), SEQG for the protection of aquatic life were selected, based on total concentrations

Bold numbers indicate exceedance of long-term criteria

Bold and italicized indicate exceedance of short-term criteria and long-term criteria.

SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.

CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

SSWQO – Saskatchewan Surface Water Quality Objectives.

DOC – Dissolved organic carbon.

TDS – Total dissolved solids.

TKN – Total Kjeldahl Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.

Narrative – Temperature - Maximum Weekly Average Temperature: Thermal additions to receiving waters should be such that the maximum weekly average temperature is not exceeded. Short-term Exposure to Extreme Temperature: Thermal additions to receiving waters should be such that the short-term exposures to maximum temperatures are not exceeded. Exposures should not be so lengthy or frequent as to adversely affect the important species.

* A pH of 7 and a temperature of 15^{o}C were assumed to convert total ammonia to un-ionized ammonia in accordance with CCME (2002).

(1) Long-term criterion for aluminum based on CCME/SEQG of 0.1 mg/L for dissolved aluminum when pH is greater than 6.5.

(2) Total ammonia-N calculated from the total ammonia guideline for an average annual temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH, Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf).

(3) Based on water hardness of >0 to <5.3 mg/L (Site-specific background hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

(4) Based on water hardness >0 to <17 mg/L.

(5) Guideline specific to Chromium VI for conservative comparison to baseline water quality

(6) Based on hardness of 5.26 mg/L (Short-term equation is ($e^{\{0.979123[\ln(\text{hardness})]-8.64497\}}$)*1000 (SEGQ via AEP 1996b)

(7) Federal Water Quality Guideline for Copper Biotic Ligand Model (BLM) Tool and User Manual, (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6)

(8) Short Term Guideline is based on dissolved manganese. Benchmark = exp(0.878[ln(hardness)] + 4.76) where the benchmark is expressed in dissolved manganese concentration (µg/L), and hardness is measured as CaCO3 equivalents in mg/L. (Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

(9) Long-term guideline for manganese based on Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life - Manganese, Appendix B - Canadian Water Quality Guidelines Calculator (pH = 6.61, hardness = 5.26 mg/L.

(10) Framework provides Trigger Ranges for Total Phosphorus (µg/L) - guideline for oligotrophic waterbody 4 - 10 µg/L

(11) MDMER Schedule 4 - maximum authorized monthly mean concentration

(12) Guideline is based on dissolved zinc.

(13) Short term guideline is based on Benchmark = exp(0.833[ln(hardness mg·L-1)] + 0.240[ln(DOC mg·L-1)] + 0.526). (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6). Note – extrapolated for value outside the hardness range.

(14) Long term guideline is based on CWQG = exp(0.947[ln(hardness mg·L-1)] - 0.815[pH] + 0.398[ln(DOC mg·L-1)] + 4.625). (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6). Note – extrapolated for value outside the hardness range.

(15) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and lowest hardness for equation of 52 mg/L

(16) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt. Based on equation and hardness of 250 mg/L for equation of FWQG = exp{(0.414[ln(hardness)] – 1.887}.

Table** Error! No text of specified style in document.**-2: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelander River	Russell Lake Inlet	Short-term Benchmark			Long-term Benchmark		
									Value	Reference	Notes	Value	Reference	Notes
Alkalinity	mg/L	NE	NE	12.4	12.4	NE	NE	NE						
Aluminum	mg/L	0.01766	0.01616	0.01835	0.02226	0.01500	0.01499	0.01614				0.1	SEQG/CCME	(1)
Ammonia (as N)	mg/L	0.01463	0.01463	0.05232	0.05215	0.03978	0.0395	0.03368				5.74	SEQG/CCME	(2)
Un-ionized Ammonia	mg/L	0.0000086	0.0000086	0.0000309	0.0000308	0.0000235	0.0000233	0.0000199				0.019	SEQG/CCME	
Arsenic	mg/L	0.00012	0.00011	0.00015	0.00015	0.00013	0.00013	0.00012	0.1	MDMER Schedule 4	(11)	0.005	SEQG/CCME	
Cadmium	mg/L	0.000024	0.000023	0.00004	0.000039	0.000033	0.000033	0.00003	29	CCME		1.5	SEQG/CCME	
Chloride	mg/L	0.32	0.32	6.14	6.11	4.2	4.16	3.26	640	SEQG/CCME	(3)	0.00004	SEQG/CCME	
Chromium	mg/L	0.00053	0.0005	0.0007	0.0007	0.0007	0.0007	0.0006				0.001	SEQG/CCME	(5)
Cobalt	mg/L	0.000101	0.000101	0.000129	0.000128	0.000119	0.000119	0.000114				0.00078	FEQG	(15)
Copper	mg/L	0.00062	0.00062	0.00082	0.00082	0.00075	0.00075	0.00072	0.0009	SEQG	(6)	0.002	CCME	
Iron	mg/L	0.0467	0.0424	0.0470	0.0567	0.0400	0.0400	0.0425						
Lead	mg/L	0.000124	0.000114	0.000118	0.00013	0.000114	0.000114	0.000116				0.001	SEQG/CCME	
Lead-210	Bq/L	0.0062	0.0057	0.0084	0.0083	0.0067	0.0067	0.0064						
Manganese	mg/L	0.001674	0.001524	0.001722	0.001867	0.001593	0.001590	0.001593	0.501	CCME	(8)	0.21	SEQG/CCME	(9)
Mercury	mg/L	0.0000053	0.0000053	0.0000053	0.0000053	0.0000053	0.0000053	0.0000053				0.000026	CCME	
Molybdenum	mg/L	0.0001	0.0001	0.0243	0.024	0.0158	0.0156	0.0118				0.07	CCME	
Nickel	mg/L	0.00039	0.00038	0.00051	0.0005	0.00046	0.00046	0.00044				0.025	CCME	
Nitrate	mg/L	NE	NE	0.249	0.249	NE	NE	NE	550	CCME		3	SEQG	
Phosphorus	mg/L	<0.01	<0.01	0.01	0.01	0.01	<0.01	<0.01				0.004 - 0.01	CCME	(10)
Polonium-210	Bq/L	0.0063	0.0058	0.0067	0.0072	0.0062	0.0062	0.0062				0.1	HC	
Radium-226	Bq/L	0.0057	0.0056	0.0069	0.0067	0.0063	0.0063	0.0061				0.11	SEQG	
Selenium	mg/L	0.000034	0.00003	0.00043	0.00041	0.00026	0.00026	0.0002				0.001	CCME	
Sulphate	mg/L	0.69	0.69	38.66	38.49	26.03	25.75	19.88				128	BC MOE	
Thallium	mg/L	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001				0.0008	SEQG/CCME	
Thorium-230	Bq/L	0.01014	0.01012	0.01868	0.01854	0.01569	0.01563	0.0143				0.6	HC	
TSS	mg/L	1.60	1.60	1.65	1.65	1.63	1.63	1.63	15	MDMER Schedule 4	(11)	background +5 mg/L	CCME	
Uranium	mg/L	0.00003	0.00003	0.00057	0.00055	0.00034	0.00033	0.00025	0.033	CCME		0.015	SEQG/CCME	
Uranium-234	Bq/L	0.000385	0.000377	0.00705	0.00672	0.00415	4.11E-03	3.09E-03						
Uranium-238	Bq/L	0.000385	0.000377	0.00705	0.00672	0.00415	4.11E-03	3.09E-03						
Vanadium	mg/L	0.00017	0.00015	0.00067	0.00056	0.00033	0.00033	0.00027				0.12	FEQG	
Zinc	mg/L	0.0007	0.00069	0.00106	0.00103	0.0009	0.0009	0.00084	0.008	CCME	(12)(13)	0.013	CCME	(14)

Notes:

All parameters listed as total concentrations unless otherwise specified

Saskatchewan Water Quality Objectives, SEQG on-line (https://envrbrportal.crmp.saskatchewan.ca/seqg-search/), SEQG for the protection of aquatic life were selected, based on total concentrations

Bold numbers indicate exceedance of long-term criteria

Bold and italicized indicate exceedance of short-term criteria and long-term criteria.

SEQG – Saskatchewan Environmental Quality Guidelines – Water Quality Guidelines for Freshwater Aquatic Life.

CWQG – Canadian Council of Ministers of the Environment – Canadian Water Quality Guidelines for the Protection of Aquatic Life.

SSWQO – Saskatchewan Surface Water Quality Objectives.

DOC – Dissolved organic carbon.

TDS – Total dissolved solids.

TKN – Total Kjeldahl Nitrogen.

TOC – Total organic carbon.

TSS – Total suspended solids.

Narrative – Temperature - Maximum Weekly Average Temperature: Thermal additions to receiving waters should be such that the maximum weekly average temperature is not exceeded. Short-term Exposure to Extreme Temperature: Thermal additions to receiving waters should be such that the short-term exposures to maximum temperatures are not exceeded. Exposures should not be so lengthy or frequent as to adversely affect the important species.

* A pH of 7 and a temperature of 15^{o}C were assumed to convert total ammonia to un-ionized ammonia in accordance with CCME (2002).

(1) Long-term criterion for aluminum based on CCME/SEQG of 0.1 mg/L for dissolved aluminum when pH is greater than 6.5.

(2) Total ammonia-N calculated from the total ammonia guideline for an average annual temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH, Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf).

(3) Based on water hardness of >0 to <5.3 mg/L (Site-specific background hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

(4) Based on water hardness >0 to <17 mg/L.

(5) Guideline specific to Chromium VI for conservative comparison to baseline water quality

(6) Based on hardness of 5.26 mg/L (Short-term equation is ($e^{\{0.979123[\ln(\text{hardness})]-8.64497\}}$)*1000 (SEGQ via AEP 1996b)

(7) Federal Water Quality Guideline for Copper Biotic Ligand Model (BLM) Tool and User Manual, (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6)

(8) Short Term Guideline is based on dissolved manganese. Benchmark = exp(0.878[ln(hardness)] + 4.76) where the benchmark is expressed in dissolved manganese concentration (µg/L), and hardness is measured as CaCO3 equivalents in mg/L. (Site-specific hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

(9) Long-term guideline for manganese based on Scientific Criteria Document for the Development of the Canadian Water Quality Guidelines for the Protection of Aquatic Life - Manganese, Appendix B - Canadian Water Quality Guidelines Calculator (pH = 6.61, hardness = 5.26 mg/L.

(10) Framework provides Trigger Ranges for Total Phosphorus (µg/L) - guideline for oligotrophic waterbody 4 - 10 µg/L

(11) MDMER Schedule 4 - maximum authorized monthly mean concentration

(12) Guideline is based on dissolved zinc.

(13) Short term guideline is based on Benchmark = exp(0.833[ln(hardness mg·L-1)] + 0.240[ln(DOC mg·L-1)] + 0.526). (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6). Note – extrapolated for value outside the hardness range.

(14) Long term guideline is based on CWQG = exp(0.947[ln(hardness mg·L-1)] - 0.815[pH] + 0.398[ln(DOC mg·L-1)] + 4.625). (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6). Note – extrapolated for value outside the hardness range.

(15) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and lowest hardness for equation of 52 mg/L.

Table** Error! No text of specified style in document.**-3: Maximum Concentration of Surface Water Constituents of Potential Concern in Surface Water During Future Centuries

Constituent	Unit	Kratchkowsky Lake (LA-7)	Whitefish Lake North (LA-6)	Whitefish Lake Middle (LA-5 North)	Whitefish Lake South (LA-5 South)	McGowan Lake (LA-1)	Icelander River	Russell Lake Inlet	Long-term Screening Concentration	Source of Screening Concentration	Notes
Aluminum	mg/L	0.01358	0.01358	0.01388	0.01373	0.0136	0.0136	0.01359	0.1	SEQG/CCME	(1)
Ammonia (as N)	mg/L	0.01463	0.01463	0.01463	0.01463	0.01463	0.01463	0.01463	5.74	SEQG/CCME	(2)
Un-ionized Ammonia	mg/L	0.000035	0.000035	0.000035	0.000035	0.000035	0.000035	0.000035	0.019	CCME	
Arsenic	mg/L	0.000103	0.000103	0.000107	0.000107	0.000105	0.000105	0.000104	0.005	SEQG/CCME	
Cadmium	mg/L	0.0000232	0.0000232	0.0000233	0.0000233	0.0000233	0.0000233	0.0000232	0.00004	SEQG/CCME*	
Chloride	mg/L	0.32	0.32	0.41	0.41	0.39	0.39	0.38	120	SEQG/CCME	
Chromium	mg/L	0.00052	0.00052	0.00053	0.00053	0.00052	0.00052	0.00052	0.001	SEQG/CCME	
Cobalt	mg/L	0.0001	0.0001	0.00011	0.00011	0.00011	0.0001	0.0001	0.00078	FEQG	(15)
Copper	mg/L	0.00062	0.00062	0.00063	0.00063	0.00062	0.00062	0.00062	0.002	CCME	
Iron	mg/L	0.12126	0.12126	0.12756	0.12672	0.12408	0.12405	0.12308	0.3	SEQG/CCME	
Lead	mg/L	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.001	SEQG/CCME	
Lead-210	Bq/L	0.00527	0.00527	0.00605	0.00592	0.00557	0.00556	0.00545	0.2	HC	
Manganese	mg/L	0.01206	0.01206	0.01419	0.01413	0.01355	0.01353	0.01317	0.21	SEQG/CCME	(9)
Mercury	mg/L	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000026	CCME	
Molybdenum	mg/L	0.00011	0.00011	0.00012	0.00012	0.00011	0.00011	0.00011	0.07	CCME	
Nickel	mg/L	0.00038	0.00038	0.00041	0.00041	0.0004	0.0004	0.00039	0.025	CCME	
Phosphorus	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.004 - 0.01	CCME	
Polonium-210	Bq/L	0.00536	0.00536	0.00615	0.00602	0.00566	0.00564	0.00553	0.1	HC	
Radium-226	Bq/L	0.00557	0.00557	0.00639	0.00637	0.00615	0.00614	0.006	0.11	SEQG	
Selenium	mg/L	0.00003	0.00003	0.00004	0.00004	0.00004	0.00004	0.00004	0.001	SEQG/CCME	
Sulphate	mg/L	0.69	0.69	0.72	0.72	0.71	0.71	0.71	128	BC MOE	
Thallium	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0008	SEQG/CCME	
Thorium-230	Bq/L	0.0101	0.0101	0.01036	0.01036	0.0103	0.0103	0.01025	0.6	HC	
TSS	mg/L	3.0	2.0	2.6	2.6	2.5	2.2	4.0	background +5 mg/L	CCME	
Uranium	mg/L	0.00003	0.00003	0.00004	0.00004	0.00003	0.00003	0.00003	0.02	SEQG/CCME	
Vanadium	mg/L	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.00015	0.12	FEQG	
Zinc	mg/L	0.00068	0.00068	0.00074	0.00074	0.00072	0.00072	0.00071	0.013	CCME	(14)

Notes:

All parameters listed as total concentrations unless otherwise specified

Saskatchewan Water Quality Objectives, SEQG on-line (https://envrbrportal.crmp.saskatchewan.ca/seqg-search/), SEQG for the protection of aquatic life were selected, based on total concentrations

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* A pH of 7 and a temperature of 15^{o}C were assumed to convert total ammonia to un-ionized ammonia in accordance with CCME (2002).

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(2) Total ammonia-N calculated from the total ammonia guideline for an average annual temperature of 15°C and a pH of 7.0, Un-ionized Ammonia from Table 1 of temperature and pH, Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (https://ccme.ca/en/res/ammonia-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf).

(3) Based on water hardness of >0 to <5.3 mg/L (Site-specific background hardness is 5.26 mg/L (95th percentile of LA-5 and LA-6).

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(14) Long term guideline is based on CWQG = exp(0.947[ln(hardness mg·L-1)] - 0.815[pH] + 0.398[ln(DOC mg·L-1)] + 4.625). (Site-specific background hardness is 5.26 mg/L, DOC is 2.24 mg/L, pH is 6.61 (95th percentile of LA-5 and LA-6). Note – extrapolated for value outside the hardness range.

(15) Environment Canada 2017. Federal Environmental Quality Guidelines, Cobalt, May. Based on equation and lowest hardness for equation of 52 mg/L.

Attachment IR-114 (Round 4)

Part 2 of IR-114 (Round 4) requested that Denison use the copper Federal Environmental Quality Guideline (FEQG). The copper FEQG guideline is the most restrictive guideline and based on current science and incorporates the use of site-specific environmental modifying factors.

A)
Baseline conditions for the Wheeler River include a background hardness of 5.26 mg/L, DOC of 2.24 mg/L, and pH of 6.61 (95th percentile of LA-5 and LA-6). Using ECCC's Biotic Ligand Model for copper, the calculated HC_5 is below 0.0002 mg/L, however, 0.0002 mg/L is considered by the FEQG to be the lowest concentration routinely measured and therefore replaces the calculated HC_5 value for this water chemistry. Therefore, at baseline conditions the FEQG is 0.0002 mg/L.

Table 3-1, Table 3-3, and Table 3-5 of the ERA (Appendix 10-A) were updated to include the copper FEQG of 0.0002 mg/L as the screening criterion. Likewise, Tables 8.2-2, 8.2-3, 8.2-10, 8.2-13 and 8.2-14 in Section 8 of the EIS were updated to include the copper FEQG of 0.0002 mg/L as the screening criteria.

B)
As identified in Section 5.3.1.1 of the ERA (Appendix 10-A), toxicity reference values (TRVs) for copper were obtained from the USEPA Ecotoxicology Database (ECOTOX) for aquatic organisms. The selected TRVs were 20% Effect Concentrations (i.e., EC_{20} values), which are concentrations at which only 20% of the test organisms respond. The TRVs are shown in Table IR-114-1 below. Where the TRVs derived from ECOTOX were lower than the CCME guideline the CCME guideline was selected.

Table IR-114-1: Copper Toxicity Reference Values Used for Aquatic Organisms in the ERA

COPC	Biotic Group	TRV	Unit	Rationale	Data Source
Copper	Forage fish	0.002	mg/L	5th percentile of estimated chronic EC_{20} distribution (n=237)	ECOTOX
	Predator fish	0.003	mg/L	5th percentile of estimated chronic EC_{20} distribution (n=89)	ECOTOX
	Zooplankton	*0.002*	mg/L	5th percentile of estimated chronic EC_{20} distribution (n=117)	ECOTOX; CCME
	Benthic invertebrates	*0.002*	mg/L	5th percentile of estimated chronic EC_{20} distribution (n=264)	ECOTOX; CCME
	Phytoplankton	0.0092	mg/L	5th percentile of estimated chronic EC_{20} distribution (n=101)	ECOTOX
	Aquatic plants	0.038	mg/L	5th percentile of estimated chronic EC_{20} distribution (n=28)	ECOTOX

As requested in IR-114, the TRVs have been re-evaluated using the FEQG and the BLM. The BLM was run based on baseline site-specific conditions. The test species and concentrations identified as used to generate the BLM were evaluated to develop TRVs for the applicable biotic groups. The most restrictive effect concentration for each biotic group was identified. The test endpoint was either an EC_{10} or an IC_{10}. Based on the protocol identified in Table 5-11 of the ERA, the EC_{10} (or IC_{10}) was multiplied by 2 to obtain an EC_{20}, which was then utilized as the TRV. A summary of the TRVs for baseline conditions is identified in Table IR-114-2.

Considering that while the facility is in operation it is expected that hardness will increase to approximately 250 mg/L and pH will increase to approximately 7, the BLM was re-run under updated site conditions and the TRVs were re-evaluated based on the test species and concentrations used to generate the BLM. The copper TRVs under site conditions are presented in Table IR-114-3.

Table IR-114-2: Copper Toxicity Reference Values from Baseline Conditions BLM

COPC	Biotic Group	TRV	Unit	Rationale	Data Source
Copper	Forage fish	0.0052	mg/L	Fathead minnow, growth (IC_{10} = 0.0026 mg/L)	FEQG BLM
	Predator fish	0.0008	mg/L	White sturgeon, growth (EC_{10} = 0.0004 mg/L)	FEQG BLM
	Zooplankton	0.0009	mg/L	Daphnia magna, reproduction (EC_{10} = 0.0004 mg/L)	FEQG BLM
	Benthic invertebrates	0.0004	mg/L	Pond snail, growth (EC_{10} = 0.0002 mg/L)	FEQG BLM
	Phytoplankton	0.0091	mg/L	Rotifer, intrinsic (EC_{10} = 0.0046 mg/L)	FEQG BLM

	Aquatic plants	0.0212	mg/L	Duckweed, root length (EC_{10} = 0.01 mg/L)	FEQG BLM

Notes:
BLM based on hardness of 5.26 mg/L, DOC of 2.24 mg/L, pH of 6.61, temperature of 13°C.
TRV is an EC_{20}, adjusted from an EC_{10} or IC_{10}.

Table IR-114-3: Copper Toxicity Reference Values from Site Conditions BLM

COPC	Biotic Group	TRV	Unit	Rationale	Data Source
Copper	Forage fish	0.025	mg/L	Fathead minnow, growth (IC_{10} = 0.012 mg/L)	FEQG BLM
	Predator fish	0.005	mg/L	White sturgeon, growth (EC_{10} = 0.002 mg/L)	FEQG BLM
	Zooplankton	0.005	mg/L	Daphnia magna, reproduction (EC_{10} = 0.003 mg/L)	FEQG BLM
	Benthic invertebrates	0.003	mg/L	Pond snail, growth (EC_{10} = 0.001 mg/L)	FEQG BLM
	Phytoplankton	0.040	mg/L	Rotifer, intrinsic (EC_{10} = 0.02 mg/L)	FEQG BLM
	Aquatic plants	0.014	mg/L	Duckweed, root length (EC_{10} = 0.007 mg/L)	FEQG BLM

Notes:
BLM based on hardness of 250 mg/L, DOC of 2.24 mg/L, pH of 7, temperature of 13°C.
TRV is an EC_{20}, adjusted from an EC_{10} or IC_{10}.

The hazard quotients (HQs) for aquatic organisms were re-evaluated using both sets of TRVs, baseline conditions and site conditions during operation where hardness and pH are increased (Table IR-114-4). Consistent with Section 5.4.1 of the ERA (Appendix 10-A) an HQ less than or equal to 1 suggests low risk to the ecological receptor, and an HQ above 1 needs further investigation to determine if adverse effects are possible. Conservatively using baseline conditions, HQs for all aquatic organisms are less than 1 with the exception of predator fish in Whitefish Lake, and benthic invertebrates at all locations where HQs are slightly above 1. As such, further consideration was given to changes in site conditions when the facility is in operation. Using more realistic site conditions for hardness and pH, HQs for all aquatic organisms are less than 1 at all locations, indicating no adverse effects to aquatic organisms from facility related copper. It is relevant to consider all aspects of the receiving environment and this includes induced hardness since the scenario being evaluated only occurs during periods of effluent discharge. This approach is used in other jurisdictions (e.g., water licences in northern Canada issued through local water boards) and therefore the concept of induced hardness is not unique.

The copper predictions in the ERA are considered conservative based on the following assumptions:

- Baseline concentrations of copper are predominantly below the detection limit, indicating that baseline concentrations of copper are likely overestimated in the ERA.
- The effluent predictions in the ERA are based on available information from test studies at the time the ERA was prepared. Denison will be refining the effluent quality through the BATEA assessment and licensing process.
- Based on the effluent quality and quantity released to Whitefish Lake, the maximum copper concentration in Whitefish Lake and downstream waterbodies was evaluated as part of the HQ. This is a conservative assumption.
- Once the facility is operational, site conditions will change which includes increased hardness and pH; therefore, the predicated HQs under baseline conditions are considered conservative and overestimate risk.

Denison is in the process of collecting additional baseline water quality data which will be used in future ERA iterations to reconsider the baseline copper concentration in the Wheeler River. The ERA is a living document that will continue to be updated at defined intervals and will integrate new data when it is available. Denison has also committed to an ongoing environmental monitoring program which will be used to determine if there are any adverse effects to aquatic organisms from copper and other constituents of potential concern.

Table IR-114-4: Re-Evaluated Hazard Quotients for Copper in Aquatic Organisms

Location	Maximum Copper Concentration in Water (mg/L)	Hazard Quotients (unitless) – Baseline Conditions						Hazard Quotients (unitless) – Site Operation Conditions					
		Forage Fish	Predator Fish	Zooplankton	Benthic Invertebrate	Phyto-plankton	Aquatic Plants	Forage Fish	Predator Fish	Zooplankton	Benthic Invertebrate	Phytoplankton	Aquatic Plants
Kratchkowsky Lake (reference) [1]	6.22E-04	0.12	0.80	0.70	**1.49**	0.07	0.03	0.12	0.80	0.70	**1.49**	0.07	0.03
Whitefish Lake North	6.20E-04	0.12	0.80	0.70	**1.49**	0.07	0.03	0.03	0.14	0.12	0.25	0.02	0.05
Whitefish Lake Middle	8.22E-04	0.16	**1.06**	0.93	**1.97**	0.09	0.04	0.03	0.18	0.16	0.33	0.02	0.06
Whitefish Lake South	8.17E-04	0.16	**1.05**	0.92	**1.96**	0.09	0.04	0.03	0.18	0.16	0.32	0.02	0.06
McGowan Lake	7.50E-04	0.14	0.97	0.85	**1.80**	0.08	0.04	0.03	0.16	0.14	0.30	0.02	0.05
Icelander River	7.49E-04	0.14	0.97	0.84	**1.80**	0.08	0.04	0.03	0.16	0.14	0.30	0.02	0.05
Russell Lake Inlet	7.17E-04	0.14	0.92	0.81	**1.72**	0.08	0.03	0.03	0.16	0.14	0.28	0.02	0.05

Note:
Bold and shaded value indicates hazard quotient greater than 1.
[1] Kratchkowsky Lake is a reference lake located upstream of the effluent discharge point, and as such, the site operation conditions were the same as baseline conditions.

IR-126

- Department: ECCC
- Project Effects Link: Aquatic species
- Reference to EIS, appendices, or supporting documentation: Section 8.5.3, Appendix 10-A (ERA), Section 5.3.1.1.8

<table>
<tr><th>Original IR#</th><th>Follow-Up IR #</th><th>Context and Rationale</th><th>IR (ROUND 1, March 2023)</th><th>Denison Response (ROUND 1, August 2023)</th><th>IR (ROUND 2, December 2023)</th><th>Denison Response (ROUND 2, Feb. 2024)</th><th>IR (ROUND 3, May 31, 2024)</th><th>Denison Response (ROUND 3, June 28, 2024)</th><th>IR (ROUND 4, Sept. 6 2024)</th><th>Denison Response (ROUND 4 October 15, 2024)</th></tr>
<tr>
<td>IR- 126</td>
<td>-</td>
<td>Context: The Proponent has used the US Environmental Protection Agency (US EPA) guidelines for the assessment of selenium fish tissue concentrations in Section 8.5.3 of the draft EIS and in the Environmental Risk Assessment (ERA) in Appendix 10-A (ERA) of Section 10.

Rationale: ECCC’s Federal Environmental Quality Guidelines of 6.7 ug/g dry weight fish whole body tissue for selenium should be used, as it is more protective than the US EPA guidelines.</td>
<td>Update the selenium fish tissue assessment in the draft EIS and the Wheeler River ERA (Appendix 10-A (ERA) in Section 10) as needed using ECCC’s FEQG.</td>
<td>Denison is aware of the ECCC Federal Environmental Quality Guideline for selenium in fish. The ECCC FEQG is for fish tissue egg-ovary and whole-body. Denison selected the US EPA guideline over the ECCC guideline since US EPA provides guidelines for fish tissue muscle as well. The fish assessed in the ERA were large-bodied fish including northern pike and white sucker. A fish tissue muscle TRV is appropriate for assessment of large-bodied fish; therefore, the US EPA selenium fish tissue muscle benchmark was preferred over the whole body value from ECCC.</td>
<td>ECCC acknowledges that the Proponent prefers the use of the US EPA guidelines due to the ability to perform fish tissue muscle TRV, however, Environmental Effects Monitoring (EEM) would require a study on fish tissue selenium whole-body or egg-ovary concentrations. The current baseline data will not be comparable to future EEM studies using fish tissue muscle concentrations of selenium and US EPA guideline methodology. There is currently EEM guidance under development for conducting selenium fish tissue sampling in fish populations that will utilize the FEQG which applies to fish tissue egg-ovary and whole-body concentrations of selenium. Additionally, the Proponent has made a commitment to utilize the most stringent guidelines available.

Based on the Project’s proposed effluent concentrations of selenium, fish tissue sampling will be required as part of the EEM monitoring for the Project. The ECCC FEQG is the guideline applied to these studies, and the current use of this guideline will facilitate the comparison to future monitoring studies.

Furthermore, the Proponent has not provided sufficient explanation in their response for the use of the less stringent US EPA guideline compared to the more conservative FEQG.

The Proponent should explain their use of the US EPA guidelines over the ECCC FEQG or update the selenium fish tissue assessment in the draft EIS and the Wheeler River ERA as needed using ECCC’s FEQG.

As noted in IR-126, please update the selenium fish tissue assessment in the draft EIS and the Wheeler River ERA (Appendix 10- A (ERA) in Section 10) as needed using ECCC’s FEQG. If the FEQG will not be used, provide further rationalization for the use of the US EPA guidelines when creating the study on fish tissue selenium concentration in the EEM.</td>
<td>The EIS assessed selenium in fish in terms of muscle tissue because the available baseline data were for muscle tissue. Since the review comment highlights the EEM program and the fish tissue selenium study component more specifically we note that the MDMER (2023) allows use of muscle tissue in the EEM study of selenium in fish (see Schedule 5, 12(1)(e)(iv). It is further noted that Denison has committed to a pre-operational EEM study and will conduct that study in accordance with the regulation and available federal guidance. The pre-operational EEM study will include a study respecting selenium in fish tissue.

Regarding the EIS, Denison and its SME stand by the current assessment approach, using muscle tissue. Nevertheless, to address the reviewer’s concern, we have calculated whole-body concentrations from the predicted selenium in muscle (Table B.5 of the revised draft EIS Appendix 10-A), using EPA (2021) conversion factors. The resulting whole-body concentrations do not exceed either EPA (2021) or ECCC (2022) guidelines for whole-body tissue, which are 8.5 µg/g dw and 6.7 µg/g dw, respectively, and therefore the conclusions of the risk assessment are unchanged. No change to the EIS is warranted.

<table>
<tr><th>Fish Species</th><th>Lake</th><th>Muscle ug/g fw</th><th>Muscle ug/g dw</th><th>Whole ug/g dw</th></tr>
<tr><td>N. Pike</td><td>Ref</td><td>1.89E-01</td><td>7.56E-01</td><td>5.95E-01</td></tr>
<tr><td></td><td>WL North</td><td>1.86E-01</td><td>7.44E-01</td><td>5.86E-01</td></tr>
<tr><td></td><td>WL Mid</td><td>1.57E+00</td><td>6.28E+00</td><td>4.94E+00</td></tr>
<tr><td></td><td>WL South</td><td>1.51E+00</td><td>6.04E+00</td><td>4.76E+00</td></tr>
<tr><td></td><td>McGowan</td><td>1.02E+00</td><td>4.08E+00</td><td>3.21E+00</td></tr>
<tr><td></td><td>Russell</td><td>8.12E-01</td><td>3.25E+00</td><td>2.56E+00</td></tr>
<tr><td>W. Sucker</td><td>Ref</td><td>1.46E-01</td><td>5.84E-01</td><td>4.60E-01</td></tr>
<tr><td></td><td>WL North</td><td>1.43E-01</td><td>5.72E-01</td><td>4.50E-01</td></tr>
<tr><td></td><td>WL Mid</td><td>1.74E+00</td><td>6.96E+00</td><td>5.48E+00</td></tr>
<tr><td></td><td>WL South</td><td>1.66E+00</td><td>6.64E+00</td><td>5.23E+00</td></tr>
<tr><td></td><td>McGowan</td><td>1.06E+00</td><td>4.24E+00</td><td>3.34E+00</td></tr>
<tr><td></td><td>Russell</td><td>8.06E-01</td><td>3.22E+00</td><td>2.54E+00</td></tr>
</table>
Notes:
dry wt = fresh wt / (1-0.75) [EPA (2021)]
whole = muscle / 1.27 [EPA (2021)]

References:

MDMER. 2023. Metal and Diamond Mining Effluent Regulations. SOR/2002-222. Last amended June 9, 2023. Minister of Justice.
EPA. 2021. 2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium 2016. EPA 822-R-21-006. U.S. Environmental Protection Agency.
ECCC. 2022. Federal Environmental Quality Guidelines. Selenium. Environment and Climate Change Canada.</td>
<td>The Proponent did not compare their predictions for fish tissue selenium to the FEQGs in the ERA as requested. Furthermore, in their response the Proponent does not use available species-specific moisture content and conversion factors available for northern pike and lake whitefish when converting muscle selenium concentrations to whole-body selenium concentrations. This means that the Proponent’s prediction likely underestimates the selenium tissue concentrations in the fish. Consequently, the hazard quotients reported are lower than expected.

Additionally, the method used by the Proponent to predict selenium concentrations in northern pike and lake whitefish does not appear to include dietary uptake and bioaccumulation of selenium, only direct contact with pore water and overlying water is considered (Table 5-5 in Appendix 10A; Section 2.2.2 of Appendix A to Appendix 10-A). Selenium uptake through the aquatic food web has been shown to result in bioaccumulation of selenium in aquatic-dependent wildlife and resulting in reproductive impairments and malformations (ECCC 2022). Dietary sources of selenium would typically be expected to be the main contribution to tissue concentrations of selenium compared to selenium uptake from water. In most situations, the conversion of inorganic selenium to organic selenium through uptake from water into periphyton/algae is the rate limiting step of selenium bioaccumulation into higher level organisms including benthic invertebrates and fish. This step is affected by many environmental parameters (e.g. temperature, substrate, lentic/lotic environment). Considering that the effluent discharge contains 42 ug/L selenium, consideration of dietary selenium is warranted.

The Proponent should update the final EIS with the following information:

1. Update the ERA with the assessment of selenium concentrations in fish tissue to include a comparison of selenium fish tissue concentrations to ECCC FEQG guidelines for either fish whole body tissue (6.7 ug/g dry weight) or fish egg/ovary tissue (14.7 ug/g dry weight) using species-specific moisture content and muscle : whole body and/or egg-ovary : muscle conversion factors (see Tables B-1b, Table B-3, Table B-4, and Table B-5 in US EPA (2021)).

2. Update the ERA for the assessment of selenium concentrations in fish tissue using a method that considers dietary uptake and bioaccumulation in order to determine predicted fish tissue</td>
<td>1. The Round 2 IR response provided a comparison against the ECCC FEQG by converting the muscle tissue concentrations to whole-body tissue concentrations using generic conversion values. The dry weight to fresh weight conversion factor used was 0.25. Based on Denison’s measured dry weight content in fish (northern pike and white sucker) the dry weight content ranged from 0.24 to 0.26 which is consistent with literature values; therefore, there is minimal difference in the moisture content. The species specific conversion factors for whole body and egg ovary for northern pike and white sucker from US EPA (2021) have been used to calculate the whole body and egg ovary tissue concentrations. (see Table in Attachment IR-126 Round 3 below for results). All predicted tissue concentrations for northern pike and white sucker in all lakes are below the FEQG.
2. The ERA utilizes a bioaccumulation factor (BAF) model from water to tissue to conservatively reflect all the multi-media contributions to uptake. The BAFs are provided in Appendix A to the ERA in Section 3.6.1. The selenium BAF for northern pike is a non-linear BAF where BAF = $949x^{0.827}$ (x is in units of µg/L). The selenium BAF for white sucker is 4425 L/kg (the rounded value shown in Figure IR-126-1 is 4400 L/kg). Both BAFs are based on publicly available regional data from other uranium mine sites in northern Saskatchewan (see Appendix A to Appendix 10-A, Section 3.6.1). Additional information on the derivation of the BAFs is provided below in Attachment IR-126 Round 3.
3. The fish tissue selenium concentrations represent the maximum concentration over the Project phases. This is the most conservative result.

References:

US EPA. 2021. 2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium 2016. EPA 822-R-21-006. U.S. Environmental Protection Agency.

ECCC. 2022. Federal Environmental Quality Guidelines. Selenium. Environment and Climate Change Canada.</td>
<td>Following a supplementary submission by Denison on July 2nd, it has been determined that item one and two of this IR have been resolved, but item three remains outstanding.

Denison has not provided the information requested to address Item 3 of the Round 3 IR. Including the estimates of error for the predicted selenium concentrations in fish is necessary as the maximum predictions for Northern Pike in Whitefish Lake North and Middle are within 1-2 ug/g dw of the Egg/Ovary FEQG guideline of 14.7 ug/g dw.

In order to resolve this IR, Denison are expected to:

1) Provide an estimate of error associated with the Northern Pike BAF.

2) Include this estimate of error for the results in Table -IR-126-2 and consider this in the effects assessment.</td>
<td>1. An estimate of the error associated with the Northern Pike BAF is included in Attachment IR-126 Round 4.

2. An estimate of the whole body and egg-ovary concentrations using the range of uncertainty (low to high) is included in Attachment IR-126 Round 4.

Denison will include the information on selenium BAF sensitivity analysis from this IR response in a new section in the final EIS of Appendix 10-A, Section 6.2.3.</td>
</tr>
</table>

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, June 28, 2024)	IR (ROUND 4, Sept. 6 2024)	Denison Response (ROUND 4 October 15, 2024)
							concentrations of selenium in northern pike and lake whitefish. This is recommended to be done over all Project phases for both the Expected Case and sensitivity scenarios. Provide predicted fish tissue selenium concentrations that include the range of variability of data used to develop the tissue selenium predictions. Only one output value without a confidence interval is provided for each location and species (see Table B.5 in Appendix B of Appendix 10-A).			

Attachment IR-126 Round 3

The whole-body concentrations were recalculated from the predicted selenium in muscle tissue concentrations (Table B.5 of the revised draft EIS Appendix 10-A), using site-specific moisture content and the species-specific US EPA (2021) conversion factors. The values used for moisture content and conversion factors for muscle to whole body and egg-ovary to whole body are shown in Table IR-126-1 below. The resulting whole-body concentrations (Table IR-126-2) do not exceed either EPA (2021) or ECCC (2022) guidelines for whole-body tissue, which are 8.5 µg/g dw and 6.7 µg/g dw, respectively, and therefore the conclusions of the risk assessment are unchanged. Note that selenium was identified as a COPC in the risk assessment and a full quantitative risk assessment was completed including calculation of hazard quotients. No change to the EIS is warranted based on the results shown in the Table below. The calculations do not change the conclusions of the EIS of no significant adverse effect. Selenium is included as part of the environmental monitoring program throughout all phases of the Project.

Table IR-126-1: Moisture Content and Conversion Factors used for Selenium Calculations

Fish Species	Moisture Content (Aquatic Baseline Studies, Table A-17)	Muscle:Whole Body (Table B-4, B-5, US EPA 2021)	Egg-Ovary:Muscle (Table B-3, US EPA 2021)
Northern Pike	77.98	1.27	1.88
White Sucker	76.55	1.34	1

Table IR-126-2: Calculated Whole Body and Egg-Ovary

FEQG (µg/g dw)				6.7	14.7
Fish Species	Lake	Muscle µg/g fw	Muscle µg/g dw	Whole Body µg/g dw	Egg-Ovary µg/g dw
Northern Pike	Ref	1.89E-01	8.58E-01	0.68	1.61
	Whitefish Lake North	1.86E-01	8.45E-01	0.67	1.59
	Whitefish Lake Middle	1.57E+00	7.13E+00	5.61	13.40
	Whitefish Lake South	1.51E+00	6.86E+00	5.40	12.89
	McGowan Lake	1.02E+00	4.63E+00	3.65	8.71
	Russell Lake	8.12E-01	3.69E+00	2.90	6.93
White Sucker	Ref	1.46E-01	6.23E-01	0.46	0.62
	Whitefish Lake North	1.43E-01	6.10E-01	0.46	0.61
	Whitefish Lake Middle	1.74E+00	7.42E+00	5.54	7.42
	Whitefish Lake South	1.66E+00	7.08E+00	5.28	7.08
	McGowan Lake	1.06E+00	4.52E+00	3.37	4.52
	Russell Lake	8.06E-01	3.44E+00	2.57	3.44

2.

Selenium bioaccumulation factors (BAFs) were derived using regional data. Using measured fish tissue data and measured water concentrations to develop the BAF incorporates the selenium bioaccumulation through the food chain and would represent the transfer (enrichment function and trophic transfer) as shown in the figure below.

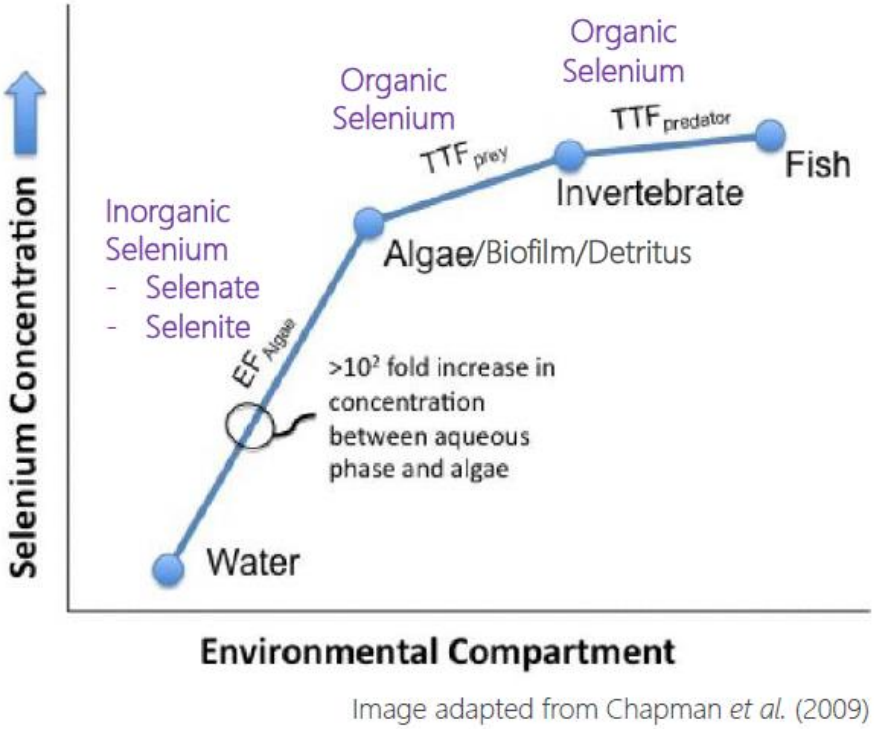


Image adapted from Chapman *et al.* (2009)

Large- and small-bodied fish were considered separately because selenium concentrations are based on different tissue analyses for these two groups: wet weight muscle and wet weight whole body, respectively. Tissue data were available for northern pike, cisco, lake trout, longnose sucker, lake whitefish, white sucker, lake chub and spottail shiner. The data comparisons resulted in the following conclusions:

- The same BAF can be applied to a fish species at different lakes;
- The BAF values for longnose sucker, cisco and lake trout were not significantly different from those for northern pike, therefore data from these species were combined to derive a BAF for northern pike;
- The BAF values for lake whitefish and white sucker were significantly different ($p<0.05$) from that for northern pike; and
- The BAF values for lake chub and spottail shiner were not significantly different ($p>0.05$) from each other, therefore data for these two species were combined to derive a BAF for small-bodied fish.

Most of the data from fish species evaluated demonstrated a linear relationship between fish tissue and water concentrations. The linear regression line was shown to underestimate selenium in northern pike tissue at low water concentrations. Therefore, a non-linear relationship was adopted for northern pike, where the BAF = $949x^{0.827}$ (x is in units of µg/L). As shown in the figure, the

linear (dotted line) and power function (solid red curve) are quite similar except where the water concentrations were less than 0.001 mg/L. The R^2 values for the linear and power function are similar but the better fit at the lower water concentration values provided a basis for selecting the power function as the preferred model for the northern pike. Correlation analyses of the tissue and water concentration data for selenium indicated that a significant relationship ($p<0.05$) existed between the water and tissue concentrations in northern pike, white suckers, lake whitefish and small-bodied fish.

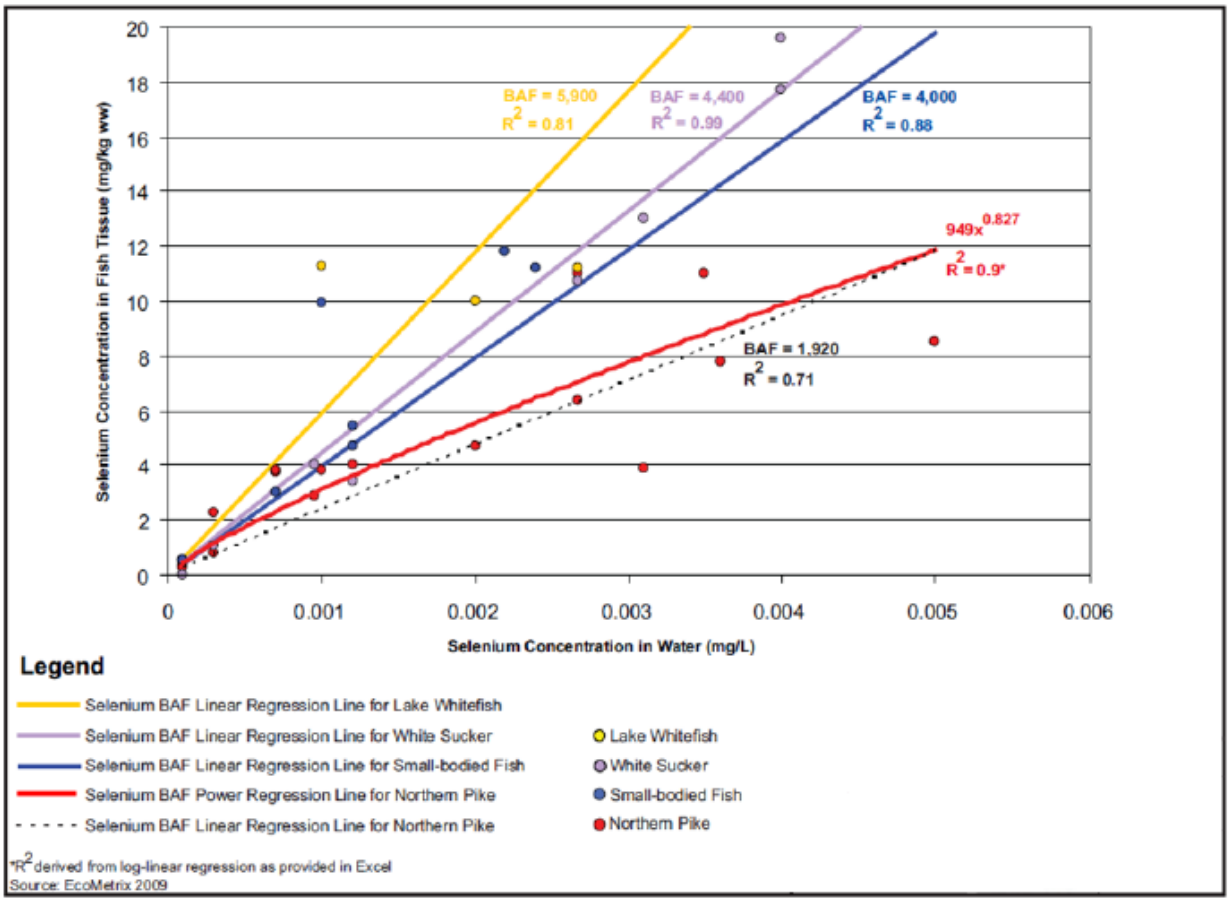


Figure IR-126-1: Development of Regional Fish BAFs for Selenium in Saskatchewan

References:

Chapman PM, Adams WJ, Brooks ML Delos CG, LuomaSN, Maher WA, OhlendorfHM, Presser TS and Shaw DP. 2009. Ecological Assessment of Selenium in the Aquatic Environment. SETAC Pellston Workshop, February 22-28, 2009, Pensacola, FL, USA.

EPA. 2021. 2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium 2016. EPA 822-R-21-006. U.S. Environmental Protection Agency.

Attachment IR-126 Round 4

As identified in Attachment IR-126 Round 3, selenium bioaccumulation factors (BAFs) were derived using regional data. Using measured fish tissue data and measured water concentrations to develop the BAF incorporates the selenium bioaccumulation through the food chain. For northern pike, a non-linear relationship was adopted where the BAF = $949x^{0.827}$ (x is the water concentration in units of µg/L).

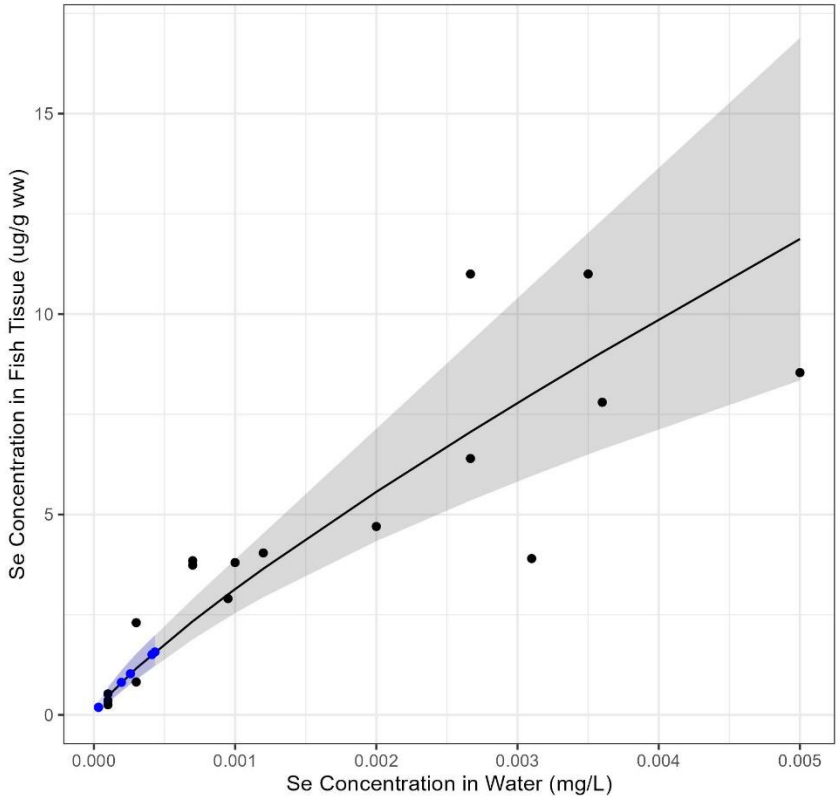
The whole-body concentrations were calculated from the predicted range of selenium in muscle tissue concentrations, using site-specific moisture content and the species-specific US EPA (2021) conversion factors. The resulting whole-body concentrations do not exceed either EPA (2021) or ECCC (2022) guidelines for whole-body tissue, which are 8.5 µg/g dw and 6.7 µg/g dw, respectively, and therefore the conclusions of the risk assessment are unchanged. Note that selenium was identified as a COPC in the risk assessment and a full quantitative risk assessment was completed including calculation of hazard quotients.

To evaluate the range of uncertainty in the northern pike BAF, a power-regression (log-log) of the water and fish tissue selenium data was used to generate the expected relationship between selenium in water and selenium in tissue. The model was a good fit to the data ($R^2 = 0.88$). The regression equation ($y = ax^b$) was:

$$Se_{[tissue;\ \mu g/g\ ww]} = a \times Se_{[water;\ mg/L]}^{\ b},$$

where the 95% confidence interval for '*a*' was 295–3060 and for '*b*' was 0.66–0.99.

The predicted mean response and confidence ribbon for those values are shown in Figure IR-126-1 and Table IR-126-1. Analysis was completed in *R v.* 4.4.4 using base functions (e.g., *lm()* and associated *predict()*). Plots were generated using *ggplot v.* 3.5.5.



Note: Blue dots are Wheeler River predictions, black dots are regional data

Figure IR-126-1: Predicted Mean Response and Confidence Ribbon – Selenium in Fish

Table IR-126-1: Predicted Mean Lower and Upper Fish Tissue Selenium Concentrations

Fish Species	Lake	Water Concentration LA-5 mg/L	Fish Muscle Tissue (Mean Value) µg/g fw	Fish Muscle Tissue (Low Value) µg/g fw	Fish Muscle Tissue (Upper Value) µg/g fw
Northern Pike	Reference	3.35E-05	1.89E-01	1.06E-01	3.36E-01
	Whitefish Lake North	3.28E-05	1.86E-01	1.04E-01	3.31E-01
	Whitefish Lake Middle	4.33E-04	1.57E+00	1.23E+00	2.00E+00
	Whitefish Lake South	4.12E-04	1.51E+00	1.18E+00	1.93E+00
	McGowan Lake	2.59E-04	1.02E+00	7.65E-01	1.37E+00
	Russell Lake	1.95E-04	8.12E-01	5.85E-01	1.12E+00

Using the range of the uncertainty in the northern pike BAF (from Table IR-126-1), fish muscle tissue selenium concentrations were calculated for the various lakes, using site-specific moisture content and the species-specific US EPA (2021) conversion factors (see Table IR-126-2).

For reference, as indicated previously the whole body tissue and egg-ovary concentrations do not exceed the ECCC (2022) guidelines for the mean BAF. The resulting whole-body tissue and egg-

ovary concentrations do not exceed the ECCC (2022) guidelines for the BAF lower range of uncertainty. At the upper range of the BAF, the egg-ovary concentration in Whitefish Lake exceeds the whole body guideline of 6.7 µg/g dw and the egg-ovary guideline of 14.7 µg/g dw from ECCC (2022). At all other lakes the predicted whole body and egg-ovary concentrations are below the selenium guidelines (see Table IR-126-3).

The results of the EIS are interpreted based on the expected mean BAF. Based on the expected selenium BAF, no significant adverse effects are predicted to northern pike from exposure to selenium. The uncertainty results requested by the CNSC provide a range (lower and upper) around the risk; however, there are numerous conservative assumptions in the overall assessment that would indicate the expected BAF is sufficiently conservative. The effluent quality in the EIS provides a bounding assessment and a conservative representation of risk; however, Denison plans to continue to refine effluent quality predictions as part of the BATEA assessment and licensing process. Additionally, selenium is included as part of the environmental monitoring program throughout all phases of the Project. Continued monitoring will provide the ability for adaptive management throughout the life of the mine, which is commensurate with the level of risk associated with the upper bound BAF.

Table IR-126-2: Calculated Whole Body and Egg-Ovary Selenium Concentrations – Expected Mean BAF

		FEQG (µg/g dw)		6.7	14.7
Fish Species	**Lake**	**Muscle µg/g fw**	**Muscle µg/g dw[(a)]**	**Whole Body µg/g dw[(b)]**	**Egg-Ovary µg/g dw[(c)]**
Northern Pike	Ref	1.89E-01	8.58E-01	0.68	1.61
	Whitefish Lake North	1.86E-01	8.45E-01	0.67	1.59
	Whitefish Lake Middle	1.57E+00	7.13E+00	5.61	13.40
	Whitefish Lake South	1.51E+00	6.86E+00	5.40	12.89
	McGowan Lake	1.02E+00	4.63E+00	3.65	8.71
	Russell Lake	8.12E-01	3.69E+00	2.90	6.93

Notes:
(a) The site-specific moisture content for northern pike of 77.98% was used to convert from fresh weight to dry weight.
(b) A Muscle:Whole Body ratio of 1.27 was used for northern pike from Table B-4, B-5, US EPA 2021
(c) An Egg-Ovary:Muscle ratio of 1.88 was used for northern pike from Table B-3, US EPA 2021

Table IR-126-3: Calculated Whole Body and Egg-Ovary Selenium Concentrations – Range of Uncertainty

							FEQG (µg/g dw)	6.7	6.7	14.7	14.7
Fish Species	**Lake**	**Water Concent-ration LA-5**	**Fish Muscle Tissue (Lower Value)**	**Fish Muscle Tissue (Upper Value)**	**Fish Muscle Tissue (Lower Value)**	**Fish Muscle Tissue (Upper Value)**	**Whole Body (Lower Value) [b]**	**Whole Body (Upper Value) [b]**	**Egg-Ovary (Lower Value) [c]**	**Egg-Ovary (Upper Value) [c]**
		mg/L	**µg/g fw**	**µg/g fw**	**µg/g dw**	**µg/g dw**	**µg/g dw**	**µg/g dw**	**µg/g dw**	**µg/g dw**
Northern Pike	Reference	3.35E-05	1.06E-01	3.36E-01	4.82E-01	1.53E+00	0.38	1.20	0.91	2.87
	Whitefish Lake North	3.28E-05	1.04E-01	3.31E-01	4.72E-01	1.50E+00	0.37	1.18	0.89	2.83
	Whitefish Lake Middle	4.33E-04	1.23E+00	2.00E+00	5.59E+00	9.07E+00	4.40	**7.14**	10.51	**17.06**
	Whitefish Lake South	4.12E-04	1.18E+00	1.93E+00	5.35E+00	8.74E+00	4.21	**6.88**	10.05	**16.44**
	McGowan Lake	2.59E-04	7.65E-01	1.37E+00	3.48E+00	6.24E+00	2.74	4.91	6.54	11.73
	Russell Lake	1.95E-04	5.85E-01	1.12E+00	2.66E+00	5.10E+00	2.09	4.02	5.00	9.59

Notes:
(a) The site-specific moisture content for northern pike of 77.98% was used to convert from fresh weight to dry weight.
(b) A Muscle:Whole Body ratio of 1.27 was used for northern pike from Table B-4, B-5, US EPA 2021
(c) An Egg-Ovary:Muscle ratio of 1.88 was used for northern pike from Table B-3, US EPA 2021
Bold indicates exceedance of the selenium guideline.

References:

Environment and Climate Change Canada (ECCC). 2022. Federal Environmental Quality Guidelines Selenium. August.

US EPA. 2021. 2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium 2016. EPA 822-R-21-006. U.S. Environmental Protection Agency.

IR-142, IR-159, IR-167 -R1

- Department: ECCC
- Project Effects Link: Migratory birds
- Reference to EIS, appendices, or supporting documentation: Section 9.4.5.2.1 Work Timing Windows and Habitat Disturbance

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, July 8, 2024)	IR (ROUND 4, Sept. 16, 2024)	Denison Response (ROUND 4, Sept. 27 2024)
IR-142		**Context:** The Proponent did not conduct any field work to identify potential wolverine dens in the Project area and therefore did not present any mitigations for the potential impacts to wolverine dens. In Section 9.3.3.2.1, the Proponent states: "Denning females are sensitive to disturbance during denning season in February to April and may abandon their dens and, in some cases, their litter, which may decrease their reproductive success. " In Section 9.3.6, the Proponent states: "In the Project Area, 145.0 ha or 100% of available wolverine habitat is assumed to be removed and will not be available to wolverine for the duration of the Project (Table 9.3-13). Similarly, 145.0 ha (3.4%) of available wolverine habitat within the Wildlife LSA is anticipated to be removed, all from the Project Area, during site clearing in Construction. In the Terrestrial RSA, up to 0.5% (145.0 ha; from the Project Area) of available wolverine habitat is anticipated to be removed during site clearing in Construction." The residual effect assessment estimates that 8.2% of available wolverine habitat within the Terrestrial RSA may be altered or lost (Table 9.3-20). **Rationale**: As Wolverine is a Species at Risk Act Schedule 1 listed species, effects need to be identified, avoided, lessened and monitored. Mitigations, such as setback distances, should be used to protect important habitat features, such as dens. Wolverine occupy large home ranges and, therefore, need vast tracts of undisturbed land to maintain viable populations. The species avoids most human footprint types and linear features	1. Please provide additional information on whether the lost and/or altered wolverine habitat overlaps with wolverine home ranges. 2. Describe any important wolverine habitat feature (i.e., dens) that may be lost as a result of the Project. 3. Assess the need for pre-construction/pre-clearing surveys to identify any wolverine denning sites. 4. Please provide additional information on whether the remaining, available, undisturbed wolverine habitat size is suitable to maintain populations.	1. While wolverine were not observed during baseline studies for the Project, it is assumed that the Project (Project Area, LSA) may overlap with wolverine home ranges. As described in the EIS, wolverine occur in low densities across all forest stand and vegetation types but are generally absent from areas of human development and activities. 2. No wolverine dens were identified during any of the baseline studies. It is not anticipated that wolverine denning sites will be lost and/or altered because there are no specific landscape features typically used by wolverine as potential denning sites located in the Project footprint. Further, much of the proposed Project footprint will be developed within previously disturbed areas, including roads and cutlines. 3. Pre-construction surveys will be completed to identify all sensitive wildlife habitat features, including wolverine denning sites. 4. Most of the Project footprint is already disturbed through previous exploration activities. The total expected direct habitat loss of 169.6 ha includes the already disturbed areas. In the Terrestrial RSA, 8.2% of available wolverine habitat may be altered or lost; this includes 0.5% that will be cleared within the Project Area during Construction, and an additional 7.7% that may be altered through indirect effects (sensory disturbance). The magnitude of this effect was characterized as being "moderate" and the residual effect is not expected to result in a change that will alter wolverine habitat integrity to the point where it would not be able to sustain the regional populations of wolverine. This considers that no wolverine were observed during the baseline investigations, the small Project footprint, and the typically large size of a wolverine home range.	The information provided by the Proponent is complete, however, a follow up IR regarding survey methods for all pre-construction and pre-clearing surveys is required. See follow-up IR-142-159-167.	n/a	n/a	n/a	n/a	n/a
IR-159		Context and Rationale: Information presented in the draft EIS is insufficient to accurately predict Project impacts to breeding birds. The Proponent collected a single year of breeding songbird point counts and aerial waterfowl surveys (including avian species at risk). A single year of surveys in which birds may be unusually scarce or abundant could severely compromise interpretation of post-construction monitoring data. Additionally, data presented in the draft EIS is from 2017 and ECCC advises that more recent data is needed for a comprehensive baseline to verify Project impacts. Data from the Saskatchewan Conservation Data Centre (HABISask), the Saskatchewan Breeding Bird Atlas and the Boreal Avian Modelling project contain information on avian densities and avian species at risk that could supplement field data. The national standard for major projects recommends a minimum of two years of field surveys to be provided, so that temporal variability can be considered when comparing post-construction against baseline records and other available data.	Supplement breeding bird point count data and aerial waterfowl data collected during 2017 with additional pre-construction field data or existing post-2017 data/modelling to provide a comprehensive baseline that can be used to verify Project impacts during construction and operational phases.	The baseline data presented in the draft EIS are sufficient for the intended purpose – that is the data are sufficient, in conjunction with regionally available data, to identify potential project effects. The data collected as part of the baseline studies for birds was focused on the habitat types and areas most likely to be disturbed as a result of the Project. Conducting additional baseline surveys for waterfowl, raptors, and breeding birds is not anticipated to result in changes to the assessment outcomes and predictions made as part of the effects assessment, which was habitat-based, for avian species. The assessment methods used a conservative approach with the assumption that following the implementation of site-specific mitigation measures, the proposed Project activities would have a residual effect on these species guilds regardless of species presence on site. As described in the EIS, pre-construction surveys will be conducted prior to the commencement of any vegetation clearing or soil disturbance. Avian species will also be routinely monitored throughout the life of the Project. Results from the surveys and monitoring activities are expected to inform the adaptive management process to update Project design and identify the need for additional mitigation measures, if required. Note: Section 9.4.3.3 of the draft EIS includes all available information from the HABISask database at the time of the assessment. While recent surveys from Environment and Climate Change Canada and the Saskatchewan Breeding Bird Atlas have expanded surveys into the northern boreal forest, these data are not yet publicly available or published to make inferences on population trends for	This response has not been accepted. The Proponent's response indicated that their opinion is that the data presented in the draft EIS is sufficient and that no updates to the draft EIS are needed. However, a single year of baseline data from 2017 is insufficient to assess Project impacts during the follow-up and monitoring program. Although pre-construction surveys prior to clearing can give a very localized picture of the avian community, it does not provide a baseline within the Regional Study Area (RSA) of the bird community and will be of limited use for comparing construction and operational monitoring data to baseline conditions. Use of more recent data or supplemental data	Denison and its SME continue to be of the opinion that the data on which the effects assessment is based are sufficient and fit for purpose as it concerns the EA process. The effects assessment was not based on the 2017 field survey data alone. The EA used an accepted, proven habitat-based EA approach to address the variability of population surveys. Further, the EA used all available, recent/relevant survey data collected in appropriately timed and executed methodologies, including IK. The supplemental avian data received from records from the Saskatchewan Breeding Bird Atlas downloaded through the NatureCounts web portal (Saskatchewan Breeding Bird Atlas 2017), which also includes data received as part of the Saskatchewan Boreal Monitoring Strategy program. These data represent bird observations from 24-point counts conducted on June 7 and June 9, 2019. Nine point-counts are located approximately 6.5 km east of the Project footprint, the majority of which are located in the BS3 ecosite type; 15 point-counts are located approximately 7.7 km south of the Project footprint, the majority of which are located in the BS3/BS7 ecosite type. During this survey effort, 24 migratory songbird species were documented. A summary of the total number of individuals observed for each species across all plots is provided in Appendix 9-F of the revised Draft EIS. While the supplemental data do provide further context for the RSA, they would not be expected to alter the findings or the mitigation measures proposed, nor the conclusions reached in the EA. The above does not preclude the implementation of further breeding bird surveys prior to site development and operations. Denison accepts the comment that additional, more recent information, as well as supplemental data as available, and will provide	n/a (accepted)	n/a	n/a	n/a

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				migratory songbirds that could use the available habitat in the Terrestrial RSA.	can account for interannual variation and any regional effects and will allow for a more accurate review of mitigation and follow-up measures. See follow-up IR-142-159-167-R1	the basis for a more effective review of mitigation and follow-up measures as the Project moves forward. The details of such follow-up monitoring will be defined as part of the further consideration of planning related to follow up programs. For clarification the pre-clearance wildlife sweeps are intended to identify sensitive wildlife features (e.g., hibernacula, roosting habitat, dens, nests, mineral licks) that would require site-specific mitigation measures to limit or avoid adverse effects. The spatial scale of where these pre-construction sweeps would be completed could be expanded to include other areas beyond the Project Area but within the RSA.				
IR-167	-	**Context and Rationale:** The Proponent has stated that when it is not practicable to clear outside of the breeding bird window, they will conduct pre-clearing surveys. Section 9.4.5.2.1 states: "Prior to commencing any site clearing (i.e., vegetation clearing and/or soil disturbance) during the nesting season, pre-clearing nest surveys will be conducted at that location within the Project Area." ECCC does not recommend the use of nest searches or pre-clearing surveys for active bird nests during the breeding season as a mitigation, given the difficulty associated with finding nests reliably and the high likelihood of disturbing nesting birds when searching. Instead, ECCC recommends that clearing and grubbing activities not be conducted during the breeding bird season. The Migratory Birds Regulations 2022 (MBR 2022) brings new scenarios that need to be considered: 1. Most migratory birds: - Nests are protected only when they are in use or when live eggs or chicks are present. 2. Migratory birds listed in MBR 2022 Schedule 1: - For the 18 species of migratory birds identified on Schedule 1, the MBR 2022 provide year-round nest protection until they can be deemed abandoned. 3. Migratory birds listed under SARA: - For some SARA listed migratory birds, the residence prohibition (s.33) will protect nests that are not active, but are re-used in subsequent years, and the critical habitat prohibition (s.58) will protect nests that are part of the critical habitat identification. Those prohibitions apply everywhere in Canada and at all times of the year. In these cases, a SARA permit will be required.	Provide the following information: • details on how vegetation clearing related to site development will be conducted to minimize risk to migratory birds and species at risk (SAR). • the timing window that will be used for vegetation removal to reduce risk to migratory birds and SAR	Site clearing and other works that involve disturbance of vegetation and/or soil will be completed during least-risk timing windows for migratory birds and SAR (i.e., winter), where practical, to avoid disturbance during sensitive time periods. It is noted that additional information related to timing windows and species as it concerns Project activities has been provided in response to IR-134. Pre-clearing surveys will be conducted and set-back buffers implemented, as needed. The pre-clearance surveys will be completed prior to all clearing events, regardless of the time of year / season when clearing is set to occur. If nests or tree cavities should be encountered during pre-construction surveys or ongoing monitoring activities, any subsequent Project activities will be in accordance with the 2022 Migratory Birds Regulations.	Response is accepted, but also see AD-57 in the Advice to Proponent table and follow-up IR-142-159-167-R1.	n/a	Response is accepted, but also see AD-57 in the Advice to Proponent table and follow-up IR-142-159-167-R1.	See response to IR-142-159-167-R1 below.	n/a	n/a
n/a	IR-142, IR-159, IR-167 - R1		n/a	n/a	Provide survey methodology and timing for all preconstruction and pre-clearing surveys, including avian and species at risk surveys (caribou, wolverine).	As noted in the August 2023 IR responses, site clearing and other works that involve disturbance of vegetation and/or soil will be completed during least-risk timing windows for migratory birds and SAR (i.e., winter), where practical, to avoid disturbance during sensitive time periods. However, in the event that site clearing activities or other works are anticipated to occur during a sensitive timing window for migratory birds and SAR, the pre-disturbance wildlife sweeps would be conducted by qualified biologists at least 7 days prior to any scheduled vegetation/land disturbance. The biologist would search the proposed area to be cleared, plus a 100 m buffer, for sensitive wildlife features that may be used by avian SAR (e.g., nests and/or nesting cavities), woodland caribou, and bats (e.g., roosting sites/cavities). The wildlife sweeps will not be species-specific surveys focused on species at risk per se, but will be based on timing of Project related activities (i.e., will be completed in advance of site clearing activities). These surveys are intended to identify sensitive wildlife features such as hibernacula, dens, nests, cavities, mineral licks, that would require specific mitigation measures to avoid or minimize adverse effects on identified features and are not species-specific. Nevertheless, the methods associated with these pre-construction and pre-clearing sweeps will be	The Proponent notes that: • Site clearing and other works that involve disturbance of vegetation and/or soil will be completed in winter. • Pre-disturbance wildlife sweeps would be conducted by qualified biologists at least seven days prior to any scheduled vegetation/land disturbance. • Mitigation measures to avoid or minimize adverse effects on identified features are not species specific. • The methods associated with these pre-construction and pre-clearing sweeps will be	The requested information on species at risk pre-clearance sweeps are summarized below in Attachment IR-142, IR-159, IR-167-R1 (Round 3). Denison and its SMEs believe we have provided sufficient information and analysis in the EIS, associated supporting documents and IR responses for the federal government to make a determination as to the effect of the Project on SAR, within the approved scope of the Project and *CEAA 2012*. Commensurate with the stage of the Project and EA process conceptual level detail for monitoring and follow-up programs (see EIS Appendix 16F) and a description of the programs fit into the overall environmental management system (EIS Section 2.9) have been provided. Further details regarding these programs	The Proponent notes that they will use visual searches for several bird SAR. This includes Bank Swallow, Barn Swallow, Common Nighthawk, and Horned Grebe. While visual observations are an appropriate method for detecting Barn and Bank Swallow nests, it is not suitable for detecting Common Nighthawk. The province of Saskatchewan provides appropriate protocols for detection of Common Nighthawk. The Proponent also notes that they will conduct call-playback or visual searches for Olive-sided Flycatcher and Short-eared Owl. While the call-playback surveys would be more likely to detect individuals in areas to be cleared, the visual searches are unlikely to be effective for these species. The Proponent should consider following the provincial detection survey protocols for Short-eared Owl and Olive-Sided Flycatcher.	1. To address this part of the Round 4 IR, the wildlife species at risk pre-clearance sweep methods and timing table (now included in the final EIS Appendix 9-D as Table 4-1) has been updated. In this table, the column "survey techniques" has been updated as follows: - common nighthawk – "visual search" changed to "call-playback" - short-eared owl – "call-playback or visual searches" changed to "call-playback." - olive-sided flycatcher – "call-playback or visual searches" changed to "call-playback." A reference to the Saskatchewan SDSPs have been added to the last column of Table 4-1. Finally, a footnote has been added to the table: "Surveys will be completed by qualified professional biologists; in their capacity as professional biologists, they will refer to available guidance such as the Saskatchewan species detection survey protocols to develop details of the surveys (e.g.,

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						tailored to species at risk that may potentially be using habitats at certain times of the year. For example, methods will include searching prominent topographic features such as rock outcropping or downed forest trees and debris where wolverine may establish denning sites. In the event the sweeps are conducted during the winter period, methods related to snow tracking would identify wolverine presence based on tracks and potential denning sites in the snow pack within ravines or drainages within the forested areas within the study areas (as per Resources Inventory Committee 1999). Additionally, methods will include searching for potential roost trees for bat species, as per protocols included in the Wildlife Habitat Features Field Guide (BC Ministry of Environment and Climate Change Strategy, Ecosystems Branch 2019). Depending on the results of these sweeps, appropriate mitigation measures will be developed and implemented. If sensitive wildlife features are found, they will be documented (e.g., photographs, GPS location recorded). The data collected would inform the development and implementation of appropriate mitigation measures (e.g., appropriate set-back distances for Project activities and/or consideration of timing windows as per SK MOE (2017), in consideration of applicable laws and regulations (e.g., Migratory Birds Conservation Act, Wildlife Act), as appropriate. **References:** B.C. Ministry of Environment and Climate Change Strategy Ecosystems Branch. 2019. Wildlife Habitat Features Field Guide (Kootenay Boundary Region). October 2019. Pp. 119 Resources Inventory Committee. 1999. Inventory Methods for Medium-Sized Territorial Carnivores: Coyote, Red Fox, Lynx, Bobcat, Wolverine, Fisher and Badger. Standards for Components of BC's Biodiversity No. 25. Ministry of Environment, Lands and Parks. Saskatchewan Ministry of Environment (SK MOE). 2017. Saskatchewan Activity Restriction Guidelines for Sensitive Species. https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download (accessed July 2021).	tailored to species at risk that may potentially be using habitats at certain times of the year. • Methods will include searching for potential roost trees for bat species, as per protocols included in the Wildlife Habitat Features Field Guide (BC Ministry of Environment and Climate Change Strategy, Ecosystems Branch 2019). If sensitive features are found, then they will be documented, and data collected would inform the development and implementation of appropriate mitigation measures. It is unclear what is meant by "surveys are not species-specific" but sweeps will be "tailored to the species at risk". It is also unclear how mitigation measures will be developed and implemented in a seven-day period. In order for ECCC and CNSC to provide advice on potential effects to SAR based on the habitat potential mapping, the development of species-specific mitigation measures needs to be produced for review during this assessment process. The Proponent also needs to provide details on follow up and monitoring programs that are in place to confirm that the mitigation measures implemented are effective. In addition, ongoing monitoring is required for SAR. Denison is expected to describe the planned monitoring and follow-up programs for SAR. Denison must justify how the proposed methods are adequate to provide a baseline for each SAR, to verify that mitigation measures are effective, and to allow for statistically robust comparison to assess potential impacts on SAR over the lifecycle of the project.	have been provided in response to various IRs. Denison continues to refine the program level detail, and in parallel develop its plan level documentation to support CNSC licensing and provincial permitting. Any ongoing monitoring for SAR will be detailed in the Wheeler River Project's Environmental Management Program documentation, including for example the Biodiversity Management Plan. We also note that ongoing SAR management is under Provincial jurisdiction. For reference, within the EIS, the EMS framework is described in Section 2.9, wildlife monitoring plans are provided in Section 9.3.8, avian monitoring plans are provided in 9.4.8, and a summary of general and species-specific mitigation measures is provided in Appendix 9-D. Briefly, wildlife and avian species will be routinely monitored throughout the life of the Project in accordance with the wildlife monitoring plans. An adaptive management process will be employed, after applicable consultations and approvals, where implemented mitigation measures are found to be unsuccessful.	In order to resolve this IR, Denison are expected to: 1. Modify the Table in "Attachment IR-142, IR-159, IR-167-R1 (Round 3)" to incorporate appropriate protocols for detection of Common Nighthawk, Short-eared Owl, and Olive-Sided Flycatcher, as suggested by ECCC. 2. Incorporate the Table into the EIS documentation, e.g., Appendix 9-D. 3. Update any related commitments for pre-clearance / pre-disturbance surveys in their commitments register.	selecting the appropriate time of day for the survey)." 2. The table is now available in the final EIS (Appendix 9-D Table 4-1). 3. Existing commitment 9-3 has been updated and now reads (additions in **bold**): "To adequately address potential effects, regardless of the wildlife, seasonal or species-specific sensitivities, pre-disturbance wildlife clearance surveys (i.e., not species-specific surveys) will be completed prior to any work commencing. Results of the wildlife clearance surveys will be used to inform the design and delineation/establishment of suitable setback distances (i.e., specific to species, habitat, life-cycle sensitivities), work delays and/or other species-specific mitigation measures at that location, with discussions with ENV as appropriate. **The details on the methodology of species-specific pre-clearance sweep protocols and timing are provided in the Appendix 9-D of the final EIS**."

Attachment IR-142, IR-159, IR-167-R1 (Round 3)

Table 1: Species at Risk Survey Methods

Species of Concern	Baseline Survey Results	Assessed in the EIS	Important Habitat and Needs	Survey Target Areas	Survey Technique	Timing	Action if Species Detected	Information Source
Northern Leopard Frog	Not observed.	Appendix 9-D	From winter sites, adult frogs travel up to 1.6 km to breed.	Wetlands/ water/ riparian / wet/ moist/ scrublands/ bogs/ fens.	Visual searches for egg masses or frogs.	Snow/ice-free early spring and spring season.	Pond setback; 10m (low); 200m (Mod) and 500m (High);	MOE (2017)
			They breed in the shallow, warm waters of a variety of wetlands including marshes, springs, flooded ditches, dugouts, borrow pits, beaver ponds, margins of lakes, and slow-moving waters of streams and rivers.		Auditory call surveys.	April 20 to June 10.		
			After breeding, adults and sub-adults may disperse up to 8 km from breeding ponds.					
			Northern Leopard Frogs usually do not utilize areas that are heavily wooded		Visual searches for egg masses or frogs.	Snow/ice-free early spring and spring season.		
			They forage in the summer in riparian or upland habitats. These areas are moist habitats including meadows, pastures, scrublands, riparian corridors, and drainage or irrigation ditches.		Visual searches for egg masses or frogs.	Snow/ice-free early spring and spring season.		
Little Brown Myotis and Northern Bat	34 ultrasonic detections of little brown/northern myotis.	Appendix 9-D	The presence of large snags, tree cavities, is an important attribute in old growth forest stands that provides maternity roosts and day roosts for northern myotis and little brown bats. Building are also used.	Treed areas with the largest diameter and/or older trees. Focus on older forest, or areas with large snags in younger forest within the project footprint (majority is regenerating forest 1-5m).	Daytime visual search of trees and potential roost sites. Systematic meandering search of areas to be cleared during active bat season. Focus on searching for roost features (snags, cracks, stumps, cavities, bark peeling) and bat sign (e.g., guano).	May to Sept	Should a roosting bat be discovered the area will be afforded protection from clearing for 24 hours and re-surveyed. The area will only be cleared if no bats are discovered. A 100 m buffer will be given to nursery roots and 50 m to daily roosting bats. If many roosting bats are recorded compensation will be considered (e.g., bat houses).	COSEWIC (2013a); Resources Information Standards Committee (RISC) (2022)

Species of Concern	Baseline Survey Results	Assessed in the EIS	Important Habitat and Needs	Survey Target Areas	Survey Technique	Timing	Action if Species Detected	Information Source
			Foraging habitat in proximity to roosting sites is also an important factor in roost selection.	Treed areas in proximity to clearings, wetlands and open water.		Year Round	Roost/Foraging site; 100m(low); 500m (Mod) and 500m (High);	MOE (2017)
Wolverine	Not observed.	Section 9.3	A wide variety of forested and vegetation associations are used by wolverine. Habitats must have an adequate year-round supply of food, mainly consisting of smaller prey such as rodents and Snowshoe Hares, and the carcasses of large ungulates, like Moose, Caribou, and Muskox.	All areas of project activity.	Winter den searches.	Snow cover months.	Setback of 250m when occupied and 100m when unoccupied.	COSEWIC (2014); Environmental Protection and Management Guideline (2024)
			Females den under snow-covered rocks, logs or within snow tunnels. Wolverines reproduce in areas where snow cover persists at least into April.					
Woodland Caribou	Observed.	Section 9.3	Woodland caribou may occupy all potential project areas but prefer forests greater than 40 year of age.	All areas of project activity.	Visual search to ensure no caribou are in the area. Ongoing vigilance.	Year Round	If caribou are in the area cease operations until they are clear of the area.	SME (2021)
Rusty Blackbird	Not observed.	Section 9.4	Rusty blackbird primarily nests in small conifers, predominantly spruce. In Canada, nests have also been found in Balsam Fir, Eastern White Cedar, Paper Birch, Balsam Poplar, Red Maple, Pin Cherry, emergent sedges, cattails, and on the ground on a beaver dam	All habitat with spruce, white birch and balsam poplar. Very limited suitable (spruce) habitat within project footprint.	Visual search for nests.	MBCA window	A 75 m buffer around coniferous bogs, fens and other wetlands suitable for Rusty blackbirds (Odsen and Pyper 2019).	Environment Canada. (2015); Odsen and Pyper (2019); Wildlife Division (2020)
			We only have spruce, birch and poplar at Wheeler.			May 1 to July 31	Nest setback of 0-50m (low activity); 150m (Mod activity) and 300m (High activity);	Manitoba Conservation (2021)
Yellow Rail	Not observed.	Section 9.4	Yellow rails inhabit shallow wetlands and other wet areas with grass-like vegetation.	Using available mapping conduct daytime Ecosite verification and stratify surveys in appropriate habitat only. Based on available mapping, no suitable habitat within project footprint.	Mid May to mid to late June. Triplicate nocturnal (23:00-03:00) call-playback surveys spaced at least 4 days apart. Or use Autonomous Recording Units throughout the breeding season.			Environment Canada (2012); SME (2014)
			They breed in wetlands such as damp hay fields or meadows, floodplains, bogs, upper levels of estuaries, salt marshes					
			These wetlands are generally dominated by short, fine-stemmed herbaceous vegetation, especially sedges (Carex spp.), as well as other graminoid vegetation of the families Cyperaceae, Poaceae, and Juncaceae. Vegetation structure (e.g. short, grass-like, and dense) is likely more important than its taxon					

Species of Concern	Baseline Survey Results	Assessed in the EIS	Important Habitat and Needs	Survey Target Areas	Survey Technique	Timing	Action if Species Detected	Information Source
			Breeding habitats may have up to 50 cm of standing water, but typically nesting sites are less than 15 cm deep			May 1 to July 15	Nest site setback; 100m(low); 150m (Mod) and 350m (High);	MOE (2017)
Bank Swallow	Not observed.	Appendix 9-D	The Bank Swallow readily breeds in a wide variety of low-elevation (< 900 m), natural and anthropogenic habitats, including: lake and ocean bluffs; stream and river banks; sand and gravel pits; roadcuts; and piles of sand, topsoil, sawdust, coal ash, and other materials.	Survey key habitat features identified as important.	Visual survey during timing window.	May 15 to July 31	Nesting Colony Setback; 50m (low); 150m (Mod) and 300m (High);	Manitoba Conservation (2021)
			Nest burrows are nearly always in a vertical or near-vertical bank (range: 76-105° slope;					
			In some cases, Bank Swallows have nested in drain pipes and in structures designed and built specifically for nesting Bank Swallows					COSEWIC (2013b)
Barn Swallow	Four visual/auditory detections.	Appendix 9-D	Nest on horizontal and vertical structures that include natural sites, such as cliffs and caves, as well as human-made structures, such as barns, bridges, and culverts . The nesting substrate must be rough, or have a ledge or projecting objects, such as bolts or light fixtures, to provide additional structural support to the nest.	Open areas in proximity to water. All buildings and man made structures.	Visual.	May 15 to Sept 30	Nest site setback; 50m (low); 100m (Mod) and 100m (High);	Manitoba Conservation (2021)
			Nesting sites must provide access to open areas with an abundant supply of aerial insects to feed on; features such as wetlands, waterbodies, watercourses, meadows, grazed grassland, and farmland are preferred . Proximity to a waterbody or moist area with a supply of wet mud is needed to facilitate nest construction.					COSEWIC (2021a)
Common Nighthawk	Two nests, five visuals and 76 auditory/visual detections.	Section 9.4	Nests are typically in open sites with dry, well-drained substrates that will not overheat and that have shade nearby for young to shelter from the sun and predators. Nest sites include forest clearings, bare patches in grassland, gravel pits, outcrops, road or rail sides, and, rarely, fenceposts.	All upland habitat.	Visual searches.	May 1 to Aug 31	Nest site setback; 0-50m (low); 150m (Mod) and 300m (High);	MOE (2017)
Horned Grebe	One observation.	Appendix 9-D	More than 90% of the Horned Grebes in North America breed in ponds and lakes in western and northern Canada.	Water bodies within the project area.	Visual searches.	May 1 to Sept 15	Nest site setback; 100m (low); 200m (Mod) and 400m (High);	Manitoba Conservation (2021)
								COSEWIC (2009)

Species of Concern	Baseline Survey Results	Assessed in the EIS	Important Habitat and Needs	Survey Target Areas	Survey Technique	Timing	Action if Species Detected	Information Source
Olive-sided Flycatcher	Fourteen observations.	Section 9.4	Olive-sided Flycatcher has been widely observed in open coniferous or mixed coniferous forests, often located near water or wetlands with the presence of tall snags or trees	All conifer and/treed upland areas.	Call-playback or visual searches.	May 1 to Aug 31	Nest setback; 100m (low); 300m (Mod) and 500m (High);	MOE (2017)
			Data gathered from points across Canada indicate that mature conifer stands within patchy landscapes influenced by natural disturbance (e.g., recent burns) support the highest densities					Environment Canada (2016)
			Olive-sided Flycatcher prefers post-burn areas or wetlands that create open habitats for the species to forage					
Short-eared Owl	Not observed.	Section 9.4	Nesting generally occurs in large open areas	Open upland and lowland areas with no trees and some shrub cover.	Call-playback or visual searches.	March 25 to Aug 1	100m (low); 300m (Mod) and 500m (High);	MOE (2017)
			Requires a minimum area of about 50-100 ha, consistent with the mean territory size of 82 ha reported in Manitoba.					COSEWIC (2021b)
			In the north, nests are primarily in tundra (Sinclair et al. 2003), and sometimes beside a small shrub that provides cover					

References:

COSEWIC 2021a. COSEWIC Assessment and Status Report on the Barn Swallow *Hirundo rustica* in Canada. Committee on the status of Endangered Wildlife in Canada (COSEWIC). Special concern 2021.

COSEWIC 2021. COSEWIC Assessment and Status Report on the Short-eared Owl *Asio flammeus* in Canada. Committee on the status of Endangered Wildlife in Canada (COSEWIC). Threatened 2021

Environment Canada. 2016. Recovery Strategy for the Olive-sided Flycatcher (*Contopus cooperi*) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. vii + 52 pp.

COSEWIC. 2014. COSEWIC assessment and status report on the Wolverine *Gulo gulo* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 76 pp.

COSEWIC. 2013a. COSEWIC assessment and status report on the Little Brown Myotis *Myotis lucifugus*, Northern Myotis *Myotis septentrionalis* and Tri-colored Bat *Perimyotis subflavus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxiv + 93 pp.

COSEWIC. 2013b. COSEWIC assessment and status report on the Bank Swallow *Riparia riparia* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 48 pp

COSEWIC. 2009. COSEWIC assessment and status report on the Horned Grebe *Podiceps auritus*, Western population and Magdalen Islands population, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 42 pp.

Environmental Protection and Management Guideline. 2024. VERSION 3.1: July 2024. British Columbia Energy Regulator. 104pp.

Saskatchewan Ministry Environment (SME). 2021. Saskatchewan Ministry of the Environment Crown Land Work Authorization (2021). Denison Wheeler Project Area.

Environment Canada. 2015. Management Plan for the Rusty Blackbird (*Euphagus carolinus*) in Canada. Species at Risk Act Management Plan Series. Environment Canada, Ottawa. iv + 26 pp.

Environment Canada. 2012. Management Plan for the Yellow Rail (*Coturnicops noveboracensis*) in Canada [Proposed]. *Species at Risk Act* Management Plan Series. Environment Canada, Ottawa. iv + 23 pp.

Odsen, S. and M. Pyper. 2019. Rusty blackbird forestry fact sheet. Foothills Research Institute. Summaries and Communications Fact Sheets.

Manitoba Conservation. 2021. Recommended Development Setback Distances and Restricted Activity Periods for Birds by Wildlife Feature Type Manitoba Conservation Data Centre 2021 November

Ministry of Environment (MOE 2017), Fish, Wildlife and Lands Branch. April 2017. Activity Restriction Guidelines for Sensitive Species. Regina, Saskatchewan. 4pp.

Resources Information Standards Committee (RISC). 2022. Inventory Methods for Bats, Standards for Components of British Columbia's Biodiversity No. 20. Version 3.0. B.C. Ministry of Land, Water and Resource Stewardship, Ecosystems Branch, Victoria, B.C.

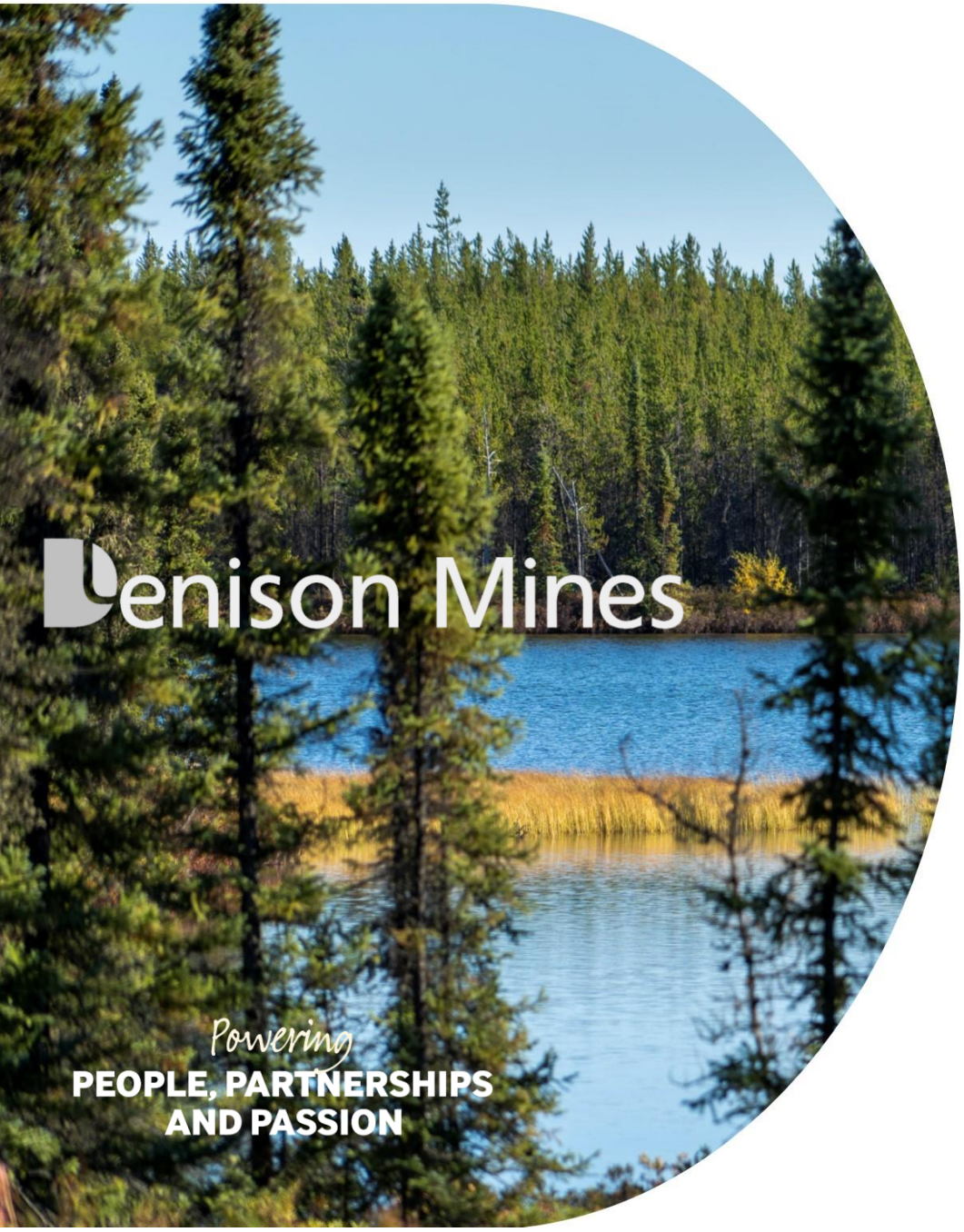
Saskatchewan Ministry of the Environment (SME) 2014. Yellow Rail Survey Protocol. Fish and Wildlife Branch Report No. 2014-14.0. 3211 Alberta Street, Regina, Saskatchewan. 8pp.

Wildlife Division. 2020. Management Plan for the Rusty Blackbird (*Euphagus carolinus*) in Newfoundland and Labrador. Department of Fisheries, Forestry and Agriculture, Government of Newfoundland and Labrador, Corner Brook, Canada. v + 23 pp.

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- Department: ECCC
- Project Effects Link: Migratory birds
- Reference to EIS, appendices, or supporting documentation: Section 9.4.6.4, Residual Effects Evaluation for Bird SAR, Table 9.4-19

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, July 8, 2024)	IR (ROUND 4, Sept. 16, 2024)	Denison Response (ROUND 4, Sept. 27 2024)
IR-170	-	**Context and Rationale:** The table and map presented by the Proponent do not appear representative of all available habitat for common nighthawk (CONI). Although CONI do preferentially use open areas such as gravel (often an anthropogenic disturbance) and regenerating forest, as identified in the draft EIS, they also use rock outcrops that can be within forested areas. As this area lies within the pre- Cambrian shield, there are likely rock outcrops that are also available habitat. As aerial insectivores, CONI select nesting areas in close proximity to wetlands or lakes where there is abundant forage. Habitat requirements and preferences for all species at risk is required for developing effective mitigations and adaptive management.	1. Provide an updated table and map that considers all available habitat for common nighthawk. 2. Additionally, as part of environmental management plans the Proponent should include species-specific mitigations that are biologically relevant to all the species at risk for all Project phases and components.	1. The methodology for the habitat-based assessment appropriately evaluated potential adverse effects on avian species. The VCs and KIs were selected following extensive consultation with Indigenous nations and communities and other Interested Parties; the VCs and KIs appropriately focused the EA; no updated table or map is considered to be required. In addition, further mapping is not expected to affect or change the findings and conclusions of the draft EIS. 2. Common Nighthawk were observed in the Project study areas during the baseline studies and are considered to be present and breeding. Rocky outcrops were not reported during the baseline studies (see Section 9.2.3). Pre-clearing surveys will be conducted, set-back buffers implemented, and pre-clearing survey and monitoring results will be used for adaptive management purposes (see also response to IR-159). Species-specific mitigation appropriate for Common Nighthawk is largely related to loss and/or alteration of habitat (including both direct and indirect effects).	This response has not been accepted. Part 1 of the IR was addressed, however, part 2 has not been addressed. ECCC requires this information to properly assess potential the mitigations and adaptive management for Common Nighthawk.	Based on the baseline field survey observations (n=38) for common nighthawk, the majority of observations (n=20) were in association with anthropogenic (disturbed) ecosite types, while the remainder (n=10) were associated with the jack pine-blueberry/black spruce-blueberry/lich (BS3/BS7) ecosite. Updates to Figure 9.4-7, Figure 9.4-12 and Table 9.4-19 of the revised draft EIS have been completed to include all habitat (ecosite) types. See separate response to IR-170: Available Habitat for Common Nighthawk. Figure 9.4-12 in the revised draft EIS has been replaced in the EIS with a revised figure that includes all ecosite types. Mitigation measures that would pertain to common nighthawks are included in Section 9.4.5.2.1 Work Timing Windows and Habitat Disturbance, which state that site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, whenever practicable. The nesting season for the Raptors, Migratory Breeding Birds, and Bird Species at Risk VCs in Saskatchewan spans a period from March 15 to August 31. Further, in the event site clearing is necessary within this time frame, pre-clearance wildlife sweeps will be completed where common nighthawks are suspected of nesting; if an occupied nest is found, applicable activity restriction guidelines would be implemented (as per SK MOE 2017). **References:** Saskatchewan Ministry of Environment (SK MOE). 2017. Saskatchewan Activity Restriction Guidelines for Sensitive Species. https://publications.saskatchewan.ca/api/v1/products/79242/formats/89555/download (accessed July 2021).	Item one was accepted, but item two remains outstanding. In Section 9.4.5.2.1, the Proponent has not included species specific mitigations for all species at risk, including common nighthawk. The Proponent should include species specific mitigations for all species at risk, including common nighthawk, so that ECCC can provide advice on the extent of Project impacts to these species. Additionally, the Proponent indicates that prior to site clearing during the nesting season (period from March 15 to August 31), pre-clearing nest surveys will be conducted. ECCC does not typically recommend nest surveys as a pre-clearing activity (please refer to the Advice to the Proponent relating to IR-170). In some instances, surveying for breeding activity using non-invasive methods could be required to determine species presence, and for some migratory birds SAR it may be required to survey for nest trees (residences) prior to clearing as these have year-round protection through SARA and a permit may be required. Specifically, it is not adequate to group SAR together (e.g., all birds) due to the unique life history and habitat requirements of each individual SAR. Denison is expected to provide species-specific mitigation measures for each SAR separately.	See response to IR-142-159-167-R1.	Following the supplementary information provided by Denison on July 8th, CNSC staff determined that Denison has not provided the requested information on species-specific mitigation measures for each SAR. It is not adequate to group SAR together (e.g., all birds) due to the unique life history and habitat requirements of each individual SAR. Denison is expected to provide species-specific mitigation measures for each SAR separately. In order to resolve this IR, Denison are expected to: •Provide species-specific mitigation measures for each individual SAR. Denison may provide this information through revision of Section 3.3 and Table 4.1 in EIS Appendix 9-D.	The requested updates have been made in Appendix 9-D of the final EIS (October 2024).


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Appendix 9-D Wildlife Species At Risk

Appendix to final EIS, Section 9

Version 3~~2~~

~~January 2024~~October 2024

Denison Mines

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Acronyms and Abbreviations

Term	Definition
BBS	Breeding Bird Survey
BC	British Columbia
CEA	Cumulative effects assessment
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
EMS	Environmental Management System
FIRT	Federal-Indigenous Review Team
IRs	Information requests
ISR	In situ recovery
KI	Key Indicator
LSA	Local Study Area
Project	Wheeler River Project
QP	Qualified Professional
RSA	Regional Study Area
SAR	Species at risk
SARA	*Species at Risk Act*
SARGSS	Saskatchewan Activity Restriction Guidelines for Sensitive Species
SKCDC	Saskatchewan Conservation Data Centre
VC	Valued Component

1 Introduction

1.1 Background

On October 21, 2022, Denison Mines Corp. (Denison) submitted a draft Environmental Impact Statement (EIS) for the proposed Wheeler River Project (the Project). Based on their initial review, the Canadian Nuclear Safety Commission indicated that the submission contained the required information to proceed with the Federal-Indigenous Review Team (FIRT) technical review of the draft EIS. On March 20, 2023, the FIRT provided Denison with a list of information requests (IRs) for Denison to respond to and eventually submit a final EIS document.

This Appendix provides additional information to address several IRs provided by Environment and Climate Change Canada (ECCC) as part of the initial round of Federal Indigenous Review Team (FIRT) comments. These IRs were related to 16 wildlife species at risk (SAR) listed under Schedule 1 of the federal *Species at Risk Act* (SARA). The draft EIS approach was conservative in that it considered appropriate representative species as Valued Components (VCs) and Key Indicators (KIs) in sections 9.3 Ungulates, Furbearers, and Woodland Caribou and 9.4 Raptors, Migratory Breeding Birds, and Bird SAR. Of the 16 wildlife SAR listed in Table 1-1, seven had been included as VCs or KIs in the EIS after a thorough scoping process (refer to Section 1.2 for additional information).

Nine of the sixteen were not included as individual VCs or KIs but are considered important from a regulatory perspective. The SARA-listed species identified by ECCC are listed in Table 1-1. Those noted in bold font indicate those for which further assessment is provided in this appendix.

Table 1-1~~1.1~~ Wildlife Species at Risk Listed by Environment and Climate Change Canada

Common Name	Scientific Name	Discussed in the ~~Draft~~ Section 9 of the draft EIS
Nine-spotted lady beetle	***Coccinella ovemnotata***	**No**
Transverse lady beetle	***Coccinella transversoguttata***	**No**
Yellow-banded bumble bee	***Bombus terricola***	**No**
Northern leopard frog	***Lithobates pipiens***	**No**
Little brown myotis	***Myotis lucifugus***	**No**
Northern myotis	***Myotis septentrionalis***	**No**
Wolverine	*Gulo gulo*	Yes
Woodland caribou	*Rangifer tarandus caribou*	Yes
Bank Swallow	***Riparia riparia***	**No**
Barn Swallow	***Hirundo rustica***	**No**
Common Nighthawk	*Chordeiles minor*	Yes
Horned Grebe	***Podiceps auritus***	**No**
Olive-sided Flycatcher	*Contopus cooperi*	Yes

Common Name	Scientific Name	Discussed in the ~~Draft~~ Section 9 of the draft EIS
Rusty Blackbird	*Euphagus carolinus*	Yes
Short-eared Owl	*Asio flammeus*	Yes
Yellow Rail	*Coturnicops noveboracensis*	Yes

Of the 16 species listed in Table 1-1, seven had been included as VCs or KIs in the EIS after a thorough scoping process, as summarized below.

1.2 Valued Component Selection

The VCs considered in the effects assessment for the Project are aspects of the biophysical and human environments that were considered to be likely to be affected (adversely or positively) by the Project. The VCs reflect identified scientific, local knowledge, and Indigenous Knowledge, and community interests regarding the Project and its potential effects. The potential effects are typically identified early in the environmental assessment process as a result of questions and concerns raised through engagement with Indigenous and community groups, government departments and agencies, and the general public.

Denison reviewed and considered all received input to develop a VC list that reflects the key environmental, socio-economic, heritage, and human health components and interests to appropriately focus the EA.

The initial VCs selected to represent bird SAR in the habitat-based assessment that were provided in the Terms of Reference (Denison 2019) were evaluated, consolidated, and organized to allow for the logical assessment of Project effects, and are presented in Table 1-2 and Table 1-3, which formed the basis for the subsequent VC-specific assessment.

Table 1-2~~1.2~~ Wildlife Species at Risk Valued Component and Rationale for their Inclusion in the Habitat-based Environmental Assessment for the Denison Wheeler River Project

Valued Component	Rationale
Biophysical Environment	
Terrestrial Environment	
Furbearers	Project activities and infrastructure may affect local furbearer populations, including species at risk (SAR), resulting in non-compliance with permit conditions (e.g., *Species at Risk Act* [SARA; Government of Canada 2022], *The Wildlife Act 1998* [Government of Saskatchewan 2020]).
Woodland Caribou	Project activities and infrastructure may affect woodland caribou populations, resulting in non-compliance with permit conditions (e.g., SARA [Government of Canada 2022], *The Wildlife Act, 1998* [Government of Saskatchewan 2020]).

Valued Component	Rationale
Bird Species at Risk	Project activities and infrastructure may affect bird SAR (specifically disturbance and/or destruction of eggs, young, and adults) resulting in non-compliance with regulatory requirements (e.g., SARA [Government of Canada 2022], *Migratory Birds Convention Act 1994* [Government of Canada 2017], *Saskatchewan Activity Restriction Guidelines for Sensitive Species* [Government of Saskatchewan 2017], *The Wildlife Act 1998* [Government of Saskatchewan 2020]).

Table 1-3~~1.3~~ Valued Components, Key Indicators, and Measurable Parameters for the Wildlife Component included in the Habitat-based Environmental Assessment for Denison Wheeler River Project

Valued Component	Key Indicator	Measurable Parameter
Furbearers	Wolverine	Amount of habitat (km^2) (not necessarily occupied) that may be altered or lost relative to its availability in the Regional Study Area (RSA). The number of wolverine mortalities directly or indirectly attributable to the Project.
Woodland Caribou	Woodland caribou	Amount of habitat (km^2) (not necessarily occupied) that may be altered or lost relative to its availability in the RSA. The number of woodland caribou mortalities directly or indirectly attributable to the Project.
Bird Species at Risk	Common Nighthawk	Percentage of habitat for Common Nighthawk altered/lost directly or indirectly as a result of Project activities. The number of Common Nighthawk mortalities directly or indirectly attributable to the Project.
	Rusty Blackbird	Percentage of habitat for Rusty Blackbird altered/lost directly or indirectly as a result of Project activities. The number of rusty blackbird mortalities directly or indirectly attributable to the Project
	Olive-sided Flycatcher	Percentage of habitat for Olive-sided Flycatcher altered/lost directly or indirectly as a result of Project activities. The number of Olive-sided Flycatcher mortalities directly or indirectly attributable to the Project
	Short-eared Owl	Percentage of habitat for Short-eared Owl altered/lost directly or indirectly as a result of Project activities. The number of Short-eared Owl mortalities directly or indirectly attributable to the Project.

Valued Component	Key Indicator	Measurable Parameter
	Yellow Rail	Percentage of habitat for Yellow Rail altered/lost directly or indirectly as a result of Project activities. The number of Yellow Rail mortalities directly or indirectly attributable to the Project.

The five bird species identified in Table 1-3 were selected as SAR VCs for the habitat-based EA in consideration of information/responses received during extensive Indigenous and community engagement completed by Denison, and they represent wildlife species of local importance. For these five species, additional information is not be provided in this Appendix. Rather, the reader is referred to the applicable sections in the EIS where appropriate information on existing conditions (Section 9.4.3.3), potential project-related effects (Section 9.4.4), mitigation measures (Section 9.4.5), residual effects and their significance (Section 9.4.6), and cumulative effects (Section 9.4.7) is provided.

2 Supplemental Information

As requested by ECCC, the following subsections provide supplemental information for the remaining nine species listed in Table 2-1 that were not included as VCs or KIs in the EIS. For these nine species, a brief overview of life history requirements (existing environment), a discussion on the effects assessment and mitigation measures, and a summary of residual and cumulative effects are included.

Table 2-1~~2.1~~ Wildlife Species At Risk Considered in the Wheeler River Project Environmental Impact Statement

Common Name	Scientific Name	Provincial Status	Federal Status[1]	Preferred Habitat	Documented Occurrence in the Local Study Area[2]	Reference in the Environmental Impact Statement (EIS)
Arthropods						
Nine-spotted lady beetle	*Coccinella novemnotata*	S4	Endangered	Habitat generalist – uses a diverse range of habitats and consumes a variety of prey. See Section 2.1.1 for further details.	Local Study Area (LSA) is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a Valued Component (VC) in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Transverse lady beetle	*Coccinella transversoguttata*	S4	Special Concern	Habitat generalist – uses a diverse range of habitats and consumes a variety of prey. See Section 2.1.2 for further details.	LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Yellow-banded bumble bee	*Bombus terricola*	S4	Special Concern	Habitat generalist – uses a variety of habitats and consumes nectar and pollen from many different flowering plants. See Section 2.1.3 for further details.	LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Amphibians						
Northern leopard frog	*Lithobates pipiens*	S3	Special Concern	Three district habitats: (1) overwintering waterbodies that are cold, well oxygenated, and do not freeze to bottom; (2) breeding and larval waterbodies with shallow, open habitats, neutral pH, and no fish; and (3) summering areas in shallow	LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date. Amphibian nocturnal call	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.

Common Name	Scientific Name	Provincial Status	Federal Status[1]	Preferred Habitat	Documented Occurrence in the Local Study Area[2]	Reference in the Environmental Impact Statement (EIS)
				marshes, moist upland meadows where grass height is less than 1 m. See Section 2.2.1 for further details.	and visual search surveys were completed in the LSA and Regional Study Area (RSA) as part of the baseline program; however, only boreal chorus frogs (*Pseudacris maculata*) were detected (Appendix 9-C).	
Bats						
Little brown myotis	*Myotis lucifugus*	S4B, S4N	Endangered	Seasonal habitat requirements: (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies. See Section 2.3.1 for further details.	Documented during the acoustic bat surveys as part of the baseline field program as present in the LSA and RSA, and previously observed in the RSA (SKCDC 2023).	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Northern myotis	*Myotis septentrionalis*	S3	Endangered	Seasonal habitat requirements: (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies. See Section 2.3.2 for further details.	Documented during the acoustic bat surveys as part of the baseline field program as present in the LSA and RSA (Appendix 9-C).	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.

Common Name	Scientific Name	Provincial Status	Federal Status[1]	Preferred Habitat	Documented Occurrence in the Local Study Area[2]	Reference in the Environmental Impact Statement (EIS)
Terrestrial Wildlife Species						
Wolverine	*Gulo gulo*	S2	Special Concern	See Section 9.3.3.2 of the EIS for details.	LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Included as a Key Indicator (KI) of the Furbearer VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Woodland caribou	*Rangifer tarandus caribou*	S3	Threatened	See Section 9.3.3.3 of the EIS for details.	Documented within the RSA during the baseline field program (Appendix 9-C)	Included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Avian Species						
Bank Swallow	*Riparia riparia*	S4B, S5M	Threatened	Nesting colonies are typically characterized by steep embankments with a sand, silt, or clay substrate that can be easily excavated for burrows. They are often adjacent to slow-moving or still waterbodies and may occur in natural habitats or in anthropogenic features. Bank Swallows are aerial insectivores that forage over a variety of open habitats. See Section 2.4.1 for further details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Not included as a KI of the Bird Species at Risk (SAR) VC in the EIS (Common Nighthawk was used as a surrogate species). A review of life history requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5).
Barn Swallow	*Hirundo rustica*	S4B	Threatened	Breeding habitat typically requires a suitable nesting site with a vertical or horizontal surface underneath a roof of	Documented during the breeding bird surveys as part of the baseline field	Not included as a KI of the Bird SAR VC in the EIS (Common Nighthawk was used as a surrogate species). A review of life history

Common Name	Scientific Name	Provincial Status	Federal Status[1]	Preferred Habitat	Documented Occurrence in the Local Study Area[2]	Reference in the Environmental Impact Statement (EIS)
				some sort, open areas for foraging, and a waterbody with mud for nest building. Anthropogenic features such as barns, houses, bridges, and culverts are commonly used nesting sites. See Section 2.4.2 for further details.	program as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5).
Common Nighthawk	*Chordeiles minor*	S4B	Special Concern	See Section 9.4.3.3 of the EIS for details.	Documented during the baseline field program as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Horned Grebe	*Podiceps auritus*	S5B	Special Concern	Breeding habitat consists of small to medium-sized freshwater lakes, ponds, and marshes that are shallow with open water (at least 40%), emergent vegetation, anchorage for nests, and concealment for nests and young. See Section 2.4.3 for further details.	Documented during the baseline field program as present in the LSA (Appendix 9-C).	Not included as a KI of the Bird SAR VC in the EIS (Yellow Rail was used as a surrogate species). A review of life history requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5).
Olive-sided Flycatcher	*Contopus cooperi*	S4B	Special Concern	See Section 9.4.3.3 of the EIS for details.	Documented during the baseline field program as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.

Common Name	Scientific Name	Provincial Status	Federal Status[1]	Preferred Habitat	Documented Occurrence in the Local Study Area[2]	Reference in the Environmental Impact Statement (EIS)
Rusty Blackbird	*Euphagus carolinus*	S3B, SUN	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Short-eared Owl	*Asio flammeus*	S3B, S2N	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Yellow Rail	*Coturnicops noveboracensis*	S3B	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.

Note: shaded rows indicate SAR was included as a VC or KI in the draft EIS

1 Schedule 1 under the *Species at Risk Act*.

2 Potential for Occurrence – based on known species occurrence data from Saskatchewan Conservation Data Centre (2023), Omnia (Appendix 9-C), Birds of Saskatchewan (2019), and Atlas of Saskatchewan Birds (Smith 1996) and/or presence of suitable habitat.

2.1 Arthropods

2.1.1 Nine-Spotted Lady Beetle

The nine-spotted lady beetle is a small beetle species found across southern Canada and the continental United States (COSEWIC 2016a). Its northern range limit in Saskatchewan is reported to occur near Lake Athabasca (COSEWIC 2016a). Based on records provided by the Saskatchewan Conservation Data Centre Hunting, Angling and Biodiversity of Saskatchewan (HABISask) database (SKCDC 2023), there are no historical observations of this species documented in the Regional Study Area (RSA).



Source: COSEWIC (2016a).

The nine-spotted lady beetle is a habitat generalist that uses a diverse range of habitats (e.g., open to semi-open forests, grasslands, riparian areas) and consumes a variety of prey (e.g., many species of arthropods [particularly aphids], sap, nectar and pollen) (COSEWIC 2016a). Being a habitat generalist allows the nine-spotted lady beetle to exploit seasonally available prey sources, with prey availability influencing the species' distribution more than habitat availability (COSEWIC 2016a).

The nine-spotted lady beetle has four life stages (i.e., egg, larva, pupa, and adult) and may produce two generations per year (i.e., spring and fall) depending on regional climate conditions (COSEWIC 2016a). Lady beetles, in general, are highly mobile and may undertake short (few hundred metres) and long-distance (18 to 120 km) movements (COSEWIC 2016a). The nine-spotted lady beetle is not migratory nor does it display strong site fidelity (COSEWIC 2016a). The nine-spotted lady beetle overwinters in aggregations in well-ventilated habitats (e.g., in rock crevices, grass tussocks, or leaf litter, or under stones or tree bark), becoming active in the early spring when temperatures start to increase (COSEWIC 2016a).

The nine-spotted lady beetle is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure) (Saskatchewan Conservation Data Centre 2023). The species has undergone significant population declines in Canada since 1975, going from one of the more common lady beetles collected to being rarely collected relative to other lady beetles, despite comprehensive and targeted surveys (COSEWIC 2016a). Reasons for these population declines are currently unknown but are thought to be driven by competition, predation, and introduced diseases from non-native species (including non-native lady beetles), agricultural pesticide use to control aphids, habitat loss via urban expansion, and other human disturbances (COSEWIC 2016a).

2.1.2 Transverse Lady Beetle

The transverse lady beetle is a small beetle species found across the United States and Canada, including all provinces and territories (COSEWIC 2016b). The species is a habitat generalist and uses similar habitat types and consumes similar prey as the nine-spotted lady beetle, which means it is also able to exploit seasonally available prey sources (COSEWIC 2016b). According to the information from the HABISask database, there are no historical observations of this species documented in the RSA.



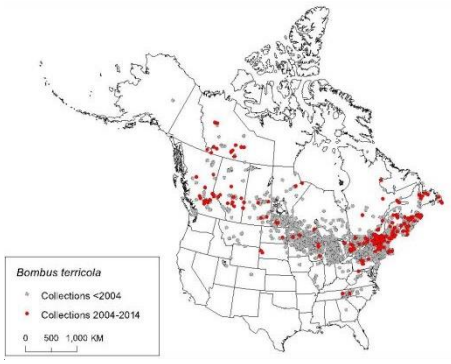
Source: COSEWIC (2016b).

The transverse lady beetle has four life stages (i.e., egg, larva, pupa, and adult) and may produce two generations per year (i.e., spring and fall) depending on regional climate conditions (COSEWIC 2016b). Lady beetles in general are highly mobile and may undertake short (few hundred metres) and long-distance (18 to 120 km) movements (COSEWIC 2016b). The transverse lady beetle is not migratory nor does it display strong site fidelity (COSEWIC 2016b). The transverse lady beetle overwinters in aggregations in well-ventilated habitats (e.g., in rock crevices, grass tussocks, or leaf litter, or under stones or tree bark), becoming active in the early spring when temperatures start to increase (COSEWIC 2016b).

The transverse lady beetle is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure) (Saskatchewan Conservation Data Centre 2023). The species was once abundant across its range in Canada and was one of the most common lady beetles collected; however, since 1986, the species is now absent, below detection limits, or present in low numbers in many parts of its range (COSEWIC 2016b). The transverse lady beetle has not been detected in Saskatchewan since 2001 (COSEWIC 2016b). Reasons for these population declines are currently unknown but are thought to be driven by the same factors listed for the nine-spotted lady beetle in Section 2.1.1.

2.1.3 Yellow-banded Bumble Bee

The yellow-banded bumble bee is a medium-sized bumble bee species found throughout eastern North America, from eastern British Columbia (BC) to Newfoundland and Labrador and from the northern United States up to the southern portion of the territories (COSEWIC 2015). The species is a habitat generalist (e.g., boreal habitats, mixed woodlands, montane meadows) and consumes nectar and pollen from many different flowering plants (COSEWIC 2015). According to the information from the HABISask database, there are no historical observations of this species documented in the RSA.



Source: COSEWIC (2015).

The yellow-banded bumble bee has four life stages (i.e., egg, larva, pupa, and adult) and produces one generation per year, with mated queens establishing new colonies each year (COSEWIC 2015). After overwintering underground in loose soil or decomposing organic material, the mated queens emerge in the spring and search for potential nest sites, which are typically located underground in existing cavities (e.g., abandoned rodent burrows, rotten logs, openings in dead wood, and grassy hummocks) (COSEWIC 2015). Once a queen has found a suitable nest site, she forages for nectar and pollen and then returns to her nest site to lay eggs, which will develop into her future workers (i.e., unmated daughters that do not typically reproduce) (COSEWIC 2015). After the initial eggs hatch and the larva and pupa develop into adult workers, the workers take over nest and brood care, foraging duties, and colony protection while the queen continues to lay eggs (COSEWIC 2015). Males and potential queens are produced by late summer once the colony reaches maximum worker production, at which point they leave the colony and mate (COSEWIC 2015). All males and workers die by fall while the mated queens hibernate through the winter in suitable overwintering sites (COSEWIC 2015).

The yellow-banded bumble bee is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure)

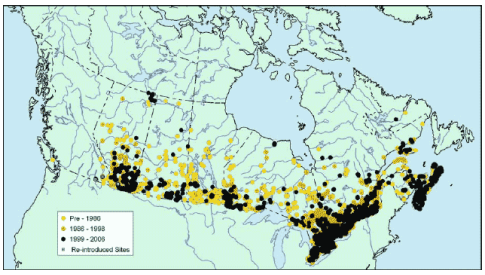
(Saskatchewan Conservation Data Centre 2023). Prior to the 1990s, the yellow-banded bumble bee was one of the more common bumble bees collected in eastern and boreal Canada (COSEWIC 2015, Environment and Climate Change Canada 2022a). Population declines started to occur in the early 1990s, with an average rate of decline of 66.5% in proportional abundance across central and southern Canada between 1992 and 2011 (COSEWIC 2015, Environment and Climate Change Canada 2022a). The species is no longer found at several historical collection sites (COSEWIC 2015).

The status of the yellow-banded bumble bee in boreal habitats and Arctic regions is unknown (COSEWIC 2015, Environment and Climate Change Canada 2022a). Reasons for these population declines are currently unknown but are thought to be driven by introduced diseases from managed bumble bee species, agricultural pesticide use, habitat loss via urban and agricultural expansion, and climate change (COSEWIC 2015).The species' unique type of sex determination, where colonies must reach maximum worker production to produce males and potential queens, has been identified as a limiting factor (COSEWIC 2015, Environment and Climate Change Canada 2022a).

2.2 Amphibians

2.2.1 Northern Leopard Frog

The northern leopard frog is found across most of west-central and northeastern North America (COSEWIC 2009a). The species is widespread in Canada, ranging from southeastern BC to Labrador, and from southcentral Northwest Territories (COSEWIC 2009a, NCC 2023).



Source: COSEWIC (2009a).

Three district habitats are used by the northern leopard frog on an annual basis: (1) overwintering waterbodies that are cold, well oxygenated, and do not freeze to bottom (e.g., rivers, streams, deep lake ponds and creeks, and spillways below dams); (2) breeding and larval waterbodies with shallow, open habitats (e.g., ponds, lakeshores, marshes, and slow-moving streams; may be permanent or semi-permanent), neutral pH, well vegetated, and no fish; and (3) summering areas in shallow marshes, moist upland meadows, forests and grasslands where grass height is less than 1 m (COSEWIC 2009a, NCC 2023). These habitats must be in proximity with suitable dispersal corridors interconnecting them (e.g., riparian areas and waterways) as the species is not capable of long-distance movements (COSEWIC 2009a, Environment Canada 2013).

Northern leopard frogs emerge from their overwintering waterbodies in early spring shortly after ice off (COSEWIC 2009a). The breeding season extends from mid-April to June, with exact timing dependent on location and latitude (COSEWIC 2009a). Females lay several thousand eggs, attaching them to submerged vegetation, which develop into tadpoles within two weeks depending on water temperatures (COSEWIC 2009a). The tadpoles in turn develop into small frogs over a two-to-three-month period, after which they migrate to their summering areas and forage on a variety of arthropods, worms, and snails, sometimes preying on small birds and smaller frogs (COSEWIC 2009a).

Three populations are recognized for the northern leopard frog in Canada: the Rocky Mountain, the Western Boreal/Prairie, and the Eastern (COSEWIC 2009a, NCC 2023). The Western Boreal/Prairie population is found in Alberta, Saskatchewan, Manitoba, and the Northwest Territories (COSEWIC 2009a,

NCC 2023). The Western Boreal/Prairie population is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S3 species in Saskatchewan (i.e., Vulnerable) (Saskatchewan Conservation Data Centre 2023).

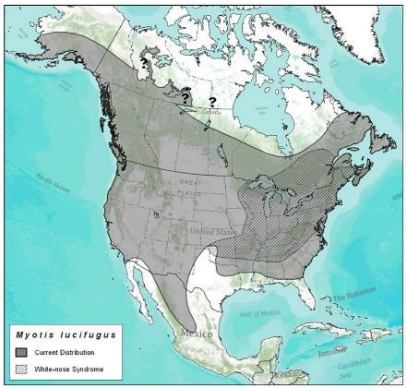
Population data are limited for the northern leopard frog in Canada (COSEWIC 2009a, Environment Canada 2013). Large-scale population declines occurred in the early 1970s, with populations in western Canada (i.e., BC and Alberta) most dramatically affected (COSEWIC 2009a). Information is lacking on the current status of northern leopard frog populations in Saskatchewan (COSEWIC 2009a, Environment Canada 2013).

Threats to the northern leopard frog include emerging diseases (e.g., *Chytridiomycosis*), introduced non-native species, habitat loss and fragmentation, environmental contamination, and increased frequency and severity of droughts (COSEWIC 2009a). The species' specific habitat requirements and vulnerability to diseases and prolonged periods of drought have been identified as limiting factors (Environment Canada 2013).

2.3 Bats

2.3.1 Little Brown Myotis

The little brown myotis is a small bat species found across North America, including across Canada south of the treeline (COSEWIC 2013a). The species is considered a short-distance regional migrant between its summer and winter ranges, with the distance travelled dependent on the location of suitable overwintering hibernacula (COSEWIC 2013a).



Source: COSEWIC (2013a).

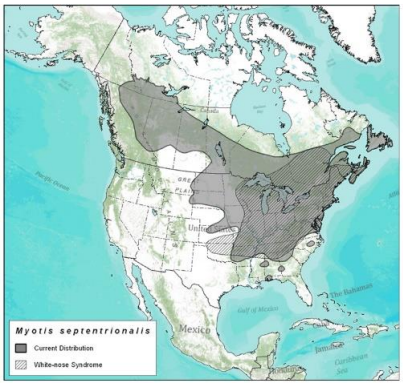
Habitat for the little brown myotis is composed of (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies (COSEWIC 2013a). Hibernacula and maternity sites are the main limiting habitat features for this species (COSEWIC 2013a). Hibernacula occur in parts of caves, mines, and buildings that have stable and specific temperature (-4 to 13°C) and humidity (>80%) conditions (COSEWIC 2013a). Maternity sites occur in large-diameter trees, rock crevices, buildings, and bat houses that offer warm and relatively stable microclimate conditions that allow females to avoid going into torpor so they can focus on caring for their young (COSEWIC 2013a, Slough and Jung 2020). Males are more versatile in their summer roosting requirements and use tree cavities, raised bark, foliage, rock crevices, buildings, and bridges with a broader range of microclimate conditions (COSEWIC 2013a, Johnson et al. 2019). Foraging areas for the little brown myotis include a variety of habitats situated close to roosting and maternity sites, including over water (e.g., wetlands, lakes, ponds, and rivers), along riparian areas and forest edges, and in forest gaps (COSEWIC 2013a).

The little brown myotis is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S4B, S4N species in Saskatchewan (i.e., Apparently Secure breeding population, Apparently Secure non-breeding population) (Saskatchewan Conservation Data Centre 2023).

The current size of the little brown myotis population in Canada is unknown. Prior to the arrival of White-nose Syndrome in 2010, the population in Canada was estimated to be over one million individuals (COSEWIC 2013a, Environment and Climate Change Canada 2018). White-nose Syndrome is a disease the causes high rates of mortality among hibernating bats, and it has been identified as the main threat for bat populations in Canada (COSEWIC 2013a). Other threats to the little brown myotis include habitat loss, colony eradication, chemical contamination, and wind turbines (COSEWIC 2013a).

2.3.2 Northern Myotis

The northern myotis is a small bat species found across North America, including across Canada south of the treeline (COSEWIC 2013a). The species is considered a short-distance regional migrant between its summer and winter ranges, with the distance travelled dependent on the location of suitable overwintering hibernacula (COSEWIC 2013a).



Source: COSEWIC (2013a).

Habitat for the northern myotis is composed of (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies (COSEWIC 2013a). Hibernacula and maternity sites are the main limiting habitat features for this species (COSEWIC 2013a). Hibernacula occur in parts of caves, mines, and buildings that have stable and specific temperature (0.6 to 14°C) and humidity (>80%) conditions (COSEWIC 2013a). Summer roosting trees are typically found in mature to old-growth forests, swamps, and riparian areas, although retained older trees and snags in younger forests may occasionally provide suitable roosting habitat (Environment and Climate Change Canada 2018). Females strongly prefer tall, large-diameter trees (both living and dead, typically deciduous) with early- to mid-decay for maternity sites (COSEWIC 2013a, Environment and Climate Change Canada 2018). Anthropogenic features (e.g., barns) may occasionally be used as maternity sites in fragmented landscapes with few potential roost trees (Environment and Climate Change Canada 2018). Maternity sites that maintain warm and relatively stable microclimate conditions are important to reproductive females and young as they allow more energy to be directed toward growth and development (Caceres and Barclay 2000, COSEWIC 2013a). Males are more versatile in their summer roosting requirements; they most frequently roost under exfoliating, raised bark but may also roost in the cavities and crevices of trees and snags with early- to mid-decay (Jung et al. 2004, COSEWIC 2013a).

The northern myotis is well adapted to flying in areas of dense or structurally complex vegetation where it catches flying insects on the wing or feeds by gleaning prey from foliage (Caceres and Barclay 2000, Henderson and Broders 2008). The species typically forages within the interior of mature to old-growth deciduous and mixedwood forests, but may also forage in forest gaps, along forest edges and riparian areas, and over rivers (Henderson and Broders 2008, COSEWIC 2013a).

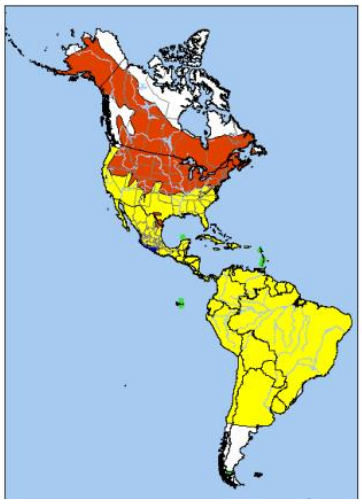
The northern myotis is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S3 species in Saskatchewan (i.e., Vulnerable) (Saskatchewan Conservation Data Centre 2023). The current size of the northern myotis population in Canada is unknown. Prior to the arrival of White-nose Syndrome in 2010, the population in Canada was estimated to be over one million individuals (COSEWIC 2013a, Environment and Climate Change Canada 2018). White-nose Syndrome has

been identified as the main threat for northern myotis populations in Canada (COSEWIC 2013a). . Other threats to the northern myotis include habitat loss, colony eradication, chemical contamination, and wind turbines (COSEWIC 2013a).

2.4 Avian Species

2.4.1 Bank Swallow

The Bank Swallow is a small songbird that occurs on every continent (except Antarctica and Australia), breeds throughout Canada, and winters primarily in South America (COSEWIC 2013b). Nesting colonies are typically characterized by steep embankments with a sand, silt, or clay substrate that can be easily excavated for burrows (COSEWIC 2013b, Government of Canada 2019a). These steep sand, silt, or clay embankments are frequently subject to erosion or slumping (COSEWIC 2013b, Garrison and Turner 2020).



Source: COSEWIC (2013b).

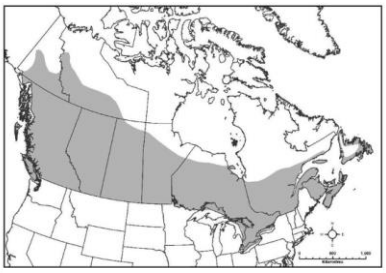
Nesting colonies are often adjacent to slow-moving or still waterbodies (e.g., low gradient rivers or lakes) and may occur in natural habitats or in anthropogenic features (e.g., quarries or road cuts) (COSEWIC 2013b, Government of Canada 2019a, Garrison and Turner 2020). Colony size can range from less than half a dozen burrows to hundreds or thousands of burrows (COSEWIC 2013b, Government of Canada 2019a). Individual burrows within colonies may be recolonized in subsequent years if the integrity of the colony remains intact (i.e., does not erode and collapse) (Garrison and Turner 2020). Bank Swallows are aerial insectivores that forage over a variety of open habitats such as lakes, ponds, rivers, wetlands, grasslands, and agricultural areas (COSEWIC 2013b, Garrison and Turner 2020).

The Bank Swallow is federally listed under Schedule 1 of SARA as Threatened (Government of Canada 2023) and is designated as an S4B, S5M species in Saskatchewan (i.e., Apparently Secure breeding population, Secure aggregating transient population [migrants]) (Saskatchewan Conservation Data Centre 2023). The most recent breeding population estimate for Canada is 2.4 million individuals (Environment and Climate Change Canada 2022b). Based on Breeding Bird Survey (BBS) data collected between 1970 and 2019, the Bank Swallow population in Canada has declined at a rate of 5.3% per year, for an overall decline of 98.0% (Environment and Climate Change Canada 2022b). The long-term population decline appears to be driven by several threats acting cumulatively, including loss of nesting and foraging habitats, incidental take during anthropogenic activities (e.g., aggregate extraction and erosion control), large-scale declines in aerial insect populations, and climate change (COSEWIC 2013b). Bank Swallows are also particularly vulnerable to collisions with vehicles partly due to the attraction of individuals to intraspecific carcasses; one swallow hit by a vehicle could attract several individuals to a road, potentially resulting in subsequent collisions and large mortality events (COSEWIC 2013b, Garrison and Turner 2020).

Although colonial nesting may provide advantages (e.g., predation protection and assistance with thermoregulation), it has been identified as a limiting factor for the Bank Swallow, potentially making

them more vulnerable to natural events or anthropogenic activities, which may result in mass mortality events (Environment and Climate Change Canada 2022b).

2.4.2 Barn Swallow

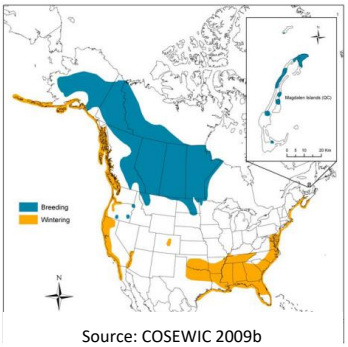


Source: COSEWIC (2021).

The Barn Swallow is a medium-sized songbird that occurs on every continent (except Antarctica), breeds throughout Canada, and winters in the southern United States, Mexico, and southwards (COSEWIC 2021a). Breeding habitat typically requires a suitable nesting site with a vertical or horizontal surface underneath a roof of some sort, open areas for foraging (e.g., grasslands, fields, wetlands, and shorelines), and a waterbody with mud for nest building (Government of Canada 2019b, Brown and Brown 2020, COSEWIC 2021a). Historically, suitable nesting sites were likely provided by caves, cliff faces, rock leges, tree branches, and hollow trees (Brown and Brown 2020, COSEWIC 2021a). Today, nesting sites are usually located within agricultural and rural areas, and along roads and highways (Brown and Brown 2020, COSEWIC 2021a). Anthropogenic features such as barns, houses, bridges, and culverts are commonly used for nesting sites (COSEWIC 2021a). Barn Swallows nest in colonies or independently and typically return to the same nesting sites each year and may reuse old nests (Government of Canada 2019b, Brown and Brown 2020, COSEWIC 2021a).

The Barn Swallow is federally listed under Schedule 1 of SARA as Threatened (Government of Canada 2023) and is designated as an S4B species in Saskatchewan (i.e., Apparently Secure breeding population) (Saskatchewan Conservation Data Centre 2023). An estimated 6.4 million individuals currently breed in Canada, with over 60% of the population breeding throughout the prairie provinces (COSEWIC 2021a). Based on BBS data collected between 1970 and 2019, the Barn Swallow population in Canada has declined at a rate of 2.34% per year, for an overall decline of 68.6% (COSEWIC 2021a). Intensification of agriculture, loss of nesting sites, large-scale declines in aerial insect populations, and climate change are cited as the most imminent threats for the Barn Swallow, and its dependence on aerial insects for prey and low post-fledging survival rates are cited as limiting factors for the species (COSEWIC 2021a). The repeated use of anthropogenic features for nesting makes Barn Swallows vulnerable to incidental take, especially if the anthropogenic features require routine maintenance. In addition, their frequent use of anthropogenic features for nesting makes Barn Swallows vulnerable to entrapment (e.g., buildings, pipes, vents, other enclosed spaces) as they search for potential locations to build a nest (COSEWIC 2021a).

2.4.3 Horned Grebe



Source: COSEWIC 2009b

The Horned Grebe is a small waterbird that occurs in North America and Eurasia (COSEWIC 2009b). Within North America, the species breeds across western Canada from BC and Yukon across to the Magdalen Islands in Quebec and winters along the Pacific and Atlantic coasts (COSEWIC 2009b).

Breeding habitat for the Horned Grebe consists of small to medium-sized freshwater lakes, ponds, and marshes that are shallow with open water (at least 40%), emergent vegetation,

anchorage for nests, and concealment for nests and young (COSEWIC 2009b, Stedman 2020). Horned Grebes use a range of waterbody sizes for breeding, but typically prefer waterbodies between 0.3 and 2.0 ha in size (COSEWIC 2009b). Most pairs are solitary, but loose colonies of up to 20 pairs have been found on larger waterbodies with abundant food resources (COSEWIC 2009b, Stedman 2020). Nests are typically located in shallow water near shore on a floating or emerging mass of vegetation (COSEWIC 2009b). Horned Grebes are diving birds that feed on a variety of aquatic arthropods and fish (COSEWIC 2009b, Stedman 2020).

The Western population of the Horned Grebe is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S5B species in Saskatchewan (i.e., Secure breeding population) (Saskatchewan Conservation Data Centre 2023). An estimated 200,000 to 500,000 individuals occur in the Western population, with most breeding in southern Alberta and Saskatchewan (COSEWIC 2009b, Environment and Climate Change Canada 2022c). Based on BBS data collected between 1970 and 2019, the Western population of the Horned Grebe in Canada has declined at a rate of 1.7% per year, for an overall decline of 57.0% (Environment and Climate Change Canada 2022c). The reasons for this population decline are unknown. Probable threats include permanent habitat loss, temporary loss of habitat during droughts, eutrophication and degradation of habitat due to fertilizers, predator expansion on the prairies, Type E botulism in the Great Lakes, entanglement in commercial fishing gear, climate change and extreme weather, and oil spills on wintering grounds (COSEWIC 2009b).

3 Mitigation Measures

The Project will require the construction, operation, and decommissioning of several components (as described in Section 2 of the EIS). Expected interactions between these Project components and activities and the wildlife VCs and their associated KIs are summarized by Project phase and activity in Tables 9.3-6 and 9.4-5 of the EIS. Based on the timing and nature of interactions identified in Tables 9.3-6 and 9.4-5 of the EIS, the following adverse effects on the wildlife VCs, including SAR, are likely to occur during the lifetime of the Project:

- alteration and/or loss of habitat; and
- change in mortality.

These potential effects apply to Wildlife SAR as well. The potential effects are described in Sections 9.3.4.2 and 9.4.4.2 of the EIS for each Project phase as they may affect the wildlife VCs and associated KIs.

Mitigation in this EIS is defined as the elimination, reduction, or control of potential adverse effects of the Project on the environment throughout all Project phases. Project-specific mitigation measures include: Project design; implementation of best management practices; development of management plans; implementation of emergency response programs; and provision of training, education and awareness (Denison 2020). Mitigation measures for each potential effect are described in Sections 9.3.5 and 9.4.5 of the EIS. The following subsections summarize mitigation measures that will be implemented to avoid or minimize adverse effects on the Wildlife SAR.

3.1 Project Design Measures

Potential adverse effects on Raptors, Migratory Breeding Birds, and Bird SAR VCs will be avoided or minimized to the extent practical through Project design. All of the Project design measures listed here are consistent with those presented in Section 9 of the EIS (i.e., there are no new Project design measures proposed in this appendix):

- The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent practicable resulting in reduced habitat disturbance and noise propagation.
- Much of the proposed footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
- The powerline to the main substation at the site is relatively short (i.e., approximately 7 km) and will be constructed from the existing provincial power line adjacent to Highway 914.
- During Operation, progressive reclamation activities will be completed where possible, and the progress and success of these activities will be assessed annually.
- Cleared brush will be stockpiled when possible, to be used in progressive reclamation.
- Ongoing decommissioning of Project components will be completed when possible.
- Dust deposition on vegetation and waterbodies (including potential deposition of trace metals and radionuclides) will be reduced by:
    - directing processing plant exhaust from drying and packaging areas through a stack prior to release outside of the building;
    - designing the stack height based on results of air dispersion modelling to be an appropriate height for optimal dispersion;

  - controlling access to the property with both a north and south security gate (the north gate is on a decommissioned road and the south gate is manned);
  - making a wash bay available to clean items, equipment and vehicles that may have been in contact with potentially contaminated materials. Contaminated water from the wash bay will be collected in a sump tank and routed to the water treatment plant for treatment and discharge;
  - conducting radiological clearance scanning as required for any items, equipment, and vehicles leaving the Project Area; and.
  - watering and traffic controls on roads.

- Battery-powered light vehicles and mobile equipment, and an AC powered dual rotary drill for ISR wellfield development instead of a traditional diesel-powered unit, will be employed, where practical, to reduce air emissions and noise levels and improve energy efficiency.
- The main sources of noise will be related to transport of people and goods, drilling of holes for the freeze wall and wellfield, operation of the batch plant, operation of the processing plant, and operation of the pumphouses. The use of high-quality, low sound emission equipment and regular maintenance will reduce noise associated with Project activities.
- Bulk storage tanks for processing chemicals such as sulphuric and/or hydrochloric acid, sodium hydroxide, and hydrogen peroxide will sit inside appropriately designed and sized secondary containment basins, physically separated from the containment basins for other chemical systems.
- Surface pipelines will be designed to have secondary containment or catchment and have leak detection systems in place at key locations.
- A freeze wall will be established around the uranium deposit to reduce groundwater disturbance.
- Mining solution and process water will be reused throughout the mining process, reducing water use requirements to the extent feasible and reducing the volume of treated effluent requiring discharge. Make-up water will be preferentially sourced from site runoff where possible.
- Double-walled, high-density polyethylene or equivalent piping will be used in the wellfields and will be freeze protected and secured to minimize pipe movement.
- Contaminated wastes (e.g., mineralized drill cuttings, solid impurities removed from mining solution, dewatered reject solids) will be properly contained on a double lined waste pad with leak detection capabilities and an associated monitoring program. An adjacent pond will be used to collect runoff from the pad and water in the waste pond will be piped to the water treatment plant. Such waste will be disposed of either on site or off site at an approved facility.
- The ISR wellfield and processing plant will be designed to re-use most of the solutions inside each circuit; any excess water will be released to a surface water body once acceptable water quality is achieved. All treated effluent released to surface water will meet federal and provincial regulatory discharge limits.
- All contaminated areas, such as waste ponds and pads, and the domestic landfill will be fenced to avoid contact with workers and wildlife. Fences will be monitored and maintained.

3.2 General Mitigation Measures for Wildlife Species at Risk

Mitigation measures specific to the Wildlife SAR, in accordance with the *Migratory Birds Convention Act* and tailored to Project features will be incorporated into various Project management and monitoring plans such as the erosion and sediment controls, soil and vegetation monitoring, wildlife monitoring, the Decommissioning Plan, air quality monitoring, Spill Response Plan, Radiation Protection Plan, surface water and effluent monitoring and Waste Management Plan.

The management plans within the Environmental Management System (EMS) will provide specific mitigation measures based on proven and accepted mitigation measures following standard industry guidelines and best management practices. The EMS will provide guidance to avoid or minimize potential adverse effects of the Project on avian species and their habitat, including monitoring and follow-up programs, as appropriate. It will be in place during all phases of the Project and will be subject to ongoing review and revision as required. If monitoring identifies a need for additional or revised mitigation measures, a process of adaptive management (as described in the plan) will be triggered. The Project management plans provide direction on monitoring and adaptive management so that responses are timely and effective.

The following subsections provides a description of the mitigation measures that will be applicable during all Project phases and expected to be effective immediately following implementation. ~~Additional mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in bold text.~~

3.2.1 Work Timing Windows and Habitat Disturbance

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, when practical. The nesting season for many Wildlife SAR in Saskatchewan spans a period from March 15 to August 31; however, the dates differ for certain species. The Wildlife Management Plans within the EMS will provide details on nesting windows for avian species, as well as other sensitive time periods (e.g., caribou calving periods) occurring in the Terrestrial RSA based on the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SARGSS), which were established to support the avoidance of sensitive species' habitats during sensitive periods (SK MOE 2017).
- Prior to commencing any site clearing (i.e., vegetation clearing and/or soil disturbance) during the nesting and breeding season, pre-disturbance wildlife clearance surveys will be conducted a by a Qualified Professional (QP) at that location within the Project Area to identify sensitive species and habitat features (e.g., nests as well as roosts and hibernacula used by bat species).
- Active and/or suspected breeding and roosting locations identified during the pre- disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations). If guidelines cannot be met, due to safety or operational concerns, SK MOE will be contacted for advice on the appropriate response to the situation.
- In addition to the species listed under Schedule 1 of SARA, if any features (e.g., nests) of species included on the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SK MOE 2017) are observed during the pre-clearing wildlife surveys, the applicable activity restrictions will be implemented, as appropriate, following discussion with SK MOE.

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3.2.2 Wildlife Education and Awareness

- Employees and contractors will be provided with wildlife education and awareness training, including education about potential Wildlife SAR issues on site and training on the mitigation measures to avoid or minimize potential adverse Project effects on Wildlife SAR and their habitats.
- Employees and contractors will be educated on waste management policies that limit human-avian interactions.
- Designated employees will be trained in appropriate avian deterrent techniques to minimize avian interactions with the Project.
- Employees and contractors will be requested to report avian observations on site, injured or dead birds (which will be reported to SK MOE). Avian encounters and outcomes will be monitored, and logbooks will be used to record observations. Logbooks and reports will be available to employees.

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3.2.3 Wildlife and Habitat Protection

- Personal firearms will be prohibited for employees and contractors within the Project Area to prevent hunting activities.
- If any individual were seeking access around the Project area to undertake Aboriginal and/or Treaty Rights, Denison staff would facilitate this, provided it were safe to do so given activities in the area.
- Policies will be implemented prohibiting employees and contractors from feeding, approaching, or harassing avian species within the Project Area.
- To support habitat regeneration, progressive reclamation and ecosystem-based revegetation will be conducted on disturbed areas as soon as practicable in accordance with the Reclamation and Closure Plan.

3.2.4 Wildlife Deterrence and Prevention of Wildlife Entrapment

- Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as possible. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.
- Physical, visual, and/or auditory deterrents will be used to discourage bird and bat use of buildings and other Project infrastructure (e.g., water or waste treatment ponds) for refuge, shelter, breeding, and roosting, and to deter birds and bats from potentially becoming entrapped.
- Noise emitting Project activities will be managed to minimize sensory disturbance of wildlife SAR species, especially during sensitive time periods (i.e., breeding and nesting).
- Low sound emission equipment, regular maintenance of equipment, and the use of silencers or mufflers (whenever practical) will be used to reduce noise associated with Project activities, to the extent practical.
- Directed lighting or light shielding, rather than broad lighting, will be implemented to minimize sensory disturbance on the wildlife SAR, and lighting will be focused on work sites and not surrounding areas.

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- Dust generation and subsequent deposition on vegetation and in waterbodies (including potential deposition of trace metals and radionuclides) will be limited through dust suppression techniques such as road watering and traffic management.

3.2.5 Road and Traffic Management

- Traffic and access control measures will be implemented will include reducing traffic volume by scheduling truck convoys, using high-volume haul trucks, and restricting public access to the Project site and roads (e.g., private vehicles, snowmobiles, all-terrain vehicles, and foot traffic). It is important to note that if any individual were seeking access around the Project area to undertake Aboriginal and / or Treaty Rights, Denison staff would facilitate this, provided it were safe to do so given activities in the area.
- Appropriate road signage will be installed (e.g., speed limits) along Project roads to raise awareness and minimize the potential for wildlife SAR-vehicle collisions.
- Wildlife will have the right-of-way on Project roads, unless it is unsafe to stop (i.e., if a collision is imminent). Vehicles will not be used to encourage wildlife to move off Project roads.
- Processes will be implemented for employees and contractors to slow down and/or stop vehicles/equipment to allow animals to move away or off the road before resuming normal road speeds for the area.
- Employees and contractors will report and communicate the location and circumstances of any roadkill observed on or alongside Project roads. Large-bodied wildlife carcasses found will be reported to SK MOE and disposed of as directed to discourage avian scavengers.
- Vegetation management, such as mowing and brush cutting, will be implemented along Project roads to reduce site attractiveness for wildlife SAR and maintain appropriate sightlines for drivers to minimize wildlife-vehicle collisions.
- Alternative measures on Project roads for de-icing and winter traction (e.g., sand, gravel) or dust suppression (e.g., water) will be implemented, whenever practicable.
- Appropriately sized gaps in the roadside snowbanks during winter will be maintained to facilitate wildlife crossing and escape thereby reducing the risk of wildlife-vehicle collisions.
- New Project site and access roads will be designed to minimize sightlines for predators, whenever practicable, while still maintaining general road safety.
- Ditches and culverts along Project roads will be designed and maintained to minimize pooling of water. Roadside pools that form may attract wildlife.

3.2.6 Waste and Hazardous Materials Management

- A "no littering policy" for employees and contractors will be implemented within the Project Area.
- Vegetation management will be incorporated in the vicinity of waste ponds to discourage wildlife SAR use of potentially affected vegetation.
- Waste will be collected and temporarily stored in wildlife-proof containers to avoid attracting scavengers and with that increase the risk for human-wildlife interaction.
- The wildlife-proof containers will be inspected regularly for evidence of avian presence (e.g., gull species) or access to waste disposal facilities. If evidence of avian presence or access to waste disposal facilities is detected, modified systems will be implemented and/or off-site waste disposal frequencies will be increased.
- The use of hazardous materials will be limited as much as possible.

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- Hazardous materials will be handled, stored, and disposed of appropriately and in accordance with a Waste Management Plan to avoid attracting avian scavengers (e.g., wildlife-proof containers, exclusion fencing).
- Physical deterrents (e.g., fencing) will be employed around contaminated areas (e.g., waste ponds and waste pads), the domestic landfill, or hazardous materials storage areas to discourage wildlife use.
- Appropriate hazardous materials management practices will be implemented in accordance with industry guidelines and a Waste Management Plan to minimize the risk of accidental spills or leakage.
- Appropriate spill response kits will be positioned adjacent to areas where hazardous materials are stored in accordance with the Spill Response Plan.
- A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing in accordance with the Spill Response Plan.
- Appropriate fuel, chemical, and materials management practices will be followed in accordance with the Spill Response Plan to minimize the risk of accidental spills or leakage of diesel fuel, other hydrocarbons, and other hazardous materials.
- Air emissions will be reduced to the extent practical through implementation of an air quality monitoring plan within the EMS.
- All vehicles and equipment will be equipped with industry-standard emission control systems; unnecessary idling of vehicles will be prohibited.
- Vehicles and equipment will be maintained in good working condition (e.g., no leaks) and furnished with industry-standard spill response kits.
- Mitigation measures to reduce the potential for dispersion of radiological contaminants of potential concern to vegetation will be implemented in accordance with the Radiation Protection Plan.
- Education on and enforcement of proper waste and hazardous materials management practices will be provided to employees and contractors.

3.3 Species-Specific Mitigation Measures for Wildlife Species at Risk

The following provides a summary of the species-specific mitigation measures that will be implemented during Project activities. Mitigation measures specific to the Wildlife SAR ~~that were not included or that were revised from what was described in the draft EIS are provided in bold text. These~~ have been ~~will be~~ added to ~~the~~ Section 9 of final EIS as applicable, with species-specific details provided here in the supporting appendix. For further information on methods and timing of SAR pre-clearance sweeps, refer to Section 4 of this appendix.

3.3.1 Arthropod Species

3.3.1.1 Nine-spotted lady beetle

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- Mitigation measures designed for the Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5) VCs are expected to mitigate adverse effects on nine-spotted lady beetle primarily related to limiting the loss and/or disruption of suitable habitat for these species. These include:
  - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.

- Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
- During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.

- Herbicide use as part of vegetation management will be limited to the immediate Project Footprint and applied by licensed professional applicators, when necessary, to limit the potential for adverse effects on nine-spotted lady beetle.

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3.3.1.2 Transverse lady beetle

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- Mitigation measures designed for the Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5) VCs are expected to mitigate adverse effects on transverse lady beetle primarily related to limiting the loss and/or disruption of suitable habitat for these species. These include:
  - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.
  - Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
  - During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.
- Herbicide use as part of vegetation management will be limited to the immediate Project Footprint and applied by licensed professional applicators, when necessary, to limit the potential for adverse effects on transverse lady beetle.

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~~3.3.1~~3.3.1.3 Yellow-banded bumble bee

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- Mitigation measures designed for the Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5) VCs are expected to mitigate adverse effects on ~~the arthropod species that are considered SAR (i.e., nine-spotted lady beetle, transverse lady beetle, and~~ yellow-banded bumble bee ~~)~~ primarily related to limiting the loss and/or disruption of suitable habitat for these species. These include:
  - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.
  - Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
  - During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.
- Herbicide use as part of vegetation management will be limited to the immediate Project Footprint and applied by licensed professional applicators, when necessary, to limit the potential for adverse effects on ~~arthropod species~~yellow-banded bumble bee.

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3.3.2 Amphibian Species

~~3.3.2~~3.3.2.1 Northern leopard frog

- Mitigation measures designed for the Wetlands VC (Section 9.2.5) are expected to mitigate adverse effects on the northern leopard frog primarily related to limiting the loss and/or disruption of suitable habitat for these species. These include:
  - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.
  - Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
  - During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.
- Pre- disturbance wildlife clearance surveys will be conducted to identify site-specific habitat features (e.g., ~~amphibian~~ northern leopard frog breeding ponds) and implement the setbacks and/or timing windows (that will be defined in the Wildlife Management Plan).
- In addition to the species listed under Schedule 1 of SARA, if any features (e.g., breeding and overwintering habitat) of species included on the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SK MOE 2017) are observed during the pre-clearing wildlife surveys, the applicable activity restrictions will be implemented, as appropriate, following discussion with SK MOE.
- Locations of site-specific habitat features used by northern leopard frog ~~amphibians~~ will be communicated to Project personnel and the requirement to limit disturbance in these areas will be implemented.
- Appropriate setback and buffer distances from wetland features where northern leopard frog ~~amphibians~~ are known to occur will be implemented and maintained under the direction of a wildlife QP.
- Vehicle traffic and construction activities will be restricted to the approved access routes and work areas and will not cross or enter a watercourse or wetland.

3.3.3 Bat Species

3.3.3.1 Little brown myotis

- Vegetation clearing activities will occur outside of little brown myotis roosting periods, when practical.
- Pre- disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as little brown myotis maternal rooting sites and hibernacula used by little brown myotis. If features are identified in the Project Footprint, appropriate setbacks and/or timing windows will be implemented (refer to Table 4-1 in final EIS Appendix 9-D which will also be defined in the Wildlife Management Plan).
- In the event a little brown myotis maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat exit) will be implemented following the summer maternity roost season. This installation would allow for little brown myotis to leave but not the ability to re-enter the roosting site.

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- Locations of these site-specific habitat features used by little brown myotis will be communicated to the appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.
- Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.

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~~3.3.2~~3.3.3.2 Northern myotis

- Vegetation clearing activities will occur outside of northern myotis roosting periods, when practical.
- Pre- disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as northern myotis maternal rooting sites and hibernacula used by northern myotis~~bat species~~. If features are identified in the Project Footprint, appropriate setbacks and/or timing windows will be implemented (refer to Table 4-1 in final EIS Appendix 9-D which will also be defined in the Wildlife Management Plan).~~If features are identified in the Project Footprint, appropriate setbacks and/or timing windows will be implemented in accordance with the SARGSS (SK MOE 2017 (that will also be defined in the Wildlife Management Plan).~~
- ~~In addition to the species listed under Schedule 1 of SARA, if any features (e.g., roost/foraging site) of species included on the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SK MOE 2017) are observed during the pre-clearing wildlife surveys, the applicable activity restrictions will be implemented, as appropriate, following discussion with SK MOE.~~
- In the event a northern myotis maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat exit) will be implemented following the summer maternity roost season. This installation would allow for northern myotis ~~bats~~ to leave but not the ability to re-enter the roosting site.
- Locations of these site-specific habitat features used by northern myotis~~bats~~ will be communicated to the appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.
- Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.

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3.3.4 Avian Species

3.3.4.1 Bank Swallow

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the bank swallow nesting season, when practical. The breeding and nesting season for bank swallow in Saskatchewan typically spans a period from May 15 to July 31.
- In the event Project activities such as vegetation clearing and/or soil disturbance are required during the bank swallow breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of bank swallow nests.
- Active and/or suspected bank swallow nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with adopted regulatory guidelines (e.g., Manitoba Conservation [2021] as there is currently no activity restriction guidelines for bank swallow in Saskatchewan) in accordance with the level of

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the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).

- Locations of nesting sites used by bank swallows will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.

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3.3.4.2 Barn Swallow

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the barn swallow nesting season, when practical. The breeding and nesting season for barn swallow in Saskatchewan typically spans a period from May 15 to September 30.
- In the event Project activities such as vegetation clearing and/or soil disturbance are required during the barn swallow breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of barn swallow nests.
- Active and/or suspected barn swallow nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with adopted regulatory guidelines (e.g., Manitoba Conservation [2021] as there is currently no activity restriction guidelines for barn swallow in Saskatchewan) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).
- Locations of nesting sites used by barn swallows will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.

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3.3.4.3 Common Nighthawk

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the common nighthawk nesting season, when practical. The breeding and nesting season for common nighthawk in Saskatchewan typically spans a period from May 1 to August 31.
- In the event Project activities such as vegetation clearing and/or soil disturbance are required during the common nighthawk breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of common nighthawk nests.
- Active and/or suspected common nighthawk breeding and roosting locations identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).

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3.3.4.4 Horned Grebe

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the horned grebe nesting season, when practical. The breeding and

nesting season for horned grebe in Saskatchewan typically spans a period from May 1 to September 15.

- In the event Project activities such as vegetation clearing and/or soil disturbance are required during the horned grebe breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of horned grebe nests.
- Active and/or suspected horned grebe nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) for other grebe species (as there is currently no activity restriction guidelines for horned grebe in Saskatchewan) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).
- Locations of nesting sites used by horned grebe will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.

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3.3.4.5 Olive-sided Flycatcher

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the olive-sided flycatcher nesting season, when practical. The breeding and nesting season for olive-sided flycatcher in Saskatchewan typically spans a period from May 1 to August 31.
- In the event Project activities such as vegetation clearing and/or soil disturbance are required during the olive-sided flycatcher breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of olive-sided flycatcher nests.
- Active and/or suspected olive-sided flycatcher nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).

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3.3.4.6 Rusty Blackbird

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the rusty blackbird nesting season, when practical. The breeding and nesting season for rusty blackbird in Saskatchewan typically spans a period from May 1 to July 31.
- In the event Project activities such as vegetation clearing and/or soil disturbance are required during the rusty blackbird breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of rusty blackbird nests.
- Active and/or suspected rusty blackbird nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active

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(e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).

3.3.4.7 Short-eared Owl

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the short-eared owl nesting season, when practical. The breeding and nesting season for short-eared owl in Saskatchewan typically spans a period from March 25 to August 1.
- In the event Project activities such as vegetation clearing and/or soil disturbance are required during the short-eared owl breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of short-eared owl nests.
- Active and/or suspected short-eared owl nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).

~~3.3.4~~3.3.4.8 Yellow Rail

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the yellow rail nesting season, when practical. The breeding and nesting season for yellow rail in Saskatchewan typically spans a period from May 1 to July 15.
- In the event Project activities such as vegetation clearing and/or soil disturbance are required during the yellow rail breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of yellow rail nests.
- Active and/or suspected yellow rail nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).
- ~~Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, when practical. The breeding and nesting season for most avian species in Saskatchewan typically spans a period from March 15 to August 31; however, the dates differ for certain species.~~
- ~~**In the event Project activities such as vegetation clearing and/or soil disturbance are required during the breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of avian SAR and/or their nests.**~~
- ~~**Active and/or suspected breeding and roosting locations identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) for other grebe species (as there is currently no activity restriction guidelines for horned grebe in**~~

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Saskatchewan) in accordance with the level of the disturbance and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).

- In addition to the species listed under Schedule 1 of SARA, if any features (e.g., nests) of species included on the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SK MOE 2017) are observed during the pre-clearing wildlife surveys, the applicable activity restrictions will be implemented, as appropriate, following discussion with SK MOE.
- Locations of nesting sites used by bank swallows, barn swallows, and horned grebe will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.
- Deterrents designed to discourage or prevent barn swallows from using buildings and other Project infrastructure have been described in Section 3.2.4 of the EIS.
- Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as practical. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.

4 Pre-clearance SAR Survey Methods

The methods and timing of proposed SAR pre-clearance sweep are provided in Table 4-1.

Denison Mines

Table 4-1 Wildlife Species at Risk Pre-clearance Sweep Methods and Timing

Species of Concern	Baseline Survey Results	Assessed in the EIS	Important Habitat and Needs	Survey Target Areas	Survey Technique [1]	Timing	Action if Species Detected	Information Source
Northern Leopard Frog	Not observed.	Appendix 9-D	From winter sites, adult frogs travel up to 1.6 km to breed.	Wetlands/ water/ riparian / wet/ moist/ scrublands/ bogs/ fens.	Visual searches for egg masses or frogs.	Snow/ice-free early spring and spring season.	Pond setback; 10m (low); 200m (Mod) and 500m (High);	MOE (2017)
			They breed in the shallow, warm waters of a variety of wetlands including marshes, springs, flooded ditches, dugouts, borrow pits, beaver ponds, margins of lakes, and slow-moving waters of streams and rivers.		Auditory call surveys.	April 20 to June 10.		
			After breeding, adults and sub-adults may disperse up to 8 km from breeding ponds.					
			Northern Leopard Frogs usually do not utilize areas that are heavily wooded		Visual searches for egg masses or frogs.	Snow/ice-free early spring and spring season.		
			They forage in the summer in riparian or upland habitats. These areas are moist habitats including meadows, pastures, scrublands, riparian corridors, and drainage or irrigation ditches.		Visual searches for egg masses or frogs.	Snow/ice-free early spring and spring season.		
Little Brown Myotis and Northern Bat	34 ultrasonic detections of little brown/northern myotis.	Appendix 9-D	The presence of large snags, tree cavities, is an important attribute in old growth forest stands that provides maternity roosts and day roosts for northern myotis and little brown bats. Building are also used.	Treed areas with the largest diameter and/or older trees. Focus on older forest, or areas with large snags in younger forest within the project footprint (majority is regenerating forest 1-5m).	Daytime visual search of trees and potential roost sites. Systematic meandering search of areas to be cleared during active bat season. Focus on searching for roost features (snags, cracks, stumps, cavities, bark peeling) and bat sign (e.g., guano).	May to Sept	Should a roosting bat be discovered the area will be afforded protection from clearing for 24 hours and re-surveyed. The area will only be cleared if no bats are discovered. A 100 m buffer will be given to nursery roots and 50 m to daily roosting bats. If many roosting bats are recorded compensation will be considered (e.g., bat houses).	COSEWIC (2013a); Resources Information Standards Committee (RISC) (2022)

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Species of Concern	Baseline Survey Results	Assessed in the EIS	Important Habitat and Needs	Survey Target Areas	Survey Technique [1]	Timing	Action if Species Detected	Information Source
			Foraging habitat in proximity to roosting sites is also an important factor in roost selection.	Treed areas in proximity to clearings, wetlands and open water.		Year Round	Roost/Foraging site; 100m(low); 500m (Mod) and 500m (High);	MOE (2017)
Wolverine	Not observed.	Section 9.3	A wide variety of forested and vegetation associations are used by wolverine. Habitats must have an adequate year-round supply of food, mainly consisting of smaller prey such as rodents and Snowshoe Hares, and the carcasses of large ungulates, like Moose, Caribou, and Muskox. Females den under snow-covered rocks, logs or within snow tunnels. Wolverines reproduce in areas where snow cover persists at least into April.	All areas of project activity.	Winter den searches.	Snow cover months.	Setback of 250m when occupied and 100m when unoccupied.	COSEWIC (2014); Environmental Protection and Management Guideline (2024)
Woodland Caribou	Observed.	Section 9.3	Woodland caribou may occupy all potential project areas but prefer forests greater than 40 years of age.	All areas of project activity.	Visual search to ensure no caribou are in the area. Ongoing vigilance.	Year Round	If caribou are in the area cease operations until they are clear of the area.	SME (2021)
Rusty Blackbird	Not observed.	Section 9.4	Rusty blackbird primarily nests in small conifers, predominantly spruce. In Canada, nests have also been found in Balsam Fir, Eastern White Cedar, Paper Birch, Balsam Poplar, Red Maple, Pin Cherry, emergent sedges, cattails, and on the ground on a beaver dam We only have spruce, birch and poplar at Wheeler.	All habitat with spruce, white birch and balsam poplar. Very limited suitable (spruce) habitat within project footprint.	Visual search for nests.	MBCA window May 1 to July 31	A 75 m buffer around coniferous bogs, fens and other wetlands suitable for Rusty blackbirds (Odsen and Pyper 2019). Nest setback of 0-50m (low activity); 150m (Mod activity) and 300m (High activity);	Environment Canada. (2015); Odsen and Pyper (2019); Wildlife Division (2020) Manitoba Conservation (2021)
Yellow Rail	Not observed.	Section 9.4	Yellow rails inhabit shallow wetlands and other wet areas with grass-like vegetation. They breed in wetlands such as damp hay fields or meadows, floodplains, bogs, upper levels of estuaries, salt marshes	Using available mapping conduct daytime Ecosite verification and stratify surveys in appropriate habitat only.	Mid May to mid to late June. Triplicate nocturnal (23:00-03:00) call-playback surveys spaced at least 4	-	-	Environment Canada (2012); SME (2014) Detection surveys per Saskatchewan Species Detection Survey Protocol (SDSP) https://publications.saskatchewan.ca/#/products/79508

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Species of Concern	Baseline Survey Results	Assessed in the EIS	Important Habitat and Needs	Survey Target Areas	Survey Technique [1]	Timing	Action if Species Detected	Information Source
			These wetlands are generally dominated by short, fine-stemmed herbaceous vegetation, especially sedges (Carex spp.), as well as other graminoid vegetation of the families Cyperaceae, Poaceae, and Juncaceae. Vegetation structure (e.g. short, grass-like, and dense) is likely more important than its taxon	Based on available mapping, no suitable habitat within project footprint.	days apart. Or use Autonomous Recording Units throughout the breeding season.			
			Breeding habitats may have up to 50 cm of standing water, but typically nesting sites are less than 15 cm deep			May 1 to July 15	Nest site setback; 100m(low); 150m (Mod) and 350m (High);	MOE (2017)
Bank Swallow	Not observed.	Appendix 9-D	The Bank Swallow readily breeds in a wide variety of low-elevation (< 900 m), natural and anthropogenic habitats, including: lake and ocean bluffs; stream and river banks; sand and gravel pits; roadcuts; and piles of sand, topsoil, sawdust, coal ash, and other materials.	Survey key habitat features identified as important.	Visual survey during timing window.	May 15 to July 31	Nesting Colony Setback; 50m (low); 150m (Mod) and 300m (High);	Manitoba Conservation (2021)
			Nest burrows are nearly always in a vertical or near-vertical bank (range: 76-105° slope;			-	-	COSEWIC (2013b)
			In some cases, Bank Swallows have nested in drain pipes and in structures designed and built specifically for nesting Bank Swallows					
Barn Swallow	Four visual/auditory detections.	Appendix 9-D	Nest on horizontal and vertical structures that include natural sites, such as cliffs and caves, as well as human-made structures, such as barns, bridges, and culverts . The nesting substrate must be rough, or have a ledge or projecting objects, such as bolts or light fixtures, to provide additional structural support to the nest.	Open areas in proximity to water. All buildings and man-made structures.	Visual.	May 15 to Sept 30	Nest site setback; 50m (low); 100m (Mod) and 100m (High);	Manitoba Conservation (2021)
			Nesting sites must provide access to open areas with an abundant supply of aerial insects to feed on; features such as wetlands, waterbodies, watercourses, meadows, grazed grassland, and farmland are preferred . Proximity to a waterbody or moist area with a supply of wet mud is needed to facilitate nest construction.			-	-	COSEWIC (2021a)

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Species of Concern	Baseline Survey Results	Assessed in the EIS	Important Habitat and Needs	Survey Target Areas	Survey Technique [1]	Timing	Action if Species Detected	Information Source
Common Nighthawk	Two nests, five visuals and 76 auditory/visual detections.	Section 9.4	Nests are typically in open sites with dry, well-drained substrates that will not overheat and that have shade nearby for young to shelter from the sun and predators. Nest sites include forest clearings, bare patches in grassland, gravel pits, outcrops, road or rail sides, and, rarely, fenceposts.	All upland habitat.	Call-playback.	May 1 to Aug 31	Nest site setback; 0-50m (low); 150m (Mod) and 300m (High);	MOE (2017) Detection surveys per Saskatchewan Species Detection Survey Protocol (SDSP) https://publications.saskatchewan.ca/api/v1/products/79502/formats/117104/download
Horned Grebe	One observation.	Appendix 9-D	More than 90% of the Horned Grebes in North America breed in ponds and lakes in western and northern Canada.	Water bodies within the project area.	Visual searches.	May 1 to Sept 15	Nest site setback; 100m (low); 200m (Mod) and 400m (High);	Manitoba Conservation (2021)
						-	-	COSEWIC (2009b)
Olive-sided Flycatcher	Fourteen observations.	Section 9.4	Olive-sided Flycatcher has been widely observed in open coniferous or mixed coniferous forests, often located near water or wetlands with the presence of tall snags or trees	All conifer and/treed upland areas.	Call-playback.	May 1 to Aug 31	Nest setback; 100m (low); 300m (Mod) and 500m (High);	MOE (2017)
			Data gathered from points across Canada indicate that mature conifer stands within patchy landscapes influenced by natural disturbance (e.g., recent burns) support the highest densities			-	-	Environment Canada (2016)
			Olive-sided Flycatcher prefers post-burn areas or wetlands that create open habitats for the species to forage			-	-	Detection surveys per Saskatchewan Species Detection Survey Protocol (SDSP)
Short-eared Owl	Not observed.	Section 9.4	Nesting generally occurs in large open areas	Open upland and lowland areas with no trees and some shrub cover.	Call-playback.	March 25 to Aug 1	100m (low); 300m (Mod) and 500m (High);	MOE (2017)
			Requires a minimum area of about 50-100 ha, consistent with the mean territory size of 82 ha reported in Manitoba.			-	-	COSEWIC (2021b)
			In the north, nests are primarily in tundra (Sinclair et al. 2003), and sometimes beside a small shrub that provides cover			-	-	Detection surveys per Saskatchewan Species Detection Survey Protocol (SDSP) https://publications.saskatchewan.ca/api/v1/products/79506/formats/117101/download

[1] Surveys will be completed by qualified professional biologists; in their capacity as professional biologists, they will refer to available guidance such as the Saskatchewan species detection survey protocols to develop details of the surveys (e.g., selecting the appropriate time of day for the survey).

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45 Residual and Cumulative Effects Summary

The approach to assessing residual Project effects on wildlife VCs followed the methodology outlined in Section 5.8 of the EIS, which included a habitat-based approach. For each VC and associated KI, each residual effect was assessed in the context of the Project activities that will occur within each Project phase. Each residual effect was then characterized based on the combined predicted residual effect for all phases. See Sections 9.3.6 and 9.4.6 of the EIS for specific details regarding the residual effects assessment for wildlife VCs (i.e., residual effect characterization and significance determination). A summary of the environmental assessment considerations and determination for predicted residual effects for Wildlife SAR is provided in Table 5-1. ~~Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in bold text. These will be added to the final EIS~~.

The cumulative effects assessment (CEA) followed standard methodology as per provincial (e.g., Guidelines for an Environmental Assessment under the [Saskatchewan] *Environmental Assessment Act* 1980) and federal (e.g., Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act 2012*) guidance, and is discussed in detail in Section 5.9 of the EIS. Similar to the residual effects assessment, the CEA included a habitat-based approach. See Sections 9.3.7 and 9.4.7 of the EIS for specific details regarding the CEA for wildlife VCs. A summary of the significance determination of the cumulative effects on Wildlife SAR is provided in Table 5-2.

Table 5-14.1 Summary of the Environmental Assessment Considerations and Determination for Predicted Residual Effects for Wildlife Species At Risk

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
Terrestrial Environment	Nine-spotted lady beetle ~~Transverse lady beetle~~ ~~Yellow-banded bumble bee~~	Amount of habitat that is altered or lost relative to its availability in the Terrestrial Regional Study Area (RSA).	• Development of access roads and air strip. • Site preparation and earthworks; clearing, levelling, and grading of the Project Area. • Waste management (composting, domestic and industrial landfill operation, recycling). • Water management (including treatment). • Surface water withdrawal. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction	• The proposed mitigation measures outlined in the EIS, particularly those designed for the Valued Components (VCs) Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5), adequately and appropriately address potential for adverse effects on ~~these species~~nine-spotted lady beetle, primarily related to limiting the loss and/or disruption of suitable habitat. These include the following: - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation. - Much of the proposed Project Footprint will be developed within previously disturbed areas, including	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, and fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for ~~the~~ nine-spotted lady beetle ~~arthropod SAR~~ within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			• Water withdrawal from groundwater or surface water body. • Management of surface water (including seepage and site runoff). • Water release to groundwater and/or surface water body. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			

~~[1] Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in bold text.~~

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
			• Site water management, treatment, and release • Process water treatment and release. • Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning	roads currently used for exploration activities, thereby minimizing additional habitat disturbance. - During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually. • Herbicide use as part of vegetation management will be limited to the immediate Project Footprint applied by licensed professional applicators when necessary to limit the potential for adverse effects on ~~arthropod species~~nine-spotted lady beetle.		
		Nine-spotted lady beetle ~~M~~mortalities directly or indirectly attributable to the Project.	• Development of access roads and air strip. • Site preparation and earthworks; clearing, levelling, and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction		Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of nine-spotted lady beetle~~the arthropod SAR~~ to the point where they are not sustainable or available to contribute to ecological functions.
			• On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[4]	Predicted Residual Effect	Significance
Terrestrial Environment	Transverse lady beetle	Amount of habitat that is altered or lost relative to its availability in the Terrestrial Regional Study Area (RSA).	• Development of access roads and air strip. • Site preparation and earthworks; clearing, levelling, and grading of the Project Area. • Waste management (composting, domestic and industrial landfill operation, recycling). • Water management (including treatment). • Surface water withdrawal. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction	• The proposed mitigation measures outlined in the EIS, particularly those designed for the Valued Components (VCs) Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5), adequately and appropriately address potential for adverse effects on transverse lady beetle, primarily related to limiting the loss and/or disruption of suitable habitat. These include the following: - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation. - Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, and fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for transverse lady beetle within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			• Water withdrawal from groundwater or surface water body. • Management of surface water (including seepage and site runoff). • Water release to groundwater and/or surface water body. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Site water management, treatment, and release • Process water treatment and release.	Decommissioning			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[4]	Predicted Residual Effect	Significance
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.		additional habitat disturbance. - During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually. • Herbicide use as part of vegetation management will be limited to the immediate Project Footprint applied by licensed professional applicators when necessary to limit the potential for adverse effects on transverse lady beetle.		
		Transverse lady beetle mortalities directly or indirectly attributable to the Project.	• Development of access roads and air strip. • Site preparation and earthworks; clearing, levelling, and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction		Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of transverse lady beetle to the point where they are not sustainable or available to contribute to ecological functions.
			• On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			
Terrestrial Environment	Yellow-banded bumble bee	Amount of habitat that is altered or lost	• Development of access roads and air strip.	Construction	• The proposed mitigation measures outlined in the EIS,	Alteration and/or loss of habitat:	Not Significant: the predicted residual

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[4]	Predicted Residual Effect	Significance
		relative to its availability in the Terrestrial Regional Study Area (RSA).	• Site preparation and earthworks; clearing, levelling, and grading of the Project Area. • Waste management (composting, domestic and industrial landfill operation, recycling). • Water management (including treatment). • Surface water withdrawal. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.		particularly those designed for the Valued Components (VCs) Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5), adequately and appropriately address potential for adverse effects on yellow-banded bumble bee, primarily related to limiting the loss and/or disruption of suitable habitat. These include the following: - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation. - Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing	predicted to be low magnitude, local geographical extent, long-term duration, frequent, and fully reversible.	effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for yellow-banded bumble bee within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			• Water withdrawal from groundwater or surface water body. • Management of surface water (including seepage and site runoff). • Water release to groundwater and/or surface water body. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Site water management, treatment, and release • Process water treatment and release.	Decommissioning			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.		additional habitat disturbance. - During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually. • Herbicide use as part of vegetation management will be limited to the immediate Project Footprint applied by licensed professional applicators when necessary to limit the potential for adverse effects on yellow-banded bumble bee.		
		Yellow-banded bumble bee mortalities directly or indirectly attributable to the Project.	• Development of access roads and air strip. • Site preparation and earthworks; clearing, levelling, and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction		Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of yellow-banded bumble bee to the point where they are not sustainable or available to contribute to ecological functions.
			• On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			
Terrestrial Environment	Northern leopard frog	Amount of habitat that is altered or lost	• Development of access roads and air strip.	Construction	• The proposed mitigation measures outlined in the EIS,	Alteration and/or loss of habitat:	Not Significant: the predicted residual

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
		relative to its availability in the Terrestrial RSA.	• Site preparation and earthworks; clearing, leveling and grading of the Project Area. • Water management (including treatment and site runoff). • Surface water withdrawal. • On-site and off-site operation of vehicles and transport of materials.		particularly those designed for the Wetlands VC (Section 9.2.5), adequately and appropriately address potential adverse effects on northern leopard frogs, primarily related to limiting the loss and/or disruption of suitable habitat for this species. These include the following: - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation. - Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance. - During Operation, progressive reclamation will be completed where possible, and the progress	predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for northern leopard frog within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			• Water withdrawal from groundwater or surface water body. • Management of surface water (including seepage and site runoff). • Water release to surface water body. • On-site and off-site operation of vehicles and transport of materials.	Operation			
			• Site water management, treatment, and release. • Process water treatment and release. • Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			
		Northern leopard frog ~~M~~mortalities	• Development of access roads and air strip.	Construction		Change in mortality: predicted to be low	The predicted residual effect of

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures	Predicted Residual Effect	Significance
		directly or indirectly attributable to the Project.	• Site preparation and earthworks; clearing, leveling and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials.		and success of these activities will be assessed annually. • Pre- disturbance wildlife clearance surveys will be conducted to identify site-specific habitat features (e.g., amphibian breeding ponds) and implement the setbacks and/or timing windows (that will be defined in the Wildlife Management Plan). • Locations of site-specific habitat features used by amphibians will be communicated to Project personnel and the requirement to limit disturbance in these areas will be implemented. • Appropriate setback and buffer distances from wetland features where amphibians are known to occur will be implemented and maintained under the direction of a wildlife QP. • Vehicle traffic and construction activities will be restricted to the approved access routes and work areas and will not cross or enter a watercourse or wetland.	magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	change in mortality is not expected to alter the integrity of the regional populations of northern leopard frog to the point where they are not sustainable or available to contribute to ecological functions
			• Water withdrawal from groundwater or surface water body. • Management of surface water (including seepage and site runoff). • Water release to surface water body. • On-site and off-site operation of vehicles and transport of materials	Operation			
			• Site water management, treatment, and release. • Demolition and disposal of non-salvageable surface infrastructure and materials. • Reclamation of disturbed areas). • On-site and off-site operation of vehicles and transport of materials.	Decommissioning			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
Terrestrial Environment	Little brown myotis ~~Northern myotis~~	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	• Development of access roads and air strip. • Site preparation and earthworks; clearing, leveling and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction	• Vegetation clearing activities will occur outside of roosting periods, when practical. • Pre- disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as maternal rooting sites and hibernacula used by ~~bat species~~little brown myotis. If features are identified in the Project Footprint, appropriate setbacks and/or timing windows will be implemented (refer to Table 4-1 in final EIS Appendix 9-D which ~~in accordance with the SARGSS (SK MOE 2017 (that~~ will also be defined in the Wildlife Management Plan). • In the event a little brown myotis maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat exit) will be implemented following the summer maternity roost season. This installation would allow for little brown	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for little brown myotis ~~bat species~~ within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			• On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			
		Little brown myotis ~~M~~mortalities directly or indirectly attributable to the Project.	• Development of access roads and air strip. • Site preparation and earthworks; clearing, leveling and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction		Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of little brown myotis~~the bat~~

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
			• On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation	myotis ~~bats~~ to leave but not the ability to re-enter the roosting site. • Locations of these site-specific habitat features used by little brown myotis~~bats~~ will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented. • Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.		~~species~~ to the point where they are not sustainable or available to contribute to ecological functions
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			
Terrestrial Environment	Northern myotis	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	• Development of access roads and air strip. • Site preparation and earthworks; clearing, leveling and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction	• Vegetation clearing activities will occur outside of northern myotis roosting periods, when practical. • Pre- disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as northern myotis maternal rooting sites and hibernacula used by northern myotis. If features are identified in the Project Footprint, appropriate setbacks	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for northern myotis within the Terrestrial RSA to the point where it is not sustainable or
			• On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning	and/or timing windows will be implemented (refer to Table 4-1 in final EIS Appendix 9-D which will also be defined in the Wildlife Management Plan). • In the event a northern myotis maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat exit) will be implemented following the summer maternity roost season. This installation would allow for northern myotis to leave but not the ability to re-enter the roosting site. • Locations of these site-specific habitat features used by northern myotis will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented. • Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.		available to contribute to ecological functions.
		Northern myotis mortalities directly or indirectly attributable to the Project.	• Development of access roads and air strip. • Site preparation and earthworks; clearing, leveling and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction		Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of northern myotis to the point where they are not sustainable or available to contribute to ecological functions
			• On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[4]	Predicted Residual Effect	Significance
Terrestrial Environment	Bank Swallow	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	• Development of access roads and air strip. • Site preparation an earthworks; clearing, leveling and grading of the Project Area. • Water management (including treatment and site runoff). • Surface water withdrawal. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction	• Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the bank swallow nesting season, when practical. The breeding and nesting season for most bank swallows in Saskatchewan typically spans a period from May 15 to July 31. • In the event Project activities such as vegetation clearing and/or soil disturbance are required during the bank swallow breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted a by a QP at that location within the Project Area before activities commence to identify the presence of bank swallow nests. • Active and/or suspected bank swallow nests identified during the pre- disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with adopted regulatory guidelines	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for bank swallow within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			• Management of surface water (including seepage and site runoff). • Water release to surface water body. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Site water management, treatment, and release. • Process water treatment and release. • Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
		Bank Swallow mortalities directly or indirectly attributable to the Project.	• Development of access roads and air strip. • Site preparation and earthworks; clearing, leveling and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction	(e.g., Manitoba Conservation [2021] as there is currently no activity restriction guidelines for bank swallow in Saskatchewan) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations). • Locations of nesting sites used by bank swallows will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented. • Minimize height of salvaged soil stockpiles and avoid vertical slopes to deter bank swallows from creating nesting cavities.	Change in mortality: predicted to be low magnitude, regional in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of bank swallow to the point where they are not sustainable or available to contribute to ecological functions.
			• On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			
Terrestrial Environment	Barn Swallow	Amount of habitat that is altered or lost relative to its	• Development of access roads and air strip. • Site preparation an earthworks; clearing, leveling and grading of the Project Area.	Construction	• Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the barn swallow	Alteration and/or loss of habitat: predicted to be low magnitude, local	Not Significant: the predicted residual effect of alteration and/or loss of

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
		availability in the Terrestrial RSA.	• Water management (including treatment and site runoff). • Surface water withdrawal. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.		nesting season, when practical. The breeding and nesting season for barn swallow in Saskatchewan typically spans a period from May 15 to September 30. • In the event Project activities such as vegetation clearing and/or soil disturbance are required during the barn swallow breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of barn swallow nests. • Active and/or suspected barn swallow nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with adopted regulatory guidelines (e.g., Manitoba Conservation [2021] as there is currently no activity restriction guidelines for barn swallow in Saskatchewan) **in**	geographical extent, long-term duration, frequent, fully reversible.	habitat is not expected to alter the integrity of the habitat for barn swallow within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			• Management of surface water (including seepage and site runoff). • Water release to surface water body. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Site water management, treatment, and release. • Process water treatment and release. • Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			
		Barn Swallow mortalities directly or indirectly	• Development of access roads and air strip. • Site preparation an earthworks; clearing, leveling and grading of the Project Area.	Construction		Change in mortality: predicted to be low magnitude, regional in geographical extent, long-term	The predicted residual effect of change in mortality is not expected to alter the integrity of

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
		attributable to the Project.	• On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.		accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations). • Locations of nesting sites used by barn swallows will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.	duration, infrequent, and fully reversible.	the regional populations of barn swallow to the point where they are not sustainable or available to contribute to ecological functions.
			• On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			
Terrestrial Environment	Common Nighthawk	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	• Development of access roads and air strip. • Site preparation an earthworks; clearing, leveling and grading of the Project Area. • Water management (including treatment and site runoff). • Surface water withdrawal. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction	• Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the common nighthawk nesting season, when practical. The breeding and nesting season for common nighthawk in Saskatchewan typically spans a period from May 1 to August 31. • In the event Project activities such as vegetation clearing and/or soil disturbance are	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for common nighthawk within the Terrestrial RSA to the point where it is not sustainable or available to
			• Management of surface water (including seepage and site runoff).	Operation			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[4]	Predicted Residual Effect	Significance
			• Water release to surface water body. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.		required during the common nighthawk breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of common nighthawk nests. • Active and/or suspected common nighthawk nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).		contribute to ecological functions.
			• Site water management, treatment, and release. • Process water treatment and release. • Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			
		Common Nighthawk mortalities directly or indirectly attributable to the Project.	• Development of access roads and air strip. • Site preparation an earthworks; clearing, leveling and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction		Change in mortality: predicted to be low magnitude, regional in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of common nighthawk to the point where they are not sustainable or available to
			• On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			contribute to ecological functions.
Terrestrial Environment	Horned Grebe	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	• Development of access roads and air strip. • Site preparation an earthworks; clearing, leveling and grading of the Project Area. • Water management (including treatment and site runoff). • Surface water withdrawal. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction	• Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the horned grebe nesting season, when practical. The breeding and nesting season for horned grebe in Saskatchewan typically spans a period from May 1 to September 15. • In the event Project activities such as vegetation clearing and/or soil disturbance are required during the horned grebe breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for horned grebe within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			• Management of surface water (including seepage and site runoff). • Water release to surface water body. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Site water management, treatment, and release. • Process water treatment and release.	Decommissioning			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[4]	Predicted Residual Effect	Significance
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.		identify the presence of horned grebe nests. • Active and/or suspected horned grebe nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) for other grebe species (as there is currently no activity restriction guidelines for horned grebe in Saskatchewan) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations). • Locations of nesting sites used by horned grebe will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.		
		Horned Grebe mortalities directly or indirectly attributable to the Project.	• Development of access roads and air strip. • Site preparation an earthworks; clearing, leveling and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction		Change in mortality: predicted to be low magnitude, regional in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of horned grebe to the point where they are not sustainable or available to contribute to ecological functions.
			• On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
Terrestrial Environment	Olive-Sided Flycatcher	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	• Development of access roads and air strip. • Site preparation an earthworks; clearing, leveling and grading of the Project Area. • Water management (including treatment and site runoff). • Surface water withdrawal. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction	• Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the olive-sided flycatcher nesting season, when practical. The breeding and nesting season for olive-sided flycatcher in Saskatchewan typically spans a period from May 1 to August 31. • In the event Project activities such as vegetation clearing and/or soil disturbance are required during the olive-sided flycatcher breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of olive-sided flycatcher nests. • Active and/or suspected olive-sided flycatcher nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for olive-sided flycatcher within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			• Management of surface water (including seepage and site runoff). • Water release to surface water body. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Site water management, treatment, and release. • Process water treatment and release. • Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
		Olive-Sided Flycatcher mortalities directly or indirectly attributable to the Project.	• Development of access roads and air strip. • Site preparation an earthworks; clearing, leveling and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction	regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).	Change in mortality: predicted to be low magnitude, regional in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of olive-sided flycatcher to the point where they are not sustainable or available to contribute to ecological functions.
			• On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			
Terrestrial Environment	Rusty Blackbird	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	• Development of access roads and air strip. • Site preparation an earthworks; clearing, leveling and grading of the Project Area. • Water management (including treatment and site runoff). • Surface water withdrawal. • On-site and off-site operation of vehicles and transport of materials.	Construction	• Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the rusty blackbird nesting season, when practical. The breeding and nesting season for rusty blackbird in Saskatchewan typically spans a period from May 1 to July 31.	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for rusty blackbird within the Terrestrial RSA to the

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[4]	Predicted Residual Effect	Significance
			• Air transportation for workers.		• In the event Project activities such as vegetation clearing and/or soil disturbance are required during the rusty blackbird breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of rusty blackbird nests. • Active and/or suspected rusty blackbird nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).		point where it is not sustainable or available to contribute to ecological functions.
			• Management of surface water (including seepage and site runoff). • Water release to surface water body. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Site water management, treatment, and release. • Process water treatment and release. • Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			
		Rusty Blackbird mortalities directly or indirectly attributable to the Project.	• Development of access roads and air strip. • Site preparation an earthworks; clearing, leveling and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction		Change in mortality: predicted to be low magnitude, regional in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of rusty blackbird to the point where they are not sustainable or available to
			• On-site and off-site operation of vehicles and transport of materials.	Operation			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
			• Air transportation for workers.				contribute to ecological functions.
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			
Terrestrial Environment	Short-eared Owl	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	• Development of access roads and air strip. • Site preparation an earthworks; clearing, leveling and grading of the Project Area. • Water management (including treatment and site runoff). • Surface water withdrawal. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction	• Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the short-eared owl nesting season, when practical. The breeding and nesting season for short-eared owl in Saskatchewan typically spans a period from March 25 to August 1. • In the event Project activities such as vegetation clearing and/or soil disturbance are required during the short-eared owl breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for short-eared owl within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			• Management of surface water (including seepage and site runoff). • Water release to surface water body. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Site water management, treatment, and release.	Decommissioning			

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
			• Process water treatment and release. • Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.		identify the presence of short-eared owl nests. • Active and/or suspected short-eared owl nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).		
		Short-eared Owl mortalities directly or indirectly attributable to the Project.	• Development of access roads and air strip. • Site preparation an earthworks; clearing, leveling and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction		Change in mortality: predicted to be low magnitude, regional in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations short-eared owl to the point where they are not sustainable or available to contribute to ecological functions.
			• On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			
Terrestrial Environment	Yellow Rail	Amount of habitat that is altered or lost	• Development of access roads and air strip.	Construction	• Site clearing and other works that involve disturbance of vegetation	Alteration and/or loss of habitat:	Not Significant: the predicted residual

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
		relative to its availability in the Terrestrial RSA.	• Site preparation an earthworks; clearing, leveling and grading of the Project Area. • Water management (including treatment and site runoff). • Surface water withdrawal. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.		and/or soil will be conducted outside of the yellow rail nesting season, when practical. The breeding and nesting season for yellow rail in Saskatchewan typically spans a period from May 1 to July 15. • In the event Project activities such as vegetation clearing and/or soil disturbance are required during the yellow rail breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of yellow rail nests. • Active and/or suspected yellow rail nests identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the	predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for yellow rail within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			• Management of surface water (including seepage and site runoff). • Water release to surface water body. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Site water management, treatment, and release. • Process water treatment and release. • Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			
		Yellow Rail mortalities directly	• Development of access roads and air strip.	Construction		Change in mortality: predicted to be low	The predicted residual effect of

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Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[4]	Predicted Residual Effect	Significance
		or indirectly attributable to the Project.	• Site preparation an earthworks; clearing, leveling and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.		disturbance until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).	magnitude, regional in geographical extent, long-term duration, infrequent, and fully reversible.	change in mortality is not expected to alter the integrity of the regional populations of yellow rail to the point where they are not sustainable or available to contribute to ecological functions.
			• On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			

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Table 5-24.2 Summary of Significance of the Cumulative Effects on Wildlife Species At Risk

Component	Valued Component	Key Indicator	Cumulative Effects	Summary of Significance of the Cumulative Effects
Terrestrial Environment	Wildlife Species at Risk	• Nine-spotted lady beetle • Transverse lady beetle • Yellow-banded bumble bee • Northern leopard frog • Little brown myotis • Northern myotis • Bank Swallow • Barn Swallow • Common Nighthawk • Horned Grebe • Olive-sided Flycatcher • Rusty Blackbird • Short-eared Owl • Yellow Rail	Alteration and/or loss of habitat.	**Not significant:** The cumulative effect of alteration and/or loss of habitat is not expected to alter the integrity of the Wildlife Species at Risk habitat within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			Change in mortality.	**Not significant:** The cumulative effect of change in mortality is not expected to alter the integrity of the regional populations to the point where they are not sustainable or available to contribute to ecological functions.

~~5~~6 References

Brown, M.B. and Brown, C.R. 2020. Barn Swallow (*Hirundo rustica*), version 1.0. In Birds of the World (P. G. Rodewald, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. (https://birdsoftheworld.org/bow/species/barswa/cur/introduction). Accessed May 30, 2023.

Caceres, M.C. and Barclay, R.M.R. 2000. *Myotis septentrionalis*. Mammalian Species (634):1–4. DOI: 10.2307/0.634.1

COSEWIC. 2009a. COSEWIC assessment and update status report on the Northern Leopard Frog *Lithobates pipiens*, Rocky Mountain population, Western Boreal/Prairie populations, and Eastern populations, in Canada. Committee on the Status of Endangered Widllife in Canada, Ottawa. vii + 69 pp.

COSEWIC. 2009b. COSEWIC assessment and status report on the Horned Grebe, *Podiceps auritus*, Western population and Magdalen Islands population, in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. vii + 42 pp.

COSEWIC. 2013a. COSEWIC assessment and status report on the Little Brown Myotis *Myotis lucifugus*, Northern Myotis *Myotis septentrionalis*, and Tri-colored Bat *Perimyotis subflavus* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. xxiv + 93 pp.

COSEWIC. 2013b. COSEWIC assessment and status report on the Bank Swallow *Riparia riparia* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. xi + 48 pp.

COSEWIC. 2014. COSEWIC assessment and status report on the Wolverine *Gulo gulo* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 76 pp.

COSEWIC. 2015. COSEWIC assessment and status report on the Yellow-banded Bumble Bee *Bombus terricola* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. ix + 60 pp.

COSEWIC. 2016a. COSEWIC assessment and status report on the Nine-spotted Lady Beetle *Coccinella novemnotata* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. x + 57 pp.

COSEWIC. 2016b. COSEWIC assessment and status report on the Transverse Lady Beetle *Coccinella transversoguttata* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. xi + 57 pp.

COSEWIC. 2021a. COSEWIC assessment and status report on the Barn Swallow *Hirundo rustica* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 60 pp.

COSEWIC 2021b. COSEWIC Assessment and Status Report on the Short-eared Owl *Asio flammeus* in Canada. Committee on the status of Endangered Wildlife in Canada (COSEWIC). Threatened 2021

Environment and Climate Change Canada. 2018. Recovery Strategy for the Little Brown Myotis (*Myotis lucifugus*), the Northern Myotis (*Myotis septentrionalis*), and the Tri-colored Bat (*Perimyotis subflavus*) in Canada. Environment and Climate Change Canada, Ottawa. ix + 172 pp.

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Environment and Climate Change Canada. 2022a. Management Plan for the Yellow-banded Bumble Bee (*Bombus terricola*) in Canada [Proposed]. *Species at Risk Act* Management Plan Series. Environment and Climate Change Canada, Ottawa. iv + 46 pp.

Environment and Climate Change Canada. 2022b. Recovery Strategy for the Bank Swallow (*Riparia riparia*) in Canada. *Species at Risk Act* Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. ix + 125 pp.

Environment and Climate Change Canada. 2022c. Management Plan for the Horned Grebe (*Podiceps auritus*), Western population, in Canada. *Species at Risk Act* Management Plan Series. Environment and Climate Change Canada, Ottawa. v + 49 pp.

Environment Canada. 2013. Management Plan for the Northern Leopard Frog (*Lithobates pipiens*), Western Boreal/Prairie Populations, in Canada. *Species at Risk Act* Management Plan Series. Environment Canada, Ottawa. iii + 28 pp.

Environment Canada. 2012. Management Plan for the Yellow Rail (*Coturnicops noveboracensis*) in Canada [Proposed]. *Species at Risk Act* Management Plan Series. Environment Canada, Ottawa. iv + 23 pp.

Environment Canada. 2015. Management Plan for the Rusty Blackbird (*Euphagus carolinus*) in Canada. Species at Risk Act Management Plan Series. Environment Canada, Ottawa. iv + 26 pp.

Environment Canada. 2016. Recovery Strategy for the Olive-sided Flycatcher (*Contopus cooperi*) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. vii + 52 pp.

Environmental Protection and Management Guideline. 2024. VERSION 3.1: July 2024. British Columbia Energy Regulator. 104pp.

Garrison, B.A. and Turner, A. 2020. Bank Swallow (*Riparia riparia*), version 1.0. In Birds of the World (S. M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. (https://birdsoftheworld.org/bow/species/banswa/cur/introduction). Accessed May 30, 2023.

Government of Canada. 2019a. Description of Residence for Bank Swallow (*Riparia riparia*) in Canada. (https://species-registry.canada.ca/index-en.html#/species/1233-894#residence_description)

Government of Canada. 2019b. Description of Residence for Barn Swallow (*Hirundo rustica*) in Canada. (https://species-registry.canada.ca/index-en.html#/species/1147-790#residence_description)

Government of Canada. 2023. Species at risk public registry. (https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html). Accessed May 31, 2023.

Henderson, L.E. and Broders, H.G. 2008. Movements and Resource Selection of the Northern Long-Eared Myotis (*Myotis septentrionalis*) in a Forest - Agriculture Landscape. Journal of Mammalogy 89(4):952–963. DOI: 10.1644/07-MAMM-A-214.1

Johnson, J.S., Treanor, J.J., Slusher, A.C., and Lacki, M.J. 2019. Buildings provide vital habitat for little brown myotis (*Myotis lucifugus*) in a high-elevation landscape. Ecosphere 10(11):e02925. DOI: 10.1002/ecs2.2925

Jung, T.S., Thompson, I., and Titman, R.D. 2004. Roost site selection by forest-dwelling male *Myotis* in central Ontario, Canada. Forest Ecology and Management (202):325–335.

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Manitoba Conservation. 2021. Recommended Development Setback Distances and Restricted Activity Periods for Birds by Wildlife Feature Type Manitoba Conservation Data Centre 2021 November

Ministry of Environment (MOE 2017), Fish, Wildlife and Lands Branch. April 2017. Activity Restriction Guidelines for Sensitive Species. Regina, Saskatchewan. 4pp.

Nature Conservancy Canada (NCC). 2023. Northern Leopard Frog. (https://www.natureconservancy.ca/en/what-we-do/resource-centre/featured-species/reptiles-and-amphibians/northern-leopard-frog.html).

Odsen, S. and M. Pyper. 2019. Rusty blackbird forestry fact sheet. Foothills Research Institute. Summaries and Communications Fact Sheets.

Resources Information Standards Committee (RISC). 2022. Inventory Methods for Bats, Standards for Components of British Columbia's Biodiversity No. 20. Version 3.0. B.C. Ministry of Land, Water and Resource Stewardship, Ecosystems Branch, Victoria, B.C.

Saskatchewan Conservation Data Centre. 2023. Saskatchewan Conservation Data Centre. (http://biodiversity.sk.ca/). Accessed May 30, 2023.

Saskatchewan Ministry of the Environment (SME) 2014. Yellow Rail Survey Protocol. Fish and Wildlife Branch Report No. 2014-14.0. 3211 Alberta Street, Regina, Saskatchewan. 8pp.

Saskatchewan Ministry Environment (SME). 2021. Saskatchewan Ministry of the Environment Crown Land Work Authorization (2021). Denison Wheeler Project Area.

Slough, B.G. and Jung, T.S. 2020. Little Brown Bats Utilize Multiple Maternity Roosts Within Foraging Areas: Implications for Identifying Summer Habitat. Journal of Fish and Wildlife Management 11(1):311–320.

Smith, A.R. 1996. Atlas of Saskatchewan Birds. Special Publication No. 22. Saskatchewan Natural History Society (Nature Saskatchewan). Regina, Saskatchewan. 456 pp.

Smith, A.R., C.S. Houston, and J.F. Roy. 2019. Birds of Saskatchewan. Special Publication No. 38. Nature Saskatchewan. Regina, Saskatchewan. 765 pp.

Stedman, S.J. 2020. Horned Grebe (Podiceps auritus), version 1.0. In Birds of the World (S. M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. (https://birdsoftheworld.org/bow/species/horgre/cur/introduction). Accessed May 30, 2023.

Wildlife Division. 2020. Management Plan for the Rusty Blackbird (*Euphagus carolinus*) in Newfoundland and Labrador. Department of Fisheries, Forestry and Agriculture, Government of Newfoundland and Labrador, Corner Brook, Canada. v + 23 pp.

IR-174

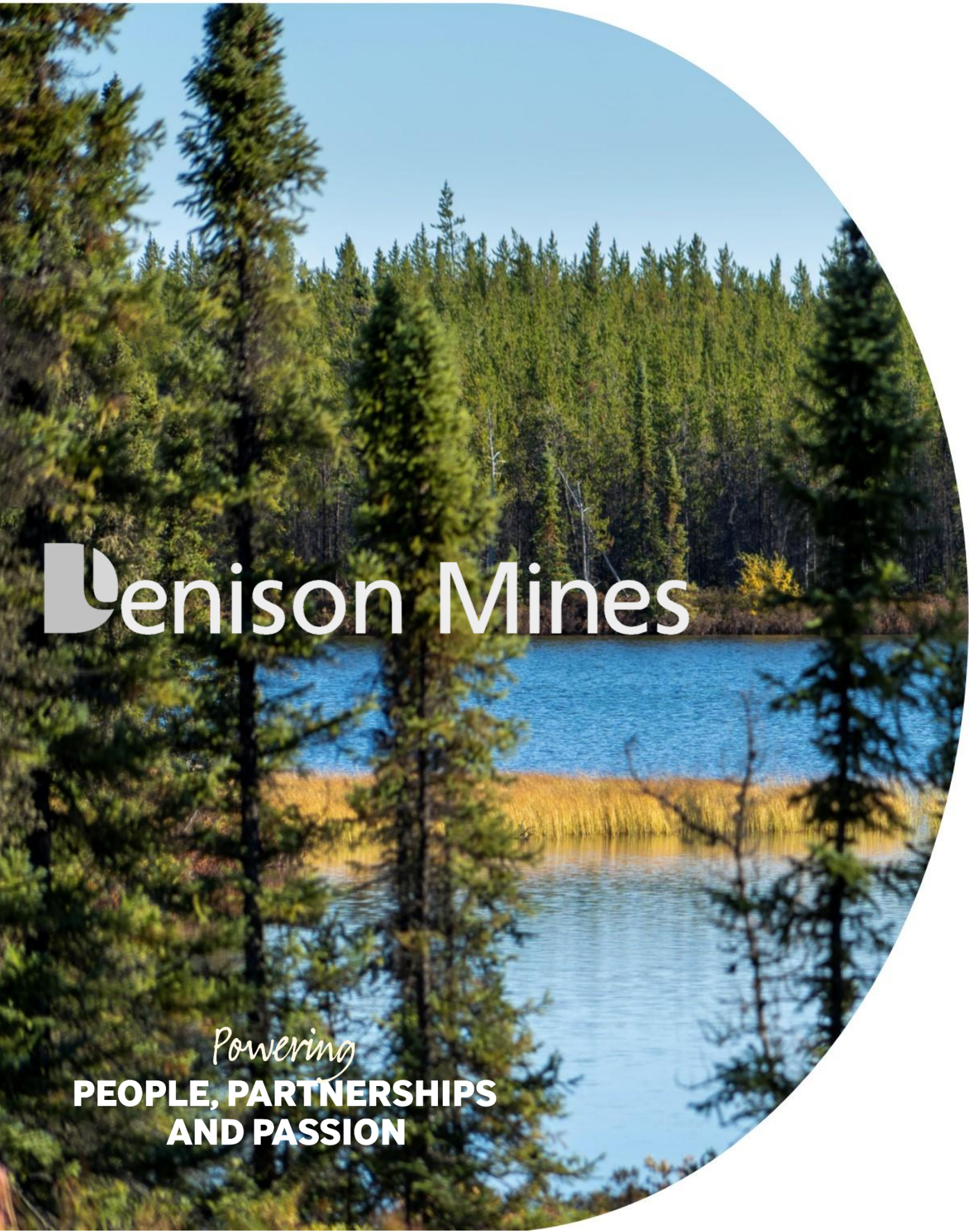
- Department: ECCC
- Project Effects Link: SAR - Bats
- Reference to EIS, appendices, or supporting documentation: Appendix 9-B, Denison Mines Corporation Wheeler River Project, Terrestrial Environment, Wildlife and Vegetation Baseline Inventory, Section 2.1.4 Acoustic Bat Surveys

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, July 4, 2024)	IR (ROUND 4 Sept. 6, 2024)	Denison Response (ROUND 4, September 27, 2024)
IR-174	-	**Context and Rationale:** The Proponent conducted acoustic surveys for bats and confirmed presence of two Species at Risk Act (SARA) schedule 1 listed bat species in the Project area, little brown myotis (Myotis lucifugus) and northern myotis (Myotis septentrionalis). However, the Proponent did not do an effects assessment of either of these bat species. Although bats are present in the study area, no work was done to identify hibernaculum or maternal roosting sites. All species at risk that are expected to be present in the Project area should be assessed and species-specific mitigations detailed.	1. Conduct an effects assessment for little brown myotis and northern myotis, including the likelihood that tree clearing during the bat roosting period, is likely to 'kill', 'harm', or 'harass' Little Brown Myotis and Northern Myotis and its ability to carry out its life processes. 2. Describe and map locations of suitable myotis hibernacula and/or maternal roost habitat within the Local Study Area and Regional Study Area and explain how these habitats may be affected by Project activities. 3. Describe what mitigation measures will be taken to avoid the breeding period for bats. 4. Describe any pre-construction/pre- clearing surveys will be conducted to identify any hibernaculum and maternal roosting sites. Describe how monitoring will support adaptive management.	As Key Indicators of Valued Components, the EIS includes terrestrial wildlife and avian species that may occur in the Project study areas and are listed on Schedule 1 of the federal Species at Risk Act. Project effects on these species and their habitats are described and assessed, and mitigation measures are included to avoid or reduce the potential for adverse effects on these species and their habitats. The Project effects and associated mitigation measures described in the draft EIS are broadly applicable to SAR species that occupy the same ecological niches. In response to a variety of IRs, including this IR, further information has been developed that is specific to SAR and included as Attachment IR-131. This includes a listing of all SAR species potentially occurring in the Project study areas, with links to applicable and appropriate mitigation measures described in the EIS. It is proposed the content of Attachment IR-131 will be added as a new appendix (Appendix 9-D) to Section 9 of the final EIS. The information provided in the SAR appendix includes a summary of the life history requirements, the expected Project effects, proposed mitigation measures, and anticipated residual effects on these listed species. This new EIS appendix provides information on little brown myotis and northern myotis. We note Denison's commitment to pre-construction surveys to identify potential for maternity and nursery roosting habitat. Refer to response to IR-134 for the timing of clearing activities outside of roosting periods. Results from pre-construction surveys and continuous monitoring (described in Section 9.3.8) will be used in the adaptive management process to update Project design and additional mitigation measures, if required.	This response has not been accepted. Items 1., 3. And 4. of IR-174 are accepted, however, item 2. Of IR-174, which asked for mapping of suitable myotis habitat, was not addressed. Mapping of suitable habitat or results from baseline studies is required to understand Project impacts to Species At Risk (SAR) bat species. This may include providing mapping of bat acoustic results, including locations along with frequency of detections. See also IR-134 and follow-up 134-R1.	Acoustic bat surveys were completed between July 22 and 23, 2019 with 61 survey points sampled across five ecosite types. The location of the survey points, species detected, and frequency of detections are included in Figure 2-9 of Appendix 9-F of the revised draft EIS. The EA used a habitat-based approach to predict the effects of the Project on bat species. Further, in the event that site clearing is necessary, pre-clearance wildlife sweeps will be completed and appropriate mitigation will be developed and implemented. The pre-construction and pre-clearing surveys will consist of wildlife sweeps conducted by qualified biologists within 7 days prior to any clearing activity at a specific location, and a 100 m buffer, within the Project Footprint. The wildlife sweeps will not be species-specific surveys focused on species at risk but will to be based on timing of Project related activities (i.e., will be completed in advance of site clearing activities). These sweeps are intended to identify sensitive wildlife features (including hibernacula or potential roosting sites for myotis species) that would require specific mitigation measures to avoid or minimize adverse effects on identified features and are not species-specific. The methods associated with these pre-construction and pre-clearing sweeps will be tailored to species at risk (including myotis species) that may potentially be using habitats at certain times of the year. Depending on the results of these surveys, appropriate mitigation measures will be developed and implemented. This is a risk-based approach with the intent of reducing the potential of important wildlife features being adversely affected during vegetation or land disturbance activities. The wildlife sweeps would be conducted within 7 days prior to disturbance activities, year-round, so that sensitive features can be identified, and appropriate mitigation measures (e.g., avoidance, timing delay) can be developed and implemented, as appropriate.	Note to Denison: There is additional text being drafted related to this topic, but it is still under review and may provide clarity on the outstanding request. Items one, three, and four have been accepted, but the response to item 2, regarding describing and mapping of locations of suitable myotis hibernacula and/or maternal roost habitat within the Local Study Area and Regional Study Area and an explanation of how these habitats may be affected by Project activities, is outstanding. In responding to item two, the Proponent has provided a map of species detected and frequency of detection in the local study area over two days on July 22 and 23, 2019. ECCC notes that analysis is lacking for the regional study area, despite a few autonomous recording units (ARUs) that were placed outside the LSA. Data from two consecutive days in the same month is not an accepted method to document baseline occurrences associated with suitable habitat. The legend for Figure 2-9 is not clear in that frequency of detection is mapped based on two criteria: little brown myotis and little brown/northern myotis. The Proponent should use a scientifically defensible method to document baseline occurrences associated with suitable habitat. The Proponent should clarify the legend and explain the values found within it, including if the turquoise dot represent occurrence of both little brown and northern myotis. Baseline data for bat SAR must be adequate to capture within and between year variability and to allow for statistically robust comparison to assess potential impacts on SAR over the lifecycle of the project. In this regard, Denison is expected to provide additional baseline data for bat SAR. If Denison choses to rely on literature data, a justification of applicability to the project is required. Nevertheless, Denison is expected to at a minimum commit to additional baseline monitoring prior to any disturbance, and to provide a description of the monitoring methods for review. These baseline surveys must be focused on suitable habitat for bat SAR that is to be identified through the requested mapping. To close this IR, Denison must: 1. Clarify the legend of Figure 2-9 with respect to frequency of detection 2. Provide suitable bat SAR habitat information in the form of a map 3. Provide additional baseline data for bat SAR based on literature sources and justify applicability to the project 4. Provide a description of proposed methods for bat SAR field monitoring for review	See IR-174 Round 3 Attachment below for supporting maps associated with responses to parts 2 and 3; the round 3 attachment is located at the end of this file. 1. The legend of revised draft EIS Appendix 9-F, Figure 2-9 (with respect to frequency of detection) shows the total number of passes and/or buzzes detected. We note this was available in Appendix 9-B Terrestrial Baseline. For additional reference it is also noted that the acoustic survey method in Appendix 9-B did not reliably allow for differentiation between little brown myotis and northern myotis, hence the two criteria presented on the map: i) little brown myotis and ii) little brown/northern myotis. These clarifications are included in the figures below and are included in Appendix 9-F of the final EIS. 2. Refer to IR-174 Round 3 Attachment below for ECCC's requested map edits, that builds on the information presented in the map provided in revised draft EIS Appendix 9-F Figure 2-9 provided with the Round 2 response. Specifically, please see Figure IR-174 Round 3-1 and Figure IR-174 Round 3-2. These maps present the same information from Appendix 9-F Figure 2-9 only at a different spatial scale and with the Project Area unshaded to facilitate review. 3. As noted in Appendix 9-D, habitat for the little brown myotis is composed of (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies (COSEWIC 2013). Hibernacula and maternity sites are reported as being the main limiting habitat features for this species (COSEWIC 2013), and this, as described below, is consistent with conditions at the Project site and surrounding area. Hibernacula occur in parts of caves, mines (openings to surface for ramps and raises for example), and buildings that have stable and specific temperature (-4 to 13°C) and humidity (>80%) conditions (COSEWIC 2013). Based on existing environment information presented in the EIS including the terrain and vegetation and ecosystem existing environment sections, there are no hibernacula anticipated in the Project Area (i.e., caves, mines, buildings with stable and specific temperatures per COSEWIC 2013). Terrain is low relief due to flat-lying sandstone and almost continuous cover of sandy glacial deposits (i.e., surface is predominately sand textured and there are no rocky outcrops or bedrock at surface for cave habitats); there are no man-made structures (e.g., mine openings or buildings) in the Project Area. As noted in the EIS, the terrain and vegetation communities are fairly uniform throughout the study areas and the habitat considerations in the	Following the supplementary information provided by Denison on July 5th, CNSC staff determined that it is unclear from the proponent's response whether Denison will perform both pre-disturbance surveys **and** additional baseline surveys for bat SAR. In order to resolve this IR, Denison are expected to: 1. Revise Figure 2-9 to re-label frequency as number of detections by time. Clarify regarding the turquoise dots if species data is uncertain in all cases or were detections for some identifiable? 2. Revise Figure IR-174 Round 3-1 and Figure IR-174 Round 3-2 to depict habitat potential for different life stages of the species for different bats. 3. Provide the proposed methods for the additional bat SAR baseline surveys including a description of the statistical approaches to be used. The methods must demonstrate how the baseline data will be of sufficient sample size and duration to obtain a basic understanding of within-year and between-year variation. 4. Provide a commitment to conduct additional bat SAR baseline surveys in their commitments register.	1. The frequency of detections was on a 5 minute interval. This has been clarified in Figure 2-9 of Appendix 9-F. We can confirm the turquoise dots represent passes or buzzes that were uncertain (unable to distinguish echolocation call characteristics between bat species) in all cases. 2. See **Attachment IR-174 (Round 4)** below for the response to this IR along with supporting maps. 3. Methods for future pre-construction baseline bat surveys will build on the 2019 baseline (refer to EIS Appendix 9-B) and methods from the 2019 baseline are provided below along with information on how comparisons within year and between years will be completed. *Methods* Surveys will be commenced one half hour after sunset and ended one half hour before sunrise. Survey stations will be established 500 m apart along linear features where safe night travel was possible. Surveys will only be completed during appropriate weather conditions, with weather attributes (temperature, sky condition and wind (Beaufort scale)) recorded throughout the survey. Each survey site consists of a five-minute listening period using a Wildlife Acoustics Echo Meter Touch 2 Pro. The detector will be held with the microphone at a 45 degree angle and slowly rotated 360 degrees for the duration of the sampling period. If a bat is detected the detector is held stationary for 15 seconds to avoid duplicate counts. Total detector hours will be calculated for the Project area and by ecosite/vegetation cover type. Ecosite/vegetation cover type for each survey point is established by utilizing the dominate ecosite/vegetation cover type within a 50 m radius of the survey point. *Acoustic Bat Call Analysis* Data will be analyzed using Wildlife Acoustics Kaleidoscope software. Echolocation call characteristics will be used to identify bat species. Call characteristics used to establish species included: • minimum frequency • maximum frequency • call duration • call slope • call shape Call characteristics will be compared to reference calls in literature and call libraries (WDNR 2016, WNDD 2016, Keinath 2011, Adams 2003). In addition, reference calls within Omnia's call library will be used where possible. For future monitoring of bat species Denison will continue to inventory bat presence at given sites and this data will be analyzed to characterize: 1. Presence (occupancy) 2. Relative abundance 3. Change metrics to be analyzed include: a. Annual and total change at specific site b. Annual and total change across all sites The analysis will be done using mean and 95% credible interval bars and will include covariates such as time of year

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, July 4, 2024)	IR (ROUND 4 Sept. 6, 2024)	Denison Response (ROUND 4, September 27, 2024)
							5. Commit to an EA commitment to collect additional bat SAR field baseline data prior to disturbance	Project Area are considered representative of the landscape in the wildlife LSA and RSA. Maternity sites can occur in large-diameter trees, rock crevices, buildings, and bat houses that offer warm and relatively stable microclimate conditions that allow females to avoid going into torpor so they can focus on caring for their young (COSEWIC 2013a, Slough and Jung 2020). As highlighted above, since there are no rock crevices, buildings, or bat houses in the Project Area, a consideration for maternal roost potential was focused on the areas where larger diameter trees may be present. Existing ecosite information was reviewed and ecosites with higher potential for maternity roosts (i.e., larger diameter trees) were selected. The ecosites with the potential for larger diameter trees are shown in Figure 2-10 below, and include ecosites RF1 (regenerating forest >5m tall; per Appendix 9-B), BS3 jack pine/blueberry/lichen, BS4 jack pine – black spruce/feathermoss, BS7 black spruce/blueberry/lichen, BS9 black spruce – jack pine/feathermoss, BS14 white birch/lingonberry – labrador tea, BS16 black spruce/ balsam poplar/river alder swamp, BS17 black spruce treed bog, and BS21 tamarack treed fen. While these ecosites were selected for the *potential* to have larger diameter trees, it is important to note that the majority of these ecosites have trees with diameter at breast height <10 cm. Refer Appendix 9-B for representative photos of the selected ecosites. Based on this conservative mapping exercise, the Project Area contains small areas of suitable potential maternal roost habitat. The total Project Area is around 170 ha and potential bat maternal roost ecosites represent less than 49 ha, when as noted above it is assumed that the ecosites identified above provide trees suitable for maternity roosts across their entirety. The above text has been added to Appendix 9-F of the final EIS along with Figure IR-174 Round 3-3. We reiterate that the additional information collated and displayed in the maps provided to support this IR response is consistent with and does not contradict anything presented in the draft EIS documentation. We also refer the reviewer to Appendix 9-D for a summary of species-specific mitigation measures for bats; text from Section 3.3.3 has been included below in *italicized font* for ease of review: *Bat Species* • *Vegetation clearing activities will occur outside of roosting periods, when practical.* • *Pre- disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as maternal rooting sites and hibernacula used by bat species. If features are identified in the Project Footprint,*		(date), precipitation, temperature, forest cover, Ecosite and proximity to water/wetland. Appropriate statistical methods to compare pre-construction baseline and 2019 baseline data spatially and temporally will be employed and accompanied by power analysis. Results of acoustic bat surveys will be submitted to Saskatchewan's Conservation Data Centre. 4. Commitment 9-37 has been updated in version 3 of Denison's commitment register (additions in bold) and now reads: "**Pre-construction baseline** acoustic bat surveys will be completed prior to construction, building on the 2019 surveys (Appendix 9-B). The surveys will determine the presence/non-absence, diversity and relative abundance of bat species in the Project Area. **Results of acoustic bat surveys will be submitted to Saskatchewan's Conservation Data Centre**".

Original IR#	Follow-Up IR #	Context and Rationale	IR (ROUND 1, March 2023)	Denison Response (ROUND 1, August 2023)	IR (ROUND 2, December 2023)	Denison Response (ROUND 2, Feb. 2024)	IR (ROUND 3, May 31, 2024)	Denison Response (ROUND 3, July 4, 2024)	IR (ROUND 4 Sept. 6, 2024)	Denison Response (ROUND 4, September 27, 2024)
								appropriate setbacks and/or timing windows will be implemented in accordance with the SARGSS (SK MOE 2017 (that will also be defined in the Wildlife Management Plan). • *In the event a maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat exit) will be implemented following the summer maternity roost season. This installation would allow for bats to leave but not the ability to re-enter the roosting site.* • *Locations of these site-specific habitat features used by bats will be communicated to the appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.* • *Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.* 4. Refer to response to IR-142, IR-159, IR-167-R1 for information on the bat-specific pre-clearance sweeps. We also note that Commitment 9-3 outlines Denison's commitment to pre-disturbance wildlife clearance surveys. 5. A commitment to complete pre-construction / disturbance bat surveying has been added to the commitments register as 9-37, as follows: "Acoustic bat surveys will be completed prior to construction, building on the 2019 surveys (Appendix 9-B). The surveys will determine the presence/non-absence, diversity and relative abundance of bat species in the Project Area." For clarity, this additional pre-construction / disturbance data will be used to inform the execution of site development activities and additionally provides further information that can be used within the context of follow-up monitoring as a basis for temporal comparison. At this time, the intent is not to integrate such information into the EIS, nor does Denison and its SMEs believe the additional information is necessary to for EA determination with respect to potential project-related effects on bats. <u>References:</u> COSEWIC. 2013. COSEWIC assessment and status report on the Little Brown Myotis *Myotis lucifugus*, Northern Myotis *Myotis septentrionalis*, and Tri-colored Bat *Perimyotis subflavus* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. xxiv + 93 pp. Slough, B.G. and Jung, T.S. 2020. Little Brown Bats Utilize Multiple Maternity Roosts Within Foraging Areas: Implications for Identifying Summer Habitat. Journal of Fish and Wildlife Management 11(1):311–320.		

Related information: Round 1 response – new EIS Appendix 9-D


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Denison Mines Corp.

Appendix 9-D Wildlife Species at Risk

New Appendix to final EIS, Section 9

Version 1

July 2023

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Acronyms and Abbreviations

Term	Definition
BBS	Breeding Bird Survey
BC	British Columbia
CEA	Cumulative effects assessment
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
EMS	Environmental Management System
FIRT	Federal-Indigenous Review Team
IRs	Information requests
ISR	In situ recovery
KI	Key Indicator
LSA	Local Study Area
Project	Wheeler River Project
QP	Qualified Professional
RSA	Regional Study Area
SAR	Species at risk
SARA	*Species at Risk Act*
SARGSS	Saskatchewan Activity Restriction Guidelines for Sensitive Species
SKCDC	Saskatchewan Conservation Data Centre
VC	Valued Component

Introduction

Background

On October 21, 2022, Denison Mines Corp. (Denison) submitted a draft Environmental Impact Statement (EIS) for the proposed Wheeler River Project (the Project). Based on their initial review, the Canadian Nuclear Safety Commission indicated that the submission contained the required information to proceed with the Federal-Indigenous Review Team (FIRT) technical review of the draft EIS. On March 20, 2023, the FIRT provided Denison with a list of information requests (IRs) for Denison to respond to and eventually submit a final EIS document.

This Appendix provides additional information to address several IRs provided by Environment and Climate Change Canada (ECCC) as part of the initial round of Federal Indigenous Review Team (FIRT) comments. These IRs were related to 16 wildlife species at risk (SAR) listed under Schedule 1 of the federal *Species at Risk Act* (SARA). The draft EIS approach was conservative in that it considered appropriate representative species as Valued Components (VCs) and Key Indicators (KIs) in sections 9.3 Ungulates, Furbearers, and Woodland Caribou and 9.4 Raptors, Migratory Breeding Birds, and Bird SAR. Of the 16 wildlife SAR listed in Table 0.1, seven had been included as VCs or KIs in the EIS after a thorough scoping process (refer to Section 0 for additional information).

Nine of the sixteen were not included as individual VCs or KIs but are considered important from a regulatory perspective. The SARA-listed species identified by ECCC are listed in Table 0.1. Those noted in bold font indicate those for which further assessment is provided in this appendix.

Table 0.1 Wildlife Species at Risk Listed by Environment and Climate Change Canada

Common Name	Scientific Name	Discussed in the draft EIS
Nine-spotted lady beetle	***Coccinella ovemnotata***	**No**
Transverse lady beetle	***Coccinella transversoguttata***	**No**
Yellow-banded bumble bee	***Bombus terricola***	**No**
Northern leopard frog	***Lithobates pipiens***	**No**
Little brown myotis	***Myotis lucifugus***	**No**
Northern myotis	***Myotis septentrionalis***	**No**
Wolverine	*Gulo gulo*	Yes
Woodland caribou	*Rangifer tarandus caribou*	Yes
Bank Swallow	***Riparia riparia***	**No**
Barn Swallow	***Hirundo rustica***	**No**
Common Nighthawk	*Chordeiles minor*	Yes
Horned Grebe	***Podiceps auritus***	**No**
Olive-sided Flycatcher	*Contopus cooperi*	Yes

Common Name	Scientific Name	Discussed in the draft EIS
Rusty Blackbird	*Euphagus carolinus*	Yes
Short-eared Owl	*Asio flammeus*	Yes
Yellow Rail	*Coturnicops noveboracensis*	Yes

Of the 16 species listed in Table 0.1, seven had been included as VCs or KIs in the EIS after a thorough scoping process, as summarized below.

Valued Component Selection

The VCs considered in the effects assessment for the Project are aspects of the biophysical and human environments that were considered to be likely to be affected (adversely or positively) by the Project. The VCs reflect identified scientific, local knowledge, and Indigenous Knowledge, and community interests regarding the Project and its potential effects. The potential effects are typically identified early in the environmental assessment process as a result of questions and concerns raised through engagement with Indigenous and community groups, government departments and agencies, and the general public.

Denison reviewed and considered all received input to develop a VC list that reflects the key environmental, socio-economic, heritage, and human health components and interests to appropriately focus the EA.

The initial VCs selected to represent bird SAR in the habitat-based assessment that were provided in the Terms of Reference (Denison 2019) were evaluated, consolidated, and organized to allow for the logical assessment of Project effects, and are presented in Table 0.2 and Table 0.3, which formed the basis for the subsequent VC-specific assessment.

Table 0.2 Wildlife Species at Risk Valued Component and Rationale for their Inclusion in the Habitat-based Environmental Assessment for the Denison Wheeler River Project

Valued Component	Rationale
Biophysical Environment	
Terrestrial Environment	
Furbearers	Project activities and infrastructure may affect local furbearer populations, including species at risk (SAR), resulting in non-compliance with permit conditions (e.g., *Species at Risk Act* [SARA; Government of Canada 2022], *The Wildlife Act 1998* [Government of Saskatchewan 2020]).
Woodland Caribou	Project activities and infrastructure may affect woodland caribou populations, resulting in non-compliance with permit conditions (e.g., SARA [Government of Canada 2022], *The Wildlife Act, 1998* [Government of Saskatchewan 2020]).

Valued Component	Rationale
Bird Species at Risk	Project activities and infrastructure may affect bird SAR (specifically disturbance and/or destruction of eggs, young, and adults) resulting in non-compliance with regulatory requirements (e.g., SARA [Government of Canada 2022], *Migratory Birds Convention Act 1994* [Government of Canada 2017], *Saskatchewan Activity Restriction Guidelines for Sensitive Species* [Government of Saskatchewan 2017], *The Wildlife Act 1998* [Government of Saskatchewan 2020]).

Table 0.3 Valued Components, Key Indicators, and Measurable Parameters for the Wildlife Component included in the Habitat-based Environmental Assessment for Denison Wheeler River Project

Valued Component	Key Indicator	Measurable Parameter
Furbearers	Wolverine	Amount of habitat (km^2) (not necessarily occupied) that may be altered or lost relative to its availability in the Regional Study Area (RSA). The number of wolverine mortalities directly or indirectly attributable to the Project.
Woodland Caribou	Woodland caribou	Amount of habitat (km^2) (not necessarily occupied) that may be altered or lost relative to its availability in the RSA. The number of woodland caribou mortalities directly or indirectly attributable to the Project.
Bird Species at Risk	Common Nighthawk	Percentage of habitat for Common Nighthawk altered/lost directly or indirectly as a result of Project activities. The number of Common Nighthawk mortalities directly or indirectly attributable to the Project.
	Rusty Blackbird	Percentage of habitat for Rusty Blackbird altered/lost directly or indirectly as a result of Project activities. The number of rusty blackbird mortalities directly or indirectly attributable to the Project
	Olive-sided Flycatcher	Percentage of habitat for Olive-sided Flycatcher altered/lost directly or indirectly as a result of Project activities. The number of Olive-sided Flycatcher mortalities directly or indirectly attributable to the Project
	Short-eared Owl	Percentage of habitat for Short-eared Owl altered/lost directly or indirectly as a result of Project activities. The number of Short-eared Owl mortalities directly or indirectly attributable to the Project.

Valued Component	Key Indicator	Measurable Parameter
	Yellow Rail	Percentage of habitat for Yellow Rail altered/lost directly or indirectly as a result of Project activities. The number of Yellow Rail mortalities directly or indirectly attributable to the Project.

The five bird species identified in Table 0.3 were selected as SAR VCs for the habitat-based EA in consideration of information/responses received during extensive Indigenous and community engagement completed by Denison, and they represent wildlife species of local importance. For these five species, additional information is not be provided in this Appendix. Rather, the reader is referred to the applicable sections in the EIS where appropriate information on existing conditions (Section 9.4.3.3), potential project-related effects (Section 9.4.4), mitigation measures (Section 9.4.5), residual effects and their significance (Section 9.4.6), and cumulative effects (Section 9.4.7) is provided.

Supplemental Information

As requested by ECCC, the following subsections provide supplemental information for the remaining nine species listed in Table 0.1 that were not included as VCs or KIs in the EIS. For these nine species, a brief overview of life history requirements (existing environment), a discussion on the effects assessment and mitigation measures, and a summary of residual and cumulative effects are included.

Table 0.1 Wildlife Species At Risk Considered in the Wheeler River Project Environmental Impact Statement

Common Name	Scientific Name	Provincial Status	Federal Status[1]	Preferred Habitat	Documented Occurrence in the Local Study Area[2]	Reference in the Environmental Impact Statement (EIS)
Arthropods						
Nine-spotted lady beetle	*Coccinella novemnotata*	S4	Endangered	Habitat generalist – uses a diverse range of habitats and consumes a variety of prey. See Section 0 for further details.	~~Unlikely~~ Local Study Area (LSA) is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a Valued Component (VC) in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Transverse lady beetle	*Coccinella transversoguttata*	S4	Special Concern	Habitat generalist – uses a diverse range of habitats and consumes a variety of prey. See Section 0 for further details.	~~Unlikely~~ LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Yellow-banded bumble bee	*Bombus terricola*	S4	Special Concern	Habitat generalist – uses a variety of habitats and consumes nectar and pollen from many different flowering plants. See Section 0 for further details.	~~Unlikely~~ LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Amphibians						
Northern leopard frog	*Lithobates pipiens*	S3	Special Concern	Three district habitats: (1) overwintering waterbodies that are cold, well oxygenated, and do not freeze to	LSA is located within COSEWIC range; no observations in SKCDC	Not included as a VC in the EIS. A review of life history requirements and discussion on

Common Name	Scientific Name	Provincial Status	Federal Status[1]	Preferred Habitat	Documented Occurrence in the Local Study Area[2]	Reference in the Environmental Impact Statement (EIS)
				bottom; (2) breeding and larval waterbodies with shallow, open habitats, neutral pH, and no fish; and (3) summering areas in shallow marshes, moist upland meadows where grass height is less than 1 m. See Section 0 for further details.	and no Project-specific observations to date. Amphibian nocturnal call and visual search surveys were completed in the LSA and Regional Study Area (RSA) as part of the baseline program; however, only boreal chorus frogs (*Pseudacris maculata*) were detected (Appendix 9-C).	effects assessment are included in this Appendix.
Bats						
Little brown myotis	*Myotis lucifugus*	S4B, S4N	Endangered	Seasonal habitat requirements: (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies. See Section 0 for further details.	Documented during the acoustic bat surveys as part of the baseline field program as present in the LSA and RSA, and previously observed in the RSA (SKCDC 2023).	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.
Northern myotis	*Myotis septentrionalis*	S3	Endangered	Seasonal habitat requirements: (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging	Documented during the acoustic bat surveys as part of the baseline field program as	Not included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in this Appendix.

Common Name	Scientific Name	Provincial Status	Federal Status[1]	Preferred Habitat	Documented Occurrence in the Local Study Area[2]	Reference in the Environmental Impact Statement (EIS)
				areas and suitable locations for roosting and maternity colonies. See Section 0 for further details.	present in the LSA and RSA (Appendix 9-C).	
Terrestrial Wildlife Species						
Wolverine	*Gulo gulo*	S2	Special Concern	See Section 9.3.3.2 of the EIS for details.	LSA is located within COSEWIC range; no observations in SKCDC and no Project-specific observations to date.	Included as a Key Indicator (KI) of the Furbearer VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Woodland caribou	*Rangifer tarandus caribou*	S3	Threatened	See Section 9.3.3.3 of the EIS for details.	Documented within the RSA during the baseline field program (Appendix 9-C)	Included as a VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Avian Species						
Bank Swallow	*Riparia riparia*	S4B, S5M	Threatened	Nesting colonies are typically characterized by steep embankments with a sand, silt, or clay substrate that can be easily excavated for burrows. They are often adjacent to slow-moving or still waterbodies and may occur in natural habitats or in anthropogenic features. Bank Swallows are aerial insectivores that forage over a variety of	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Not included as a KI of the Bird Species at Risk (SAR) VC in the EIS (Common Nighthawk was used as a surrogate species). A review of life history requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5).

Common Name	Scientific Name	Provincial Status	Federal Status[1]	Preferred Habitat	Documented Occurrence in the Local Study Area[2]	Reference in the Environmental Impact Statement (EIS)
				open habitats. See Section 0 for further details.		
Barn Swallow	*Hirundo rustica*	S4B	Threatened	Breeding habitat typically requires a suitable nesting site with a vertical or horizontal surface underneath a roof of some sort, open areas for foraging, and a waterbody with mud for nest building. Anthropogenic features such as barns, houses, bridges, and culverts are commonly used nesting sites. See Section 0 for further details.	Documented during the breeding bird surveys as part of the baseline field program as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	Not included as a KI of the Bird SAR VC in the EIS (Common Nighthawk was used as a surrogate species). A review of life history requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5).
Common Nighthawk	*Chordeiles minor*	S4B	Special Concern	See Section 9.4.3.3 of the EIS for details.	Documented during the baseline field program as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Horned Grebe	*Podiceps auritus*	S5B	Special Concern	Breeding habitat consists of small to medium-sized freshwater lakes, ponds, and marshes that are shallow with open water (at least 40%), emergent vegetation, anchorage for nests, and concealment for nests and young. See Section 0 for further details.	Documented during the baseline field program as present in the LSA (Appendix 9-C).	Not included as a KI of the Bird SAR VC in the EIS (Yellow Rail was used as a surrogate species). A review of life history requirements and discussion on effects assessment are included in this Appendix. Any new species-specific mitigation measures identified in this appendix will be added to the final EIS (Section 9.4.5)..
Olive-sided Flycatcher	*Contopus cooperi*	S4B	Special Concern	See Section 9.4.3.3 of the EIS for details.	Documented during the baseline field program	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and

Common Name	Scientific Name	Provincial Status	Federal Status[1]	Preferred Habitat	Documented Occurrence in the Local Study Area[2]	Reference in the Environmental Impact Statement (EIS)
					as present in the LSA (Appendix 9-C), and previously observed in the RSA (SKCDC 2023)	discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Rusty Blackbird	*Euphagus carolinus*	S3B, SUN	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Short-eared Owl	*Asio flammeus*	S3B, S2N	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.
Yellow Rail	*Coturnicops noveboracensis*	S3B	Special Concern	See Section 9.4.3.3 of the EIS for details.	LSA is located within COSEWIC range; no historical observations documented by the SKCDC (2023) and no Project-specific observations to date.	Included as a KI of the Bird SAR VC in the EIS. A review of life history requirements and discussion on effects assessment are included in the EIS (Section 9.3). Additional information for this species is not provided in this Appendix.

Note: shaded rows indicate SAR was included as a VC or KI in the draft EIS

1 Schedule 1 under the *Species at Risk Act*.

2 Potential for Occurrence – based on known species occurrence data from Saskatchewan Conservation Data Centre (2023), Omnia (Appendix 9-C), Birds of Saskatchewan (2019), and Atlas of Saskatchewan Birds (Smith 1996) and/or presence of suitable habitat.

Arthropods

Nine-Spotted Lady Beetle



Source: COSEWIC (2016a).

The nine-spotted lady beetle is a small beetle species found across southern Canada and the continental United States (COSEWIC 2016a). Its northern range limit in Saskatchewan is reported to occur near Lake Athabasca (COSEWIC 2016a). Based on records provided by the Saskatchewan Conservation Data Centre Hunting, Angling and Biodiversity of Saskatchewan (HABISask) database (SKCDC 2023), there are no historical observations of this species documented in the Regional Study Area (RSA).

The nine-spotted lady beetle is a habitat generalist that uses a diverse range of habitats (e.g., open to semi-open forests, grasslands, riparian areas) and consumes a variety of prey (e.g., many species of arthropods [particularly aphids], sap, nectar and pollen) (COSEWIC 2016a). Being a habitat generalist allows the nine-spotted lady beetle to exploit seasonally available prey sources, with prey availability influencing the species' distribution more than habitat availability (COSEWIC 2016a).

The nine-spotted lady beetle has four life stages (i.e., egg, larva, pupa, and adult) and may produce two generations per year (i.e., spring and fall) depending on regional climate conditions (COSEWIC 2016a). Lady beetles, in general, are highly mobile and may undertake short (few hundred metres) and long-distance (18 to 120 km) movements (COSEWIC 2016a). The nine-spotted lady beetle is not migratory nor does it display strong site fidelity (COSEWIC 2016a). The nine-spotted lady beetle overwinters in aggregations in well-ventilated habitats (e.g., in rock crevices, grass tussocks, or leaf litter, or under stones or tree bark), becoming active in the early spring when temperatures start to increase (COSEWIC 2016a).

The nine-spotted lady beetle is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure) (Saskatchewan Conservation Data Centre 2023). The species has undergone significant population declines in Canada since 1975, going from one of the more common lady beetles collected to being rarely collected relative to other lady beetles, despite comprehensive and targeted surveys (COSEWIC 2016a). Reasons for these population declines are currently unknown but are thought to be driven by competition, predation, and introduced diseases from non-native species (including non-native lady beetles), agricultural pesticide use to control aphids, habitat loss via urban expansion, and other human disturbances (COSEWIC 2016a).

Transverse Lady Beetle



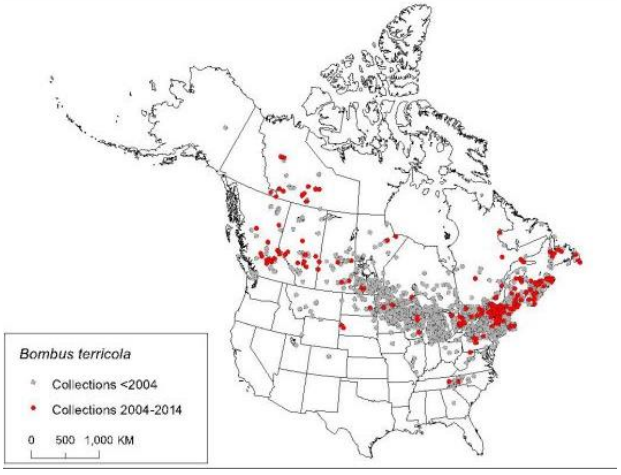
Source: COSEWIC (2016b).

The transverse lady beetle is a small beetle species found across the United States and Canada, including all provinces and territories (COSEWIC 2016b). The species is a habitat generalist and uses similar habitat types and consumes similar prey as the nine-spotted lady beetle, which means it is also able to exploit seasonally available prey sources (COSEWIC 2016b). According to the information from the HABISask database, there are no historical observations of this species documented in the RSA.

The transverse lady beetle has four life stages (i.e., egg, larva, pupa, and adult) and may produce two generations per year (i.e., spring and fall) depending on regional climate conditions (COSEWIC 2016b). Lady beetles in general are highly mobile and may undertake short (few hundred metres) and long-distance (18 to 120 km) movements (COSEWIC 2016b). The transverse lady beetle is not migratory nor does it display strong site fidelity (COSEWIC 2016b). The transverse lady beetle overwinters in aggregations in well-ventilated habitats (e.g., in rock crevices, grass tussocks, or leaf litter, or under stones or tree bark), becoming active in the early spring when temperatures start to increase (COSEWIC 2016b).

The transverse lady beetle is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure) (Saskatchewan Conservation Data Centre 2023). The species was once abundant across its range in Canada and was one of the most common lady beetles collected; however, since 1986, the species is now absent, below detection limits, or present in low numbers in many parts of its range (COSEWIC 2016b). The transverse lady beetle has not been detected in Saskatchewan since 2001 (COSEWIC 2016b). Reasons for these population declines are currently unknown but are thought to be driven by the same factors listed for the nine-spotted lady beetle in Section **Error! Reference source not found.**.

Yellow-banded Bumble Bee



Source: COSEWIC (2015).

The yellow-banded bumble bee is a medium-sized bumble bee species found throughout eastern North America, from eastern British Columbia (BC) to Newfoundland and Labrador and from the northern United States up to the southern portion of the territories (COSEWIC 2015). The species is a habitat generalist (e.g., boreal habitats, mixed woodlands, montane meadows) and consumes nectar and pollen from many different flowering plants (COSEWIC 2015). According to the information from the HABISask database, there are no historical observations of this species documented in the RSA.

The yellow-banded bumble bee has four life stages (i.e., egg, larva, pupa, and adult) and produces one generation per year, with mated queens establishing new colonies each year (COSEWIC 2015).

After overwintering underground in loose soil or decomposing organic material, the mated queens emerge in the spring and search for potential nest sites, which are typically located underground in existing cavities (e.g., abandoned rodent burrows, rotten logs, openings in dead wood, and grassy hummocks) (COSEWIC 2015). Once a queen has found a suitable nest site, she forages for nectar and pollen and then returns to her nest site to lay eggs, which will develop into her future workers (i.e., unmated daughters that do not typically reproduce) (COSEWIC 2015). After the initial eggs hatch and the larva and pupa develop into adult workers, the workers take over nest and brood care, foraging duties, and colony protection while the queen continues to lay eggs (COSEWIC 2015). Males and potential queens are produced by late summer once the colony reaches maximum worker production, at which point they leave the colony and mate (COSEWIC 2015). All males and workers die by fall while the mated queens hibernate through the winter in suitable overwintering sites (COSEWIC 2015).

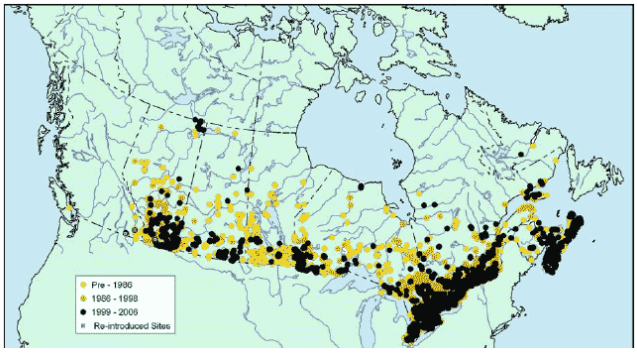
The yellow-banded bumble bee is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S4 species in Saskatchewan (i.e., Apparently Secure) (Saskatchewan Conservation Data Centre 2023). Prior to the 1990s, the yellow-banded bumble bee was one of the more common bumble bees collected in eastern and boreal Canada (COSEWIC 2015, Environment and Climate Change Canada 2022a). Population declines started to occur in the early 1990s, with an average rate of decline of 66.5% in proportional abundance across central and southern Canada between 1992 and 2011 (COSEWIC 2015, Environment and Climate Change Canada 2022a). The species is no longer found at several historical collection sites (COSEWIC 2015).

The status of the yellow-banded bumble bee in boreal habitats and Arctic regions is unknown (COSEWIC 2015, Environment and Climate Change Canada 2022a). Reasons for these population declines are currently unknown but are thought to be driven by introduced diseases from managed bumble bee species, agricultural pesticide use, habitat loss via urban and agricultural expansion, and climate change (COSEWIC 2015).The species' unique type of sex determination, where colonies must reach maximum worker production to produce males and potential queens, has been identified as a limiting factor (COSEWIC 2015, Environment and Climate Change Canada 2022a).

Amphibians

Northern Leopard Frog

The northern leopard frog is found across most of west-central and northeastern North America (COSEWIC 2009a). The species is widespread in Canada, ranging from southeastern BC to Labrador, and from southcentral Northwest Territories (COSEWIC 2009a, NCC 2023).



Source: COSEWIC (2009a).

Three district habitats are used by the northern leopard frog on an annual basis: (1) overwintering waterbodies that are cold, well oxygenated, and do not freeze to bottom (e.g., rivers, streams, deep lake ponds and creeks, and spillways below dams); (2) breeding and larval waterbodies with shallow, open habitats (e.g., ponds, lakeshores, marshes, and slow-moving streams; may be permanent or semi-permanent), neutral

pH, well vegetated, and no fish; and (3) summering areas in shallow marshes, moist upland meadows, forests and grasslands where grass height is less than 1 m (COSEWIC 2009a, NCC 2023). These habitats must be in proximity with suitable dispersal corridors interconnecting them (e.g., riparian areas and waterways) as the species is not capable of long-distance movements (COSEWIC 2009a, Environment Canada 2013).

Northern leopard frogs emerge from their overwintering waterbodies in early spring shortly after ice off (COSEWIC 2009a). The breeding season extends from mid-April to June, with exact timing dependent on location and latitude (COSEWIC 2009a). Females lay several thousand eggs, attaching them to submerged vegetation, which develop into tadpoles within two weeks depending on water temperatures (COSEWIC 2009a). The tadpoles in turn develop into small frogs over a two-to-three-month period, after which they migrate to their summering areas and forage on a variety of arthropods, worms, and snails, sometimes preying on small birds and smaller frogs (COSEWIC 2009a).

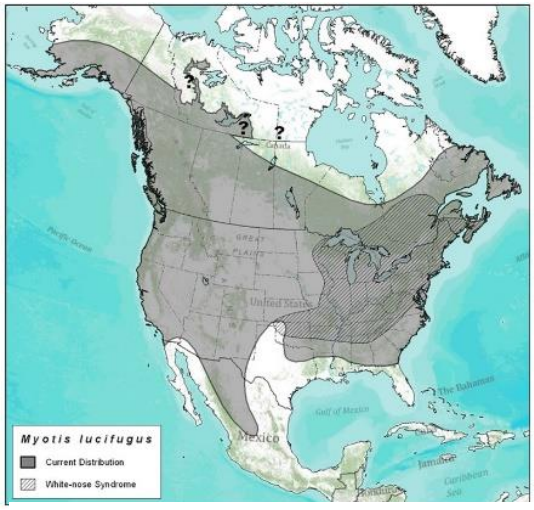
Three populations are recognized for the northern leopard frog in Canada: the Rocky Mountain, the Western Boreal/Prairie, and the Eastern (COSEWIC 2009a, NCC 2023). The Western Boreal/Prairie population is found in Alberta, Saskatchewan, Manitoba, and the Northwest Territories (COSEWIC 2009a, NCC 2023). The Western Boreal/Prairie population is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S3 species in Saskatchewan (i.e., Vulnerable) (Saskatchewan Conservation Data Centre 2023).

Population data are limited for the northern leopard frog in Canada (COSEWIC 2009a, Environment Canada 2013). Large-scale population declines occurred in the early 1970s, with populations in western Canada (i.e., BC and Alberta) most dramatically affected (COSEWIC 2009a). Information is lacking on the current status of northern leopard frog populations in Saskatchewan (COSEWIC 2009a, Environment Canada 2013).

Threats to the northern leopard frog include emerging diseases (e.g., *Chytridiomycosis*), introduced non-native species, habitat loss and fragmentation, environmental contamination, and increased frequency and severity of droughts (COSEWIC 2009a). The species' specific habitat requirements and vulnerability to diseases and prolonged periods of drought have been identified as limiting factors (Environment Canada 2013).

Bats

Little Brown Myotis



Source: COSEWIC (2013a).

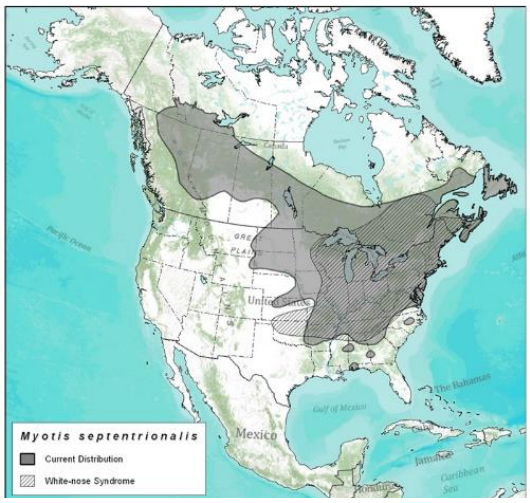
The little brown myotis is a small bat species found across North America, including across Canada south of the treeline (COSEWIC 2013a). The species is considered a short-distance regional migrant between its summer and winter ranges, with the distance travelled dependent on the location of suitable overwintering hibernacula (COSEWIC 2013a).

Habitat for the little brown myotis is composed of (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies (COSEWIC 2013a). Hibernacula and maternity sites are the main limiting habitat features for this species (COSEWIC 2013a). Hibernacula occur in parts of caves, mines, and buildings that have stable and specific temperature (-4 to 13°C) and humidity (>80%) conditions (COSEWIC 2013a). Maternity sites occur in large-diameter trees, rock crevices, buildings, and bat houses that offer warm and relatively stable microclimate conditions that allow females to avoid going into torpor so they can focus on caring for their young (COSEWIC 2013a, Slough and Jung 2020). Males are more versatile in their summer roosting requirements and use tree cavities, raised bark, foliage, rock crevices, buildings, and bridges with a broader range of microclimate conditions (COSEWIC 2013a, Johnson et al. 2019). Foraging areas for the little brown myotis include a variety of habitats situated close to roosting and maternity sites, including over water (e.g., wetlands, lakes, ponds, and rivers), along riparian areas and forest edges, and in forest gaps (COSEWIC 2013a).

The little brown myotis is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S4B, S4N species in Saskatchewan (i.e., Apparently Secure breeding population, Apparently Secure non-breeding population) (Saskatchewan Conservation Data Centre 2023).

The current size of the little brown myotis population in Canada is unknown. Prior to the arrival of White-nose Syndrome in 2010, the population in Canada was estimated to be over one million individuals (COSEWIC 2013a, Environment and Climate Change Canada 2018). White-nose Syndrome is a disease the causes high rates of mortality among hibernating bats, and it has been identified as the main threat for bat populations in Canada (COSEWIC 2013a). Other threats to the little brown myotis include habitat loss, colony eradication, chemical contamination, and wind turbines (COSEWIC 2013a).

Northern Myotis



Source: COSEWIC (2013a).

The northern myotis is a small bat species found across North America, including across Canada south of the treeline (COSEWIC 2013a). The species is considered a short-distance regional migrant between its summer and winter ranges, with the distance travelled dependent on the location of suitable overwintering hibernacula (COSEWIC 2013a).

Habitat for the northern myotis is composed of (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies (COSEWIC 2013a). Hibernacula and maternity sites are the main limiting habitat features for this species (COSEWIC 2013a). Hibernacula occur in parts of caves, mines, and buildings that have stable and specific temperature (0.6 to 14°C) and humidity (>80%) conditions (COSEWIC 2013a). Summer roosting trees are typically found in mature to old-growth forests, swamps, and riparian areas, although retained older trees and snags in younger forests may occasionally provide suitable roosting habitat (Environment and Climate Change Canada 2018). Females strongly prefer tall, large-diameter trees (both living and dead, typically deciduous) with early- to mid-decay for maternity sites (COSEWIC 2013a, Environment and Climate Change Canada 2018). Anthropogenic features (e.g., barns) may occasionally be used as maternity sites in fragmented landscapes with few potential roost trees (Environment and Climate Change Canada 2018). Maternity sites that maintain warm and relatively stable microclimate conditions are important to reproductive females and young as they allow more energy to be directed toward growth and development (Caceres and Barclay 2000, COSEWIC 2013a). Males are more versatile in their summer roosting requirements; they most frequently roost under exfoliating, raised bark but may also roost in the cavities and crevices of trees and snags with early- to mid-decay (Jung et al. 2004, COSEWIC 2013a).

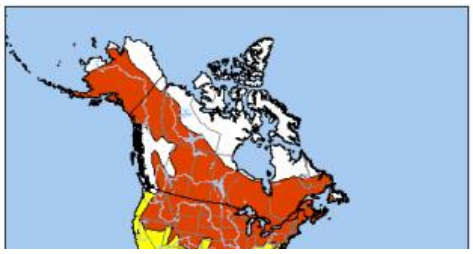
The northern myotis is well adapted to flying in areas of dense or structurally complex vegetation where it catches flying insects on the wing or feeds by gleaning prey from foliage (Caceres and Barclay 2000, Henderson and Broders 2008). The species typically forages within the interior of mature to old-growth deciduous and mixedwood forests, but may also forage in forest gaps, along forest edges and riparian areas, and over rivers (Henderson and Broders 2008, COSEWIC 2013a).

The northern myotis is federally listed under Schedule 1 of SARA as Endangered (Government of Canada 2023) and is designated as an S3 species in Saskatchewan (i.e., Vulnerable) (Saskatchewan Conservation Data Centre 2023). The current size of the northern myotis population in Canada is unknown. Prior to the arrival of White-nose Syndrome in 2010, the population in Canada was estimated to be over one million individuals (COSEWIC 2013a, Environment and Climate Change Canada 2018). White-nose Syndrome has been identified as the main threat for northern myotis

populations in Canada (COSEWIC 2013a). . Other threats to the northern myotis include habitat loss, colony eradication, chemical contamination, and wind turbines (COSEWIC 2013a)

Avian Species

Bank Swallow



Source: COSEWIC (2013b).



The Bank Swallow is a small songbird that occurs on every continent (except Antarctica and Australia), breeds throughout Canada, and winters primarily in South America (COSEWIC 2013b). Nesting colonies are typically characterized by steep embankments with a sand, silt, or clay substrate that can be easily excavated for burrows (COSEWIC 2013b, Government of Canada 2019a). These steep sand, silt, or clay embankments are frequently subject to erosion or slumping (COSEWIC 2013b, Garrison and Turner 2020).

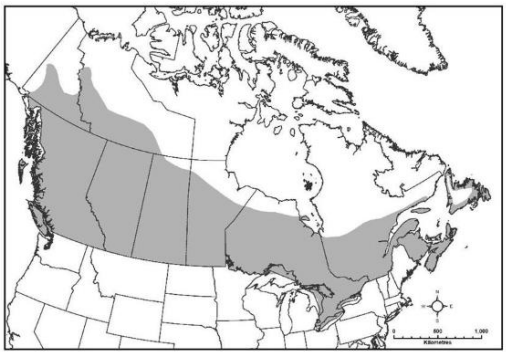
Nesting colonies are often adjacent to slow-moving or still waterbodies (e.g., low gradient rivers or lakes) and may occur in natural habitats or in anthropogenic features (e.g., quarries or road cuts) (COSEWIC 2013b, Government of Canada 2019a, Garrison and Turner 2020). Colony size can range from less than half a dozen burrows to hundreds or thousands of burrows (COSEWIC 2013b, Government of Canada 2019a). Individual burrows within colonies may be recolonized in subsequent years if the integrity of the colony remains intact (i.e., does not erode and collapse) (Garrison and Turner 2020). Bank Swallows are aerial insectivores that forage over a variety of open habitats such as lakes, ponds, rivers, wetlands, grasslands, and agricultural areas (COSEWIC 2013b, Garrison and Turner 2020).

The Bank Swallow is federally listed under Schedule 1 of SARA as Threatened (Government of Canada 2023) and is designated as an S4B, S5M species in Saskatchewan (i.e., Apparently Secure breeding population, Secure aggregating transient population [migrants]) (Saskatchewan Conservation Data Centre 2023). The most recent breeding population estimate for Canada is 2.4 million individuals (Environment and Climate Change Canada 2022b). Based on Breeding Bird Survey (BBS) data collected between 1970 and 2019, the Bank Swallow population in Canada has declined at a rate of 5.3% per year, for an overall decline of 98.0% (Environment and Climate Change Canada 2022b). The long-term population decline appears to be driven by several threats acting cumulatively, including loss of nesting and foraging habitats, incidental take during anthropogenic activities (e.g., aggregate extraction and erosion control), large-scale declines in aerial insect populations, and climate change (COSEWIC 2013b). Bank Swallows are also particularly vulnerable to collisions with vehicles partly due to the attraction of individuals to intraspecific carcasses; one swallow hit by a vehicle could attract several individuals to a road, potentially resulting in subsequent collisions and large mortality events (COSEWIC 2013b, Garrison and Turner 2020).

Although colonial nesting may provide advantages (e.g., predation protection and assistance with thermoregulation), it has been identified as a limiting factor for the Bank Swallow, potentially making

them more vulnerable to natural events or anthropogenic activities, which may result in mass mortality events (Environment and Climate Change Canada 2022b).

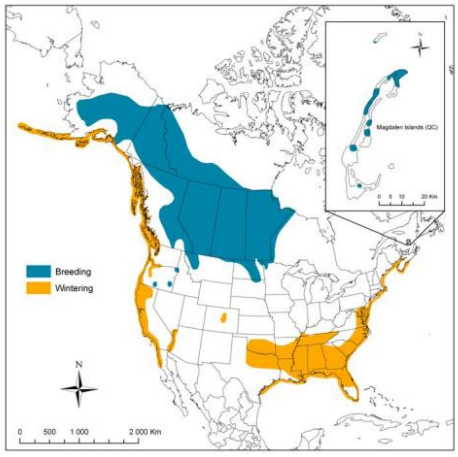
Barn Swallow



Source: COSEWIC (2021).

The Barn Swallow is a medium-sized songbird that occurs on every continent (except Antarctica), breeds throughout Canada, and winters in the southern United States, Mexico, and southwards (COSEWIC 2021). Breeding habitat typically requires a suitable nesting site with a vertical or horizontal surface underneath a roof of some sort, open areas for foraging (e.g., grasslands, fields, wetlands, and shorelines), and a waterbody with mud for nest building (Government of Canada 2019b, Brown and Brown 2020, COSEWIC 2021). Historically, suitable nesting sites were likely provided by caves, cliff faces, rock leges, tree branches, and hollow trees (Brown and Brown 2020, COSEWIC 2021). Today, nesting sites are usually located within agricultural and rural areas, and along roads and highways (Brown and Brown 2020, COSEWIC 2021). Anthropogenic features such as barns, houses, bridges, and culverts are commonly used for nesting sites (COSEWIC 2021). Barn Swallows nest in colonies or independently and typically return to the same nesting sites each year and may reuse old nests (Government of Canada 2019b, Brown and Brown 2020, COSEWIC 2021).

The Barn Swallow is federally listed under Schedule 1 of SARA as Threatened (Government of Canada 2023) and is designated as an S4B species in Saskatchewan (i.e., Apparently Secure breeding population) (Saskatchewan Conservation Data Centre 2023). An estimated 6.4 million individuals currently breed in Canada, with over 60% of the population breeding throughout the prairie provinces (COSEWIC 2021). Based on BBS data collected between 1970 and 2019, the Barn Swallow population in Canada has declined at a rate of 2.34% per year, for an overall decline of 68.6% (COSEWIC 2021). Intensification of agriculture, loss of nesting sites, large-scale declines in aerial insect populations, and climate change are cited as the most imminent threats for the Barn Swallow, and its dependence on aerial insects for prey and low post-fledging survival rates are cited as limiting factors for the species (COSEWIC 2021). The repeated use of anthropogenic features for nesting makes Barn Swallows vulnerable to incidental take, especially if the anthropogenic features require routine maintenance. In addition, their frequent use of anthropogenic features for nesting makes Barn Swallows vulnerable to entrapment (e.g., buildings, pipes, vents, other enclosed spaces) as they search for potential locations to build a nest (COSEWIC 2021).



Horned Grebe

The Horned Grebe is a small waterbird that occurs in North America and Eurasia (COSEWIC 2009b). Within North America, the species breeds across western Canada from BC and Yukon across to the Magdalen Islands in Quebec

and winters along the Pacific and Atlantic coasts (COSEWIC 2009b).

Breeding habitat for the Horned Grebe consists of small to medium-sized freshwater lakes, ponds, and marshes that are shallow with open water (at least 40%), emergent vegetation, anchorage for nests, and concealment for nests and young (COSEWIC 2009b, Stedman 2020). Horned Grebes use a range of waterbody sizes for breeding, but typically prefer waterbodies between 0.3 and 2.0 ha in size (COSEWIC 2009b). Most pairs are solitary, but loose colonies of up to 20 pairs have been found on larger waterbodies with abundant food resources (COSEWIC 2009b, Stedman 2020). Nests are typically located in shallow water near shore on a floating or emerging mass of vegetation (COSEWIC 2009b). Horned Grebes are diving birds that feed on a variety of aquatic arthropods and fish (COSEWIC 2009b, Stedman 2020).

Source: COSEWIC 2009b

The Western population of the Horned Grebe is federally listed under Schedule 1 of SARA as Special Concern (Government of Canada 2023) and is designated as an S5B species in Saskatchewan (i.e., Secure breeding population) (Saskatchewan Conservation Data Centre 2023). An estimated 200,000 to 500,000 individuals occur in the Western population, with most breeding in southern Alberta and Saskatchewan (COSEWIC 2009b, Environment and Climate Change Canada 2022c). Based on BBS data collected between 1970 and 2019, the Western population of the Horned Grebe in Canada has declined at a rate of 1.7% per year, for an overall decline of 57.0% (Environment and Climate Change Canada 2022c). The reasons for this population decline are unknown. Probable threats include permanent habitat loss, temporary loss of habitat during droughts, eutrophication and degradation of habitat due to fertilizers, predator expansion on the prairies, Type E botulism in the Great Lakes, entanglement in commercial fishing gear, climate change and extreme weather, and oil spills on wintering grounds (COSEWIC 2009b).

Mitigation Measures

The Project will require the construction, operation, and decommissioning of several components (as described in Section 2 of the EIS). Expected interactions between these Project components and activities and the wildlife VCs and their associated KIs are summarized by Project phase and activity in Tables 9.3-6 and 9.4-5 of the EIS. Based on the timing and nature of interactions identified in Tables 9.3-6 and 9.4-5 of the EIS, the following adverse effects on the wildlife VCs, including SAR, are likely to occur during the lifetime of the Project:

- alteration and/or loss of habitat; and
- change in mortality.

These potential effects apply to Wildlife SAR as well. The potential effects are described in Sections 9.3.4.2 and 9.4.4.2 of the EIS for each Project phase as they may affect the wildlife VCs and associated KIs.

Mitigation in this EIS is defined as the elimination, reduction, or control of potential adverse effects of the Project on the environment throughout all Project phases. Project-specific mitigation measures include: Project design; implementation of best management practices; development of management plans; implementation of emergency response programs; and provision of training, education and awareness (Denison 2020). Mitigation measures for each potential effect are described in Sections 9.3.5 and 9.4.5 of the EIS. The following subsections summarize mitigation measures that will be implemented to avoid or minimize adverse effects on the Wildlife SAR.

Project Design Measures

Potential adverse effects on Raptors, Migratory Breeding Birds, and Bird SAR VCs will be avoided or minimized to the extent practical through Project design. All of the Project design measures listed here are consistent with those presented in Section 9 of the EIS (i.e., there are no new Project design measures proposed in this appendix):

- The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent practicable resulting in reduced habitat disturbance and noise propagation.
- Much of the proposed footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
- The powerline to the main substation at the site is relatively short (i.e., approximately 7 km) and will be constructed from the existing provincial power line adjacent to Highway 914.
- During Operation, progressive reclamation activities will be completed where possible, and the progress and success of these activities will be assessed annually.
- Cleared brush will be stockpiled when possible, to be used in progressive reclamation.
- Ongoing decommissioning of Project components will be completed when possible.
- Dust deposition on vegetation and waterbodies (including potential deposition of trace metals and radionuclides) will be reduced by:
    - directing processing plant exhaust from drying and packaging areas through a stack prior to release outside of the building;

  - designing the stack height based on results of air dispersion modelling to be an appropriate height for optimal dispersion;
  - controlling access to the property with both a north and south security gate (the north gate is on a decommissioned road and the south gate is manned);
  - making a wash bay available to clean items, equipment and vehicles that may have been in contact with potentially contaminated materials. Contaminated water from the wash bay will be collected in a sump tank and routed to the water treatment plant for treatment and discharge;
  - conducting radiological clearance scanning as required for any items, equipment, and vehicles leaving the Project Area; and.
  - watering and traffic controls on roads.

- Battery-powered light vehicles and mobile equipment, and an AC powered dual rotary drill for ISR wellfield development instead of a traditional diesel-powered unit, will be employed, where practical, to reduce air emissions and noise levels and improve energy efficiency.
- The main sources of noise will be related to transport of people and goods, drilling of holes for the freeze wall and wellfield, operation of the batch plant, operation of the processing plant, and operation of the pumphouses. The use of high-quality, low sound emission equipment and regular maintenance will reduce noise associated with Project activities.
- Bulk storage tanks for processing chemicals such as sulphuric and/or hydrochloric acid, sodium hydroxide, and hydrogen peroxide will sit inside appropriately designed and sized secondary containment basins, physically separated from the containment basins for other chemical systems.
- Surface pipelines will be designed to have secondary containment or catchment and have leak detection systems in place at key locations.
- A freeze wall will be established around the uranium deposit to reduce groundwater disturbance.
- Mining solution and process water will be reused throughout the mining process, reducing water use requirements to the extent feasible and reducing the volume of treated effluent requiring discharge. Make-up water will be preferentially sourced from site runoff where possible.
- Double-walled, high-density polyethylene or equivalent piping will be used in the wellfields and will be freeze protected and secured to minimize pipe movement.
- Contaminated wastes (e.g., mineralized drill cuttings, solid impurities removed from mining solution, dewatered reject solids) will be properly contained on a double lined waste pad with leak detection capabilities and an associated monitoring program. An adjacent pond will be used to collect runoff from the pad and water in the waste pond will be piped to the water treatment plant. Such waste will be disposed of either on site or off site at an approved facility.
- The ISR wellfield and processing plant will be designed to re-use most of the solutions inside each circuit; any excess water will be released to a surface water body once acceptable water quality is achieved. All treated effluent released to surface water will meet federal and provincial regulatory discharge limits.

- All contaminated areas, such as waste ponds and pads, and the domestic landfill will be fenced to avoid contact with workers and wildlife. Fences will be monitored and maintained.

General Mitigation Measures for Wildlife Species at Risk

Mitigation measures specific to the Wildlife SAR, in accordance with the *Migratory Birds Convention Act* and tailored to Project features will be incorporated into various Project management and monitoring plans such as the erosion and sediment controls, soil and vegetation monitoring, wildlife monitoring, the Decommissioning Plan, air quality monitoring, Spill Response Plan, Radiation Protection Plan, surface water and effluent monitoring and Waste Management Plan.

The management plans within the Environmental Management System (EMS) will provide specific mitigation measures based on proven and accepted mitigation measures following standard industry guidelines and best management practices. The EMS will provide guidance to avoid or minimize potential adverse effects of the Project on avian species and their habitat, including monitoring and follow-up programs, as appropriate. It will be in place during all phases of the Project and will be subject to ongoing review and revision as required. If monitoring identifies a need for additional or revised mitigation measures, a process of adaptive management (as described in the plan) will be triggered. The Project management plans provide direction on monitoring and adaptive management so that responses are timely and effective.

The following subsections provides a description of the mitigation measures that will be applicable during all Project phases and expected to be effective immediately following implementation. Additional mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in **bold text**.

Work Timing Windows and Habitat Disturbance

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, when practical. **The nesting season for many Wildlife SAR in Saskatchewan spans a period from March 15 to August 31; however, the dates differ for certain species. The Wildlife Management Plans within the EMS will provide details on nesting windows for avian species, as well as other sensitive time periods (e.g., caribou calving periods) occurring in the Terrestrial RSA based on the Saskatchewan Activity Restriction Guidelines for Sensitive Species (SARGSS), which were established to support the avoidance of sensitive species' habitats during sensitive periods (SK MOE 2017).**
- **Prior to commencing any site clearing (i.e., vegetation clearing and/or soil disturbance) during the nesting and breeding season, pre-disturbance wildlife clearance surveys will be conducted a by a Qualified Professional (QP) at that location within the Project Area to identify sensitive species and habitat features (e.g., nests as well as roosts and hibernacula used by bat species).**
- **Active and/or suspected breeding and roosting locations identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) in accordance with the level of the disturbance and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations). If guidelines cannot be met, due to safety or operational concerns, SK MOE will be contacted for advice on the appropriate response to the situation.**

Wildlife Education and Awareness

- Employees and contractors will be provided with wildlife education and awareness training, including education about potential Wildlife SAR issues on site and training on the mitigation measures to avoid or minimize potential adverse Project effects on Wildlife SAR and their habitats.
- Employees and contractors will be educated on waste management policies that limit human-avian interactions.
- Designated employees will be trained in appropriate avian deterrent techniques to minimize avian interactions with the Project.
- **Employees and contractors will be requested to report avian observations on site, injured or dead birds (which will be reported to SK MOE). Avian encounters and outcomes will be monitored, and logbooks will be used to record observations. Logbooks and reports will be available to employees.**

Wildlife and Habitat Protection

- Personal firearms will be prohibited for employees and contractors within the Project Area to prevent hunting activities.
- If any individual were seeking access around the Project area to undertake Aboriginal and/or Treaty Rights, Denison staff would facilitate this, provided it were safe to do so given activities in the area.
- Policies will be implemented prohibiting employees and contractors from feeding, approaching, or harassing avian species within the Project Area.
- To support habitat regeneration, progressive reclamation and ecosystem-based revegetation will be conducted on disturbed areas as soon as practicable in accordance with the Reclamation and Closure Plan.

Wildlife Deterrence and Prevention of Wildlife Entrapment

- **Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as possible. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.**
- **Physical, visual, and/or auditory deterrents will be used to discourage bird and bat use of buildings and other Project infrastructure (e.g., water or waste treatment ponds) for refuge, shelter, breeding, and roosting, and to deter birds and bats from potentially becoming entrapped.**
- **Noise emitting Project activities will be managed to minimize sensory disturbance of wildlife SAR species, especially during sensitive time periods (i.e., breeding and nesting).**
- Low sound emission equipment, regular maintenance of equipment, and the use of silencers or mufflers (whenever practical) will be used to reduce noise associated with Project activities, to the extent practical.
- **Directed lighting or light shielding, rather than broad lighting, will be implemented to minimize sensory disturbance on the wildlife SAR, and lighting will be focused on work sites and not surrounding areas.**

- Dust generation and subsequent deposition on vegetation and in waterbodies (including potential deposition of trace metals and radionuclides) will be limited through dust suppression techniques such as road watering and traffic management.

Road and Traffic Management

- Traffic and access control measures will be implemented will include reducing traffic volume by scheduling truck convoys, using high-volume haul trucks, and restricting public access to the Project site and roads (e.g., private vehicles, snowmobiles, all-terrain vehicles, and foot traffic). It is important to note that if any individual were seeking access around the Project area to undertake Aboriginal and / or Treaty Rights, Denison staff would facilitate this, provided it were safe to do so given activities in the area.
- Appropriate road signage will be installed (e.g., speed limits) along Project roads to raise awareness and minimize the potential for wildlife SAR-vehicle collisions.
- Wildlife will have the right-of-way on Project roads, unless it is unsafe to stop (i.e., if a collision is imminent). Vehicles will not be used to encourage wildlife to move off Project roads.
- Processes will be implemented for employees and contractors to slow down and/or stop vehicles/equipment to allow animals to move away or off the road before resuming normal road speeds for the area.
- Employees and contractors will report and communicate the location and circumstances of any roadkill observed on or alongside Project roads. Large-bodied wildlife carcasses found will be reported to SK MOE and disposed of as directed to discourage avian scavengers.
- **Vegetation management, such as mowing and brush cutting, will be implemented along Project roads to reduce site attractiveness for wildlife SAR and maintain appropriate sightlines for drivers to minimize wildlife-vehicle collisions.**
- Alternative measures on Project roads for de-icing and winter traction (e.g., sand, gravel) or dust suppression (e.g., water) will be implemented, whenever practicable.
- Appropriately sized gaps in the roadside snowbanks during winter will be maintained to facilitate wildlife crossing and escape thereby reducing the risk of wildlife-vehicle collisions.
- New Project site and access roads will be designed to minimize sightlines for predators, whenever practicable, while still maintaining general road safety.
- Ditches and culverts along Project roads will be designed and maintained to minimize pooling of water. Roadside pools that form may attract wildlife.

Waste and Hazardous Materials Management

- A "no littering policy" for employees and contractors will be implemented within the Project Area.
- **Vegetation management will be incorporated in the vicinity of waste ponds to discourage wildlife SAR use of potentially affected vegetation.**
- Waste will be collected and temporarily stored in wildlife-proof containers to avoid attracting scavengers and with that increase the risk for human-wildlife interact.
- The wildlife-proof containers will be inspected regularly for evidence of avian presence (e.g., gull species) or access to waste disposal facilities. If evidence of avian presence or

access to waste disposal facilities is detected, modified systems will be implemented and/or off-site waste disposal frequencies will be increased.
- The use of hazardous materials will be limited as much as possible.
- Hazardous materials will be handled, stored, and disposed of appropriately and in accordance with a Waste Management Plan to avoid attracting avian scavengers (e.g., wildlife-proof containers, exclusion fencing).
- Physical deterrents (e.g., fencing) will be employed around contaminated areas (e.g., waste ponds and waste pads), the domestic landfill, or hazardous materials storage areas to discourage wildlife use.
- Appropriate hazardous materials management practices will be implemented in accordance with industry guidelines and a Waste Management Plan to minimize the risk of accidental spills or leakage.
- Appropriate spill response kits will be positioned adjacent to areas where hazardous materials are stored in accordance with the Spill Response Plan.
- A minimum 100 m distance from any waterbody will be maintained for fuel storage, refueling activities, or equipment servicing in accordance with the Spill Response Plan.
- Appropriate fuel, chemical, and materials management practices will be followed in accordance with the Spill Response Plan to minimize the risk of accidental spills or leakage of diesel fuel, other hydrocarbons, and other hazardous materials.
- Air emissions will be reduced to the extent practical through implementation of an air quality monitoring plan within the EMS.
- All vehicles and equipment will be equipped with industry-standard emission control systems; unnecessary idling of vehicles will be prohibited.
- Vehicles and equipment will be maintained in good working condition (e.g., no leaks) and furnished with industry-standard spill response kits.
- Mitigation measures to reduce the potential for dispersion of radiological contaminants of potential concern to vegetation will be implemented in accordance with the Radiation Protection Plan.
- Education on and enforcement of proper waste and hazardous materials management practices will be provided to employees and contractors.

Species-Specific Mitigation Measures for Wildlife Species at Risk

The following provides a summary of the species-specific mitigation measures that will be implemented during Project activities. Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in **bold text**. These will be added to the final EIS.

Arthropod Species

- Mitigation measures designed for the Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5) VCs are expected to mitigate adverse effects on the arthropod species that are considered SAR (i.e., nine-spotted lady beetle, transverse lady beetle, and yellow-banded bumble bee) primarily related to limiting the loss and/or disruption of suitable habitat for these species. These include:

- The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.
- Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
- During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.

- **Herbicide use as part of vegetation management will be limited to the immediate Project Footprint and applied by licensed professional applicators, when necessary, to limit the potential for adverse effects on arthropod species.**

Amphibian Species

- Mitigation measures designed for the Wetlands VC (Section 9.2.5) are expected to mitigate adverse effects on the northern leopard frog primarily related to limiting the loss and/or disruption of suitable habitat for these species. These include:
  - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation.
  - Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance.
  - During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually.
- **Pre- disturbance wildlife clearance surveys will be conducted to identify site-specific habitat features (e.g., amphibian breeding ponds) and implement the setbacks and/or timing windows (that will be defined in the Wildlife Management Plan).**
- **Locations of site-specific habitat features used by amphibians will be communicated to Project personnel and the requirement to limit disturbance in these areas will be implemented.**
- **Appropriate setback and buffer distances from wetland features where amphibians are known to occur will be implemented and maintained under the direction of a wildlife QP.**
- **Vehicle traffic and construction activities will be restricted to the approved access routes and work areas and will not cross or enter a watercourse or wetland**.

Bat Species

- Vegetation clearing activities will occur outside of roosting periods, when practical.
- **Pre- disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as maternal rooting sites and hibernacula used by bat species. If features are identified in the Project Footprint, appropriate setbacks and/or timing windows will be implemented in accordance with the SARGSS (SK MOE 2017 (that will also be defined in the Wildlife Management Plan).**

- **In the event a maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat exit) will be implemented following the summer maternity roost season. This installation would allow for bats to leave but not the ability to re-enter the roosting site.**
- **Locations of these site-specific habitat features used by bats will be communicated to the appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.**
- **Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.**

Avian Species

- Site clearing and other works that involve disturbance of vegetation and/or soil will be conducted outside of the nesting season, when practical. The breeding and nesting season for most avian species in Saskatchewan typically spans a period from March 15 to August 31; however, the dates differ for certain species.
- **In the event Project activities such as vegetation clearing and/or soil disturbance are required during the breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted by a QP at that location within the Project Area before activities commence to identify the presence of avian SAR and/or their nests.**
- **Active and/or suspected breeding and roosting locations identified during the pre-disturbance wildlife clearance surveys will be protected with a no-disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) for other grebe species (as there is currently no activity restriction guidelines for horned grebe in Saskatchewan) in accordance with the level of the disturbance and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).**
- **Locations of nesting sites used by bank swallows, barn swallows, and horned grebe will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.**
- **Deterrents designed to discourage or prevent barn swallows from using buildings and other Project infrastructure have been described in Section 3.2.4 of the EIS.**
- **Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as practical. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces.**

Residual and Cumulative Effects Summary

The approach to assessing residual Project effects on wildlife VCs followed the methodology outlined in Section 5.8 of the EIS, which included a habitat-based approach. For each VC and associated KI, each residual effect was assessed in the context of the Project activities that will occur within each Project phase. Each residual effect was then characterized based on the combined predicted residual effect for all phases. See Sections 9.3.6 and 9.4.6 of the EIS for specific details regarding the residual effects assessment for wildlife VCs (i.e., residual effect characterization and significance determination). A summary of the environmental assessment considerations and determination for predicted residual effects for Wildlife SAR is provided in Table 0.1. Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in bold text. These will be added to the final EIS.

The cumulative effects assessment (CEA) followed standard methodology as per provincial (e.g., Guidelines for an Environmental Assessment under the [Saskatchewan] *Environmental Assessment Act* 1980) and federal (e.g., Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act 2012*) guidance, and is discussed in detail in Section 5.9 of the EIS. Similar to the residual effects assessment, the CEA included a habitat-based approach. See Sections 9.3.7 and 9.4.7 of the EIS for specific details regarding the CEA for wildlife VCs. A summary of the significance determination of the cumulative effects on Wildlife SAR is provided in Table 0.2.

Table 0.1 Summary of the Environmental Assessment Considerations and Determination for Predicted Residual Effects for Wildlife Species At Risk

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
Terrestrial Environment	Nine-spotted lady beetle Transverse lady beetle Yellow-banded bumble bee	Amount of habitat that is altered or lost relative to its availability in the Terrestrial Regional Study Area (RSA).	• Development of access roads and air strip. • Site preparation and earthworks; clearing, levelling, and grading of the Project Area. • Waste management (composting, domestic and industrial landfill operation, recycling). • Water management (including treatment). • Surface water withdrawal. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction	• The proposed mitigation measures outlined in the EIS, particularly those designed for the Valued Components (VCs) Soil and Organic Matter / Peat (Section 9.1.5) and Vegetation and Ecosystems (Section 9.2.5), adequately and appropriately address potential for adverse effects on these species, primarily related to limiting the loss and/or disruption of suitable habitat. These include the following: - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation. - Much of the proposed Project Footprint will be developed within	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, and fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for the arthropod SAR within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			• Water withdrawal from groundwater or surface water body. • Management of surface water (including seepage and site runoff). • Water release to groundwater and/or surface water body. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			

[1] Mitigation measures specific to the Wildlife SAR that were not included or that were revised from what was described in the draft EIS are provided in bold text.

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
			• Site water management, treatment, and release • Process water treatment and release. • Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning	previously disturbed areas, including roads currently used for exploration activities, thereby minimizing additional habitat disturbance. - During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually. • **Herbicide use as part of vegetation management will be limited to the immediate Project Footprint applied by licensed professional applicators when necessary to limit the potential for adverse effects on arthropod species.**		
		Mortalities directly or indirectly attributable to the Project.	• Development of access roads and air strip. • Site preparation and earthworks; clearing, levelling, and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction		Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of the arthropod SAR to the point where they are not sustainable or available to contribute to ecological functions.
			• On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
Terrestrial Environment	Northern leopard frog	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	• Development of access roads and air strip. • Site preparation and earthworks; clearing, leveling and grading of the Project Area. • Water management (including treatment and site runoff). • Surface water withdrawal. • On-site and off-site operation of vehicles and transport of materials.	Construction	• The proposed mitigation measures outlined in the EIS, particularly those designed for the Wetlands VC (Section 9.2.5), adequately and appropriately address potential adverse effects on northern leopard frogs, primarily related to limiting the loss and/or disruption of suitable habitat for this species. These include the following: - The Project Area (i.e., the area of maximum physical disturbance) has been reduced to the extent safely practicable resulting in reduced habitat disturbance and noise propagation. - Much of the proposed Project Footprint will be developed within previously disturbed areas, including roads currently used for exploration activities, thereby minimizing	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for northern leopard frog within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			• Water withdrawal from groundwater or surface water body. • Management of surface water (including seepage and site runoff). • Water release to surface water body. • On-site and off-site operation of vehicles and transport of materials.	Operation			
			• Site water management, treatment, and release. • Process water treatment and release. • Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
		Mortalities directly or indirectly attributable to the Project.	• Development of access roads and air strip. • Site preparation and earthworks; clearing, leveling and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials.	Construction	additional habitat disturbance. - During Operation, progressive reclamation will be completed where possible, and the progress and success of these activities will be assessed annually. • **Pre- disturbance wildlife clearance surveys will be conducted to identify site-specific habitat features (e.g., amphibian breeding ponds) and implement the setbacks and/or timing windows (that will be defined in the Wildlife Management Plan).** • **Locations of site-specific habitat features used by amphibians will be communicated to Project personnel and the requirement to limit disturbance in these areas will be implemented.** • **Appropriate setback and buffer distances from wetland features where**	Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of northern leopard frog to the point where they are not sustainable or available to contribute to ecological functions
			• Water withdrawal from groundwater or surface water body. • Management of surface water (including seepage and site runoff). • Water release to surface water body. • On-site and off-site operation of vehicles and transport of materials	Operation			
			• Site water management, treatment, and release. • Demolition and disposal of non-salvageable surface infrastructure and materials. • Reclamation of disturbed areas). • On-site and off-site operation of vehicles and transport of materials.	Decommissioning			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
					amphibians are known to occur will be implemented and maintained under the direction of a wildlife QP. • **Vehicle traffic and construction activities will be restricted to the approved access routes and work areas and will not cross or enter a watercourse or wetland.**		
Terrestrial Environment	Little brown myotis Northern myotis	Amount of habitat that is altered or lost relative to its availability in the Terrestrial RSA.	• Development of access roads and air strip. • Site preparation and earthworks; clearing, leveling and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction	• **Vegetation clearing activities will occur outside of roosting periods, when practical.** • **Pre- disturbance wildlife clearance surveys will be completed to identify site-specific habitat features such as maternal rooting sites and hibernacula used by bat species. If features are identified in the Project Footprint, appropriate setbacks and/or timing windows will be implemented in accordance with the SARGSS (SK MOE 2017 (that will also be defined in the Wildlife Management Plan).**	Alteration and/or loss of habitat: predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	Not Significant: the predicted residual effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for bat species within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			• On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
		Mortalities directly or indirectly attributable to the Project.	• Development of access roads and air strip. • Site preparation and earthworks; clearing, leveling and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Construction	• **In the event a maternal roosting site is identified on the Project Footprint, exclusionary methods (e.g., installing a one-way bat exit) will be implemented following the summer maternity roost season. This installation would allow for bats to leave but not the ability to re-enter the roosting site.** • **Locations of these site-specific habitat features used by bats will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.** • **Specific exclusion methods will be added as mitigation measures (Section 9.4.5 of the final EIS) to prevent access to buildings and other infrastructure.**	Change in mortality: predicted to be low magnitude, local in geographical extent, long-term duration, infrequent, and fully reversible.	The predicted residual effect of change in mortality is not expected to alter the integrity of the regional populations of the bat species to the point where they are not sustainable or available to contribute to ecological functions
			• On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			
Terrestrial Environment	Bank Swallow	Amount of habitat that is altered or	• Development of access roads and air strip.	Construction	• Site clearing and other works that involve disturbance of	Alteration and/or loss of habitat:	Not Significant: the predicted residual

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
	Barn Swallow Common Nighthawk Horned Grebe Olive-sided Flycatcher Rusty Blackbird Short-eared Owl Yellow Rail	lost relative to its availability in the Terrestrial RSA.	• Site preparation an earthworks; clearing, leveling and grading of the Project Area. • Water management (including treatment and site runoff). • Surface water withdrawal. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.		vegetation and/or soil will be conducted outside of the nesting season, when practical. The breeding and nesting season for most avian species in Saskatchewan typically spans a period from March 15 to August 31; however, the dates differ for certain species. • **In the event Project activities such as vegetation clearing and/or soil disturbance are required during the breeding and nesting season, pre-disturbance wildlife clearance surveys will be conducted a by a QP at that location within the Project Area before activities commence to identify the presence of avian SAR and/or their nests.** • **Active and/or suspected breeding and roosting locations identified during the pre- disturbance wildlife clearance surveys will be protected with a no-**	predicted to be low magnitude, local geographical extent, long-term duration, frequent, fully reversible.	effect of alteration and/or loss of habitat is not expected to alter the integrity of the habitat for the avian SAR within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			• Management of surface water (including seepage and site runoff). • Water release to surface water body. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Site water management, treatment, and release. • Process water treatment and release. • Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			
		Mortalities directly or indirectly	• Development of access roads and air strip.	Construction		Change in mortality:	The predicted residual effect of

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
		attributable to the Project.	• Site preparation an earthworks; clearing, leveling and grading of the Project Area. • On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.		**disturbance setback buffer consistent with regulatory guidelines (e.g., the 2017 SARGSS [SK MOE 2017]) for other grebe species (as there is currently no activity restriction guidelines for horned grebe in Saskatchewan) in accordance with the level of the disturbance and species until the young have successfully fledged, the nest is confirmed as no longer active (e.g., abandoned or depredated), or the nesting window has passed (for suspected nest locations).** • **Locations of nesting sites used by bank swallows, barn swallows, and horned grebe will be communicated to appropriate Project personnel and the requirement to limit disturbance in these areas will be implemented.** • **Deterrents designed to discourage or prevent barn swallows from using**	predicted to be low magnitude, regional in geographical extent, long-term duration, infrequent, and fully reversible.	change in mortality is not expected to alter the integrity of the regional populations of the avian SAR to the point where they are not sustainable or available to contribute to ecological functions.
			• On-site and off-site operation of vehicles and transport of materials. • Air transportation for workers.	Operation			
			• Demolition and disposal of non-salvageable surface infrastructure and materials. • On-site and off-site operation of vehicles and transport of materials. • Reclamation of disturbed areas.	Decommissioning			

Component	Wildlife SAR	Measurable Parameters	Project Activities Resulting in Primary Interactions	Project Phase	Species-Specific Mitigation Measures[1]	Predicted Residual Effect	Significance
					buildings and other Project infrastructure have been previously described in Section 3.2.4 of the EIS. • Buildings and other Project infrastructure will be designed and maintained to exclude birds (e.g., barn swallows) and bats as much as practical. This would include installing solid barriers (e.g., corner slope panels, wooden panels) or flexible barriers (e.g., netting, tarps or geotextiles) under roof eaves or other exterior surfaces • Minimize height of salvaged soil stockpiles and avoid vertical slopes to deter bank swallows from creating nesting cavities.		

Table 0.2 Summary of Significance of the Cumulative Effects on Wildlife Species At Risk

Component	Valued Component	Key Indicator	Cumulative Effects	Summary of Significance of the Cumulative Effects
Terrestrial Environment	Wildlife Species at Risk	• Nine-spotted lady beetle • Transverse lady beetle • Yellow-banded bumble bee • Northern leopard frog • Little brown myotis • Northern myotis • Bank Swallow • Barn Swallow • Common Nighthawk • Horned Grebe • Olive-sided Flycatcher • Rusty Blackbird • Short-eared Owl • Yellow Rail	Alteration and/or loss of habitat.	**Not significant:** The cumulative effect of alteration and/or loss of habitat is not expected to alter the integrity of the Wildlife Species at Risk habitat within the Terrestrial RSA to the point where it is not sustainable or available to contribute to ecological functions.
			Change in mortality.	**Not significant:** The cumulative effect of change in mortality is not expected to alter the integrity of the regional populations to the point where they are not sustainable or available to contribute to ecological functions.

References

Brown, M.B. and Brown, C.R. 2020. Barn Swallow (*Hirundo rustica*), version 1.0. In Birds of the World (P. G. Rodewald, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. (https://birdsoftheworld.org/bow/species/barswa/cur/introduction). Accessed May 30, 2023.

Caceres, M.C. and Barclay, R.M.R. 2000. *Myotis septentrionalis*. Mammalian Species (634):1–4. DOI: 10.2307/0.634.1

COSEWIC. 2009a. COSEWIC assessment and update status report on the Northern Leopard Frog *Lithobates pipiens*, Rocky Mountain population, Western Boreal/Prairie populations, and Eastern populations, in Canada. Committee on the Status of Endangered Widllife in Canada, Ottawa. vii + 69 pp.

COSEWIC. 2009b. COSEWIC assessment and status report on the Horned Grebe, *Podiceps auritus*, Western population and Magdalen Islands population, in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. vii + 42 pp.

COSEWIC. 2013a. COSEWIC assessment and status report on the Little Brown Myotis *Myotis lucifugus*, Northern Myotis *Myotis septentrionalis*, and Tri-colored Bat *Perimyotis subflavus* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. xxiv + 93 pp.

COSEWIC. 2013b. COSEWIC assessment and status report on the Bank Swallow *Riparia riparia* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. xi + 48 pp.

COSEWIC. 2015. COSEWIC assessment and status report on the Yellow-banded Bumble Bee *Bombus terricola* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. ix + 60 pp.

COSEWIC. 2016a. COSEWIC assessment and status report on the Nine-spotted Lady Beetle *Coccinella novemnotata* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. x + 57 pp.

COSEWIC. 2016b. COSEWIC assessment and status report on the Transverse Lady Beetle *Coccinella transversoguttata* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. xi + 57 pp.

COSEWIC. 2021. COSEWIC assessment and status report on the Barn Swallow *Hirundo rustica* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 60 pp.

Environment and Climate Change Canada. 2018. Recovery Strategy for the Little Brown Myotis (*Myotis lucifugus*), the Northern Myotis (*Myotis septentrionalis*), and the Tri-colored Bat (*Perimyotis subflavus*) in Canada. Environment and Climate Change Canada, Ottawa. ix + 172 pp.

Environment and Climate Change Canada. 2022a. Management Plan for the Yellow-banded Bumble Bee (*Bombus terricola*) in Canada [Proposed]. *Species at Risk Act* Management Plan Series. Environment and Climate Change Canada, Ottawa. iv + 46 pp.

Environment and Climate Change Canada. 2022b. Recovery Strategy for the Bank Swallow (*Riparia riparia*) in Canada. *Species at Risk Act* Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. ix + 125 pp.

Environment and Climate Change Canada. 2022c. Management Plan for the Horned Grebe (*Podiceps auritus*), Western population, in Canada. *Species at Risk Act* Management Plan Series. Environment and Climate Change Canada, Ottawa. v + 49 pp.

Environment Canada. 2013. Management Plan for the Northern Leopard Frog (*Lithobates pipiens*), Western Boreal/Prairie Populations, in Canada. *Species at Risk Act* Management Plan Series. Environment Canada, Ottawa. iii + 28 pp.

Garrison, B.A. and Turner, A. 2020. Bank Swallow (*Riparia riparia*), version 1.0. In Birds of the World (S. M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. (https://birdsoftheworld.org/bow/species/banswa/cur/introduction). Accessed May 30, 2023.

Government of Canada. 2019a. Description of Residence for Bank Swallow (*Riparia riparia*) in Canada. (https://species-registry.canada.ca/index-en.html#/species/1233-894#residence_description)

Government of Canada. 2019b. Description of Residence for Barn Swallow (*Hirundo rustica*) in Canada. (https://species-registry.canada.ca/index-en.html#/species/1147-790#residence_description)

Government of Canada. 2023. Species at risk public registry. (https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html). Accessed May 31, 2023.

Henderson, L.E. and Broders, H.G. 2008. Movements and Resource Selection of the Northern Long-Eared Myotis (*Myotis septentrionalis*) in a Forest - Agriculture Landscape. Journal of Mammalogy 89(4):952–963. DOI: 10.1644/07-MAMM-A-214.1

Johnson, J.S., Treanor, J.J., Slusher, A.C., and Lacki, M.J. 2019. Buildings provide vital habitat for little brown myotis (*Myotis lucifugus*) in a high-elevation landscape. Ecosphere 10(11):e02925. DOI: 10.1002/ecs2.2925

Jung, T.S., Thompson, I., and Titman, R.D. 2004. Roost site selection by forest-dwelling male *Myotis* in central Ontario, Canada. Forest Ecology and Management (202):325–335.

Nature Conservancy Canada (NCC). 2023. Northern Leopard Frog. (https://www.natureconservancy.ca/en/what-we-do/resource-centre/featured-species/reptiles-and-amphibians/northern-leopard-frog.html).

Saskatchewan Conservation Data Centre. 2023. Saskatchewan Conservation Data Centre. (http://biodiversity.sk.ca/). Accessed May 30, 2023.

Slough, B.G. and Jung, T.S. 2020. Little Brown Bats Utilize Multiple Maternity Roosts Within Foraging Areas: Implications for Identifying Summer Habitat. Journal of Fish and Wildlife Management 11(1):311–320.

Smith, A.R. 1996. Atlas of Saskatchewan Birds. Special Publication No. 22. Saskatchewan Natural History Society (Nature Saskatchewan). Regina, Saskatchewan. 456 pp.

Smith, A.R., C.S. Houston, and J.F. Roy. 2019. Birds of Saskatchewan. Special Publication No. 38. Nature Saskatchewan. Regina, Saskatchewan. 765 pp.

Stedman, S.J. 2020. Horned Grebe (Podiceps auritus), version 1.0. In Birds of the World (S. M. Billerman, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. (https://birdsoftheworld.org/bow/species/horgre/cur/introduction). Accessed May 30, 2023.

Denison Mines

Related information: Round 2 response – new EIS Appendix 9-F, Figure 2.9

Species At Risk – *Myotis* Species

The following information is intended to provide additional context to the responses provided in the IR tracking sheet for IR-174.

Acoustic bat surveys were completed between July 22 and 23, 2019 with 61 survey points sampled across five ecosite types. The location of the survey points, species detected, and frequency of detections are included in Figure .

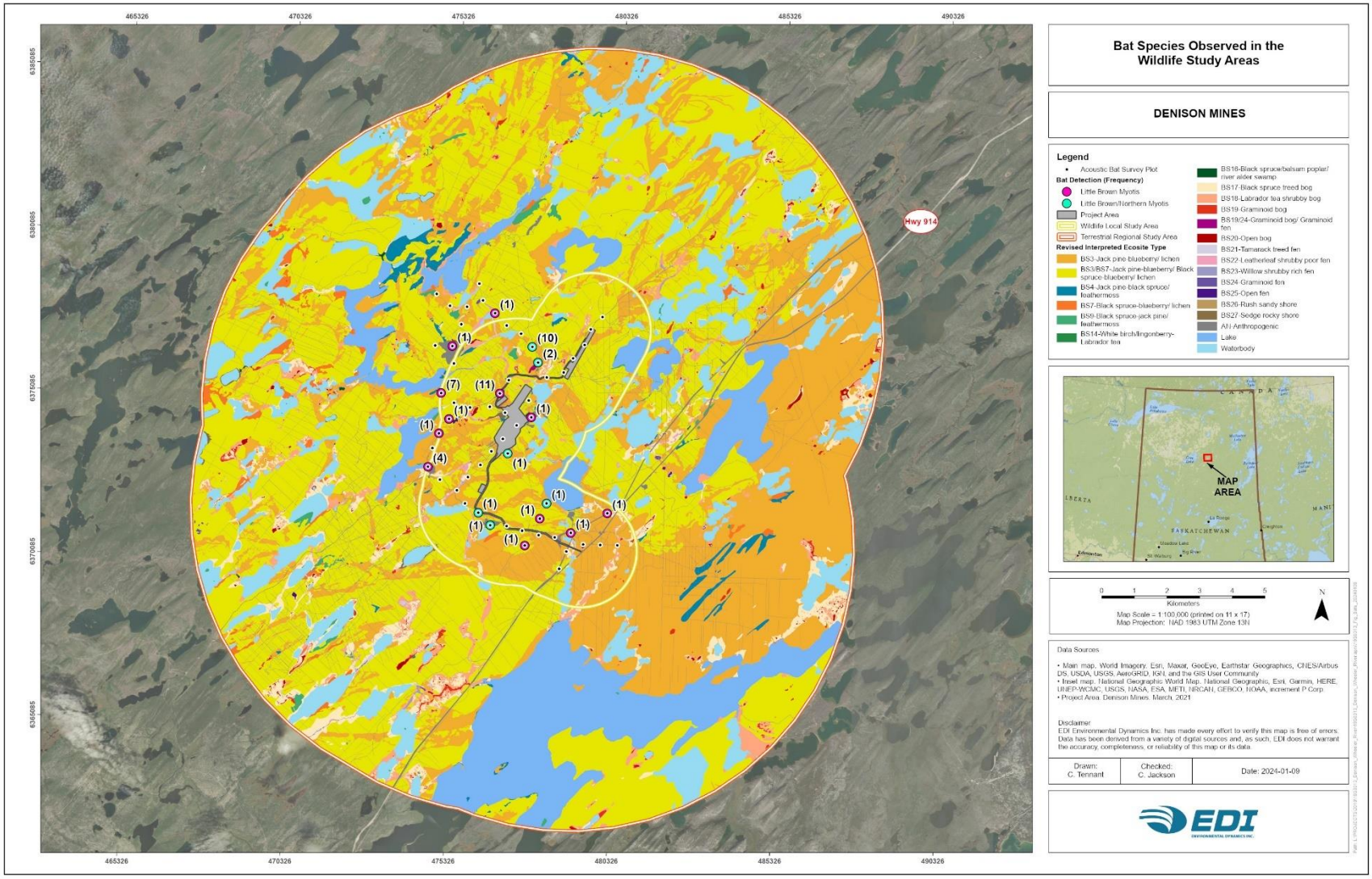


Figure 2-9: Bat Species Observed within the Wildlife Study Areas

IR-174, Round 3 Attachment:

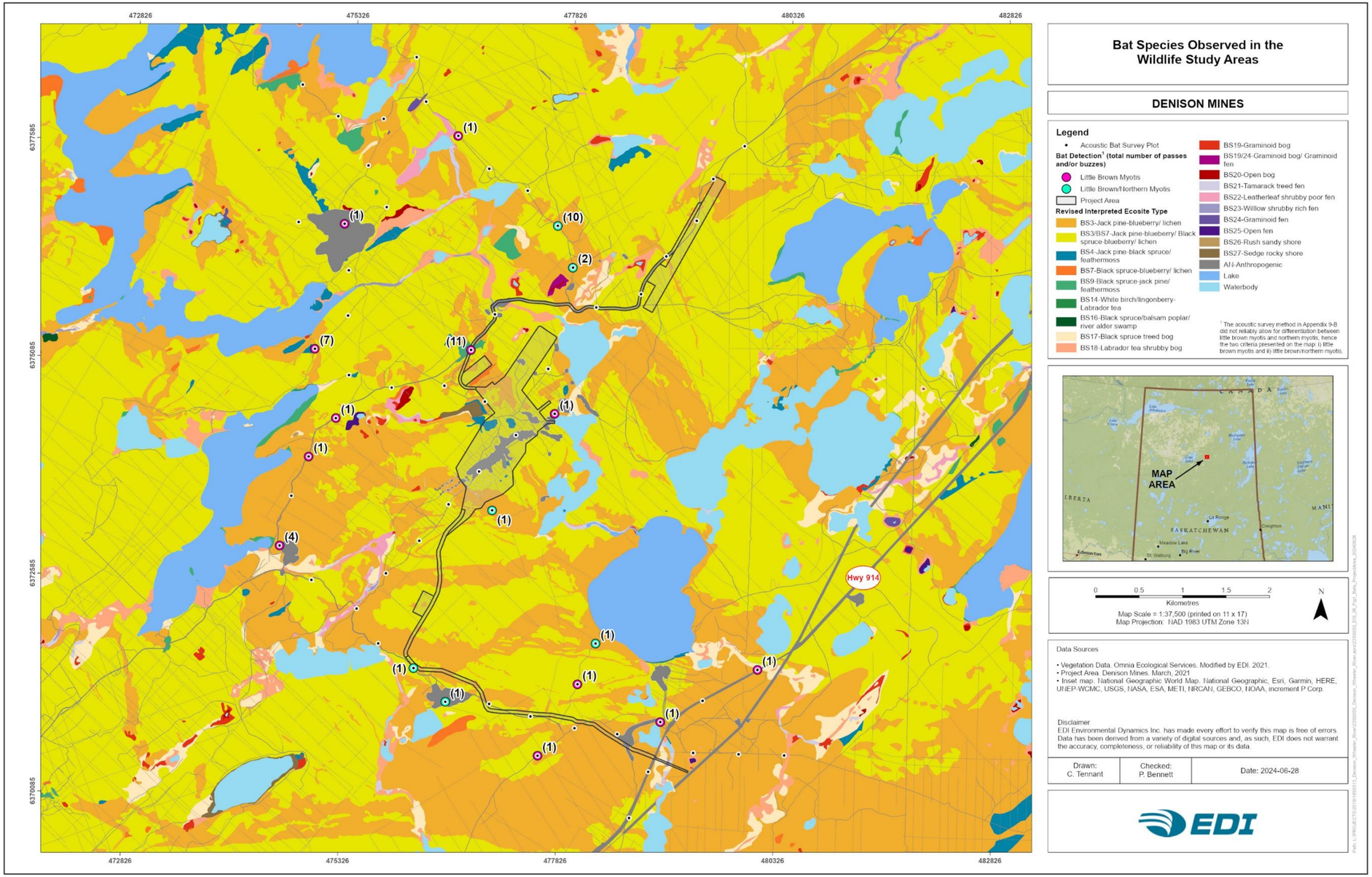


Figure IR-174 Round 3-1: Bat Species Observed within the Wildlife Study Areas

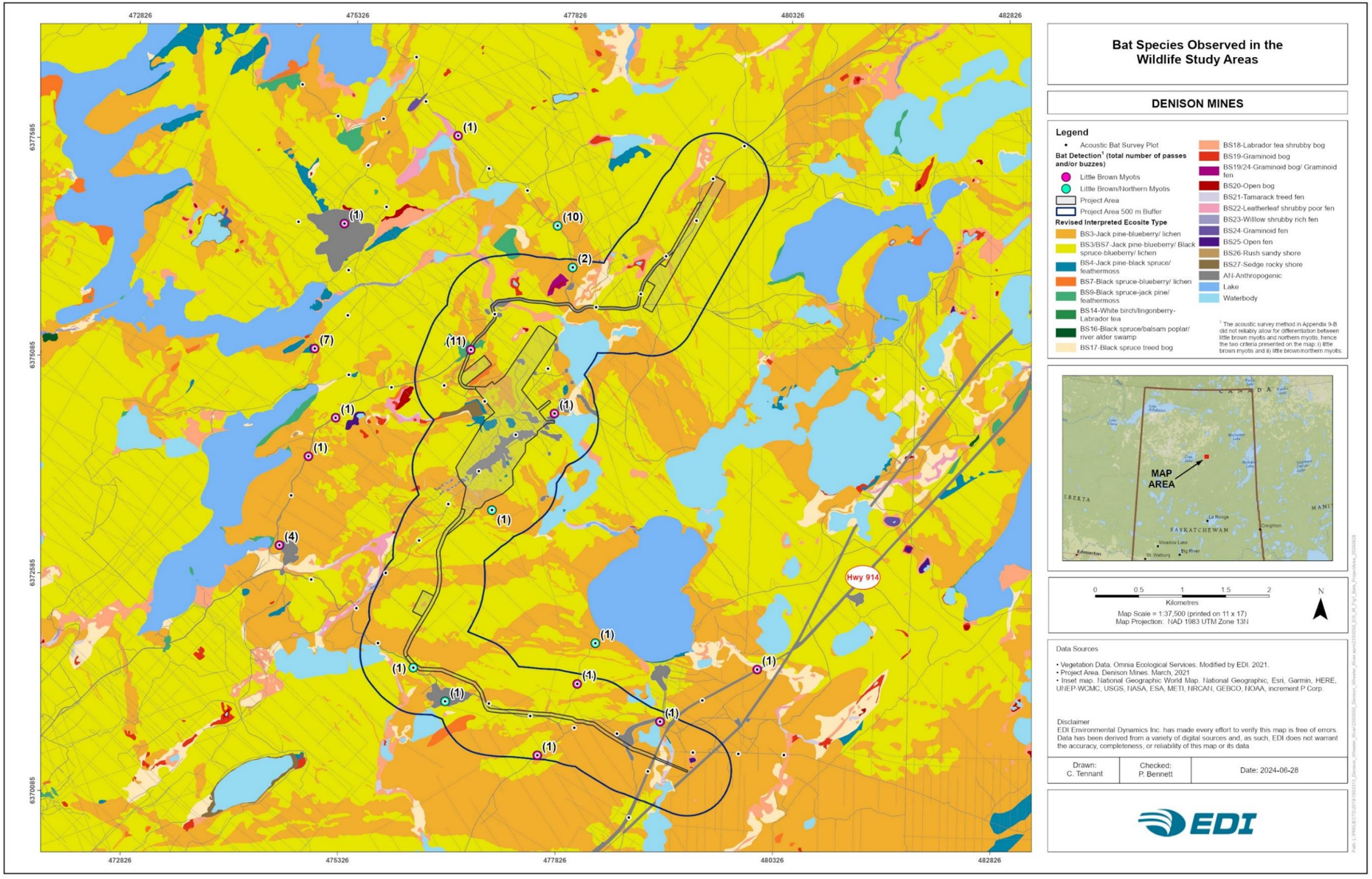


Figure IR-174 Round 3-2: Bat Species Observed within the Wildlife Study Areas (with 500m disturbance buffer shown)

Note: the above figure is provided as Figure 2-9 in Appendix 9-F of the final EIS

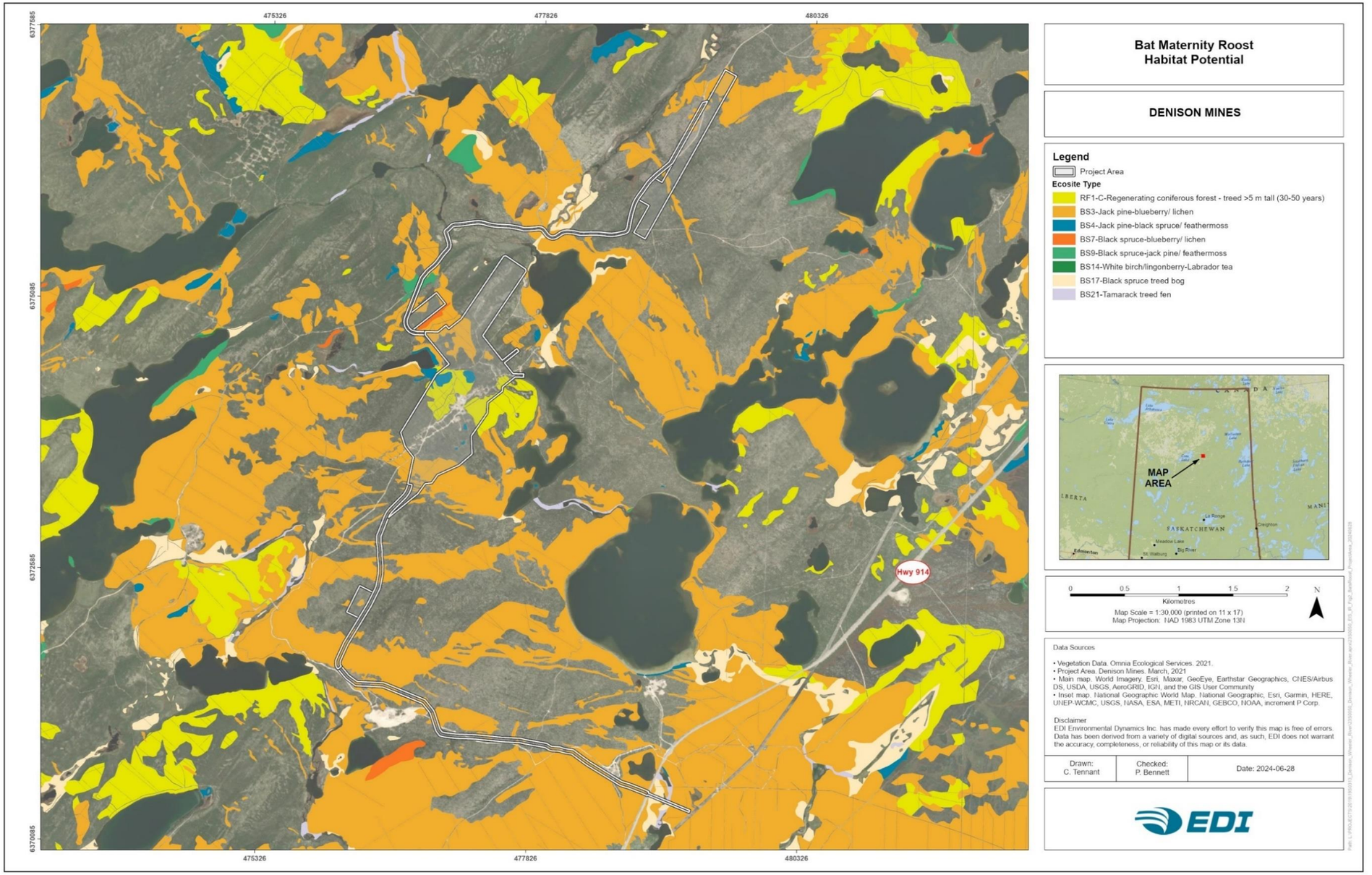


Figure IR-174 Round 3-3: Bat Maternity Roost Habitat Potential

Note: the above figure is provided as Figure 2-10 in Appendix 9-F of the final EIS

Attachment IR-174 (Round 4):

To address this Round 4 IR, a series of 16 maps are provided in this attachment. There are 4 different life stages shown (i.e., forage habitat potential, overwinter hibernacula potential, maternity roost habitat potential, and summer roost habitat potential) for each bat species (little brown myotis and northern myotis) with both the 1) Project footprint and 2) project footprint plus 500 m buffer. The following list summarizes the map numbers and content:

- Little Brown Myotis Forage Habitat Potential within the…
    - Figure 1: Wildlife Study Areas
    - Figure 2: Wildlife Study Areas (with 500m disturbance buffer shown)
- Northern Myotis Forage Habitat Potential within the…
    - Figure 3: Wildlife Study Areas
    - Figure 4: Wildlife Study Areas (with 500m disturbance buffer shown)
- Little Brown Myotis Overwinter Hibernacula Habitat Potential within the…
    - Figure 5: Wildlife Study Areas
    - Figure 6: Wildlife Study Areas (with 500m disturbance buffer shown)
- Northern Myotis Overwinter Hibernacula Habitat Potential within the…
    - Figure 7: Wildlife Study Areas
    - Figure 8: Wildlife Study Areas (with 500m disturbance buffer shown)
- Little Brown Myotis Maternity Roost Habitat Potential within the…
    - Figure 9: Wildlife Study Areas
    - Figure 10: Wildlife Study Areas (with 500m disturbance buffer shown)
- Northern Myotis Maternity Roost Habitat Potential within the…
    - Figure 11: Wildlife Study Areas
    - Figure 12: Wildlife Study Areas (with 500m disturbance buffer shown)
- Little Brown Myotis Summer Roost Habitat Potential within the…
    - Figure 13: Wildlife Study Areas
    - Figure 14: Wildlife Study Areas (with 500m disturbance buffer shown)
- Northern Myotis Summer Roost Habitat Potential within the…
    - Figure 15: Wildlife Study Areas
    - Figure 16: Wildlife Study Areas (with 500m disturbance buffer shown)

The rationale for each of the 4 life stages is provided below.

<u>Foraging habitat:</u>

> Based on information in Appendix 9-D, both species of bats could potentially forage anywhere and as such, all ecosites were shown as providing potential foraging habitat in Figures 1 to 4.

Overwinter hibernacula habitat:

As noted in Appendix 9-D, hibernacula occur in parts of caves, mines (openings to surface for ramps and raises for example), and buildings that have stable and specific temperature (-4 to 13°C) and humidity (>80%) conditions (COSEWIC 2013). Based on existing environment information presented in the EIS including the terrain and vegetation and ecosystem existing environment sections, there are no caves anticipated in the wildlife study areas. Terrain is low relief due to flat-lying sandstone and almost continuous cover of sandy glacial deposits (i.e., surface is predominately sand textured and there are no rocky outcrops or bedrock at surface for cave habitats). There are no mine openings in the wildlife study areas. We do note that there are buildings in the wildlife study areas are Denison's exploration camp which is located out of the Project Area; this area is shown as providing overwinter hibernacula habitat potential in Figures 5 to 8.

Maternity roost habitat:

Maternity sites can occur in large-diameter trees, rock crevices, buildings, and bat houses that offer warm and relatively stable microclimate conditions that allow females to avoid going into torpor so they can focus on caring for their young (COSEWIC 2013, Slough and Jung 2020). The only buildings in the wildlife study area are buildings at Denison's existing exploration camp, which are outside of the Project Area. There are no known bat houses in the wildlife study areas. An evaluation of maternal roost potential in trees was focused on the areas where larger diameter trees may be present. Existing ecosite information was reviewed and ecosites with higher potential for maternity roosts (i.e., larger diameter trees) were selected. The ecosites with the potential for larger diameter trees are shown in Figures 9, 10, 11, and 12 below, and include ecosites RF1 (regenerating forest >5m tall; per Appendix 9-B), BS3 jack pine/blueberry/lichen, BS4 jack pine – black spruce/feathermoss, BS7 black spruce/blueberry/lichen, BS9 black spruce – jack pine/feathermoss, BS14 white birch/lingonberry – labrador tea, BS16 black spruce/ balsam poplar/river alder swamp, BS17 black spruce treed bog, and BS21 tamarack treed fen. While these ecosites were selected for the potential to have larger diameter trees, it is important to note that the majority of these ecosites have trees with diameter at breast height <10 cm. Refer Appendix 9-B for representative photos of the selected ecosites.

Summer roost habitat potential:

Litle Brown Myotis: Males are more versatile in their summer roosting requirements and use tree cavities, raised bark, foliage, rock crevices, buildings, and bridges with a broader range of microclimate conditions (COSEWIC 2013a, Johnson et al. 2019).

Northern Myotis: Summer roosting trees are typically found in mature to old-growth forests, swamps, and riparian areas, although retained older trees and snags in younger forests may occasionally provide suitable roosting habitat (Environment and Climate Change Canada 2018).

Considering the above information, Figures 13 to 16 show ecosites with trees and the existing exploration camp (i.e., buildings). The rationale is that in the summer bats can roost anywhere there are trees. As such, ecosites where trees are not expected are not included in the summer roost habitat potential (e.g., waterbodies, bogs, fens with the exception of BS21 tamarack treed fen are not included in Figures 13 to 16).

References:

COSEWIC. 2013. COSEWIC assessment and status report on the Little Brown Myotis Myotis lucifugus, Northern Myotis Myotis septentrionalis, and Tri-colored Bat Perimyotis subflavus in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. xxiv + 93 pp.

Environment and Climate Change Canada. 2018. Recovery Strategy for the Little Brown Myotis (Myotis lucifugus), the Northern Myotis (Myotis septentrionalis), and the Tri-colored Bat (Perimyotis subflavus) in Canada. Environment and Climate Change Canada, Ottawa. ix + 172 pp.

Johnson, J.S., Treanor, J.J., Slusher, A.C., and Lacki, M.J. 2019. Buildings provide vital habitat for little brown myotis (Myotis lucifugus) in a high-elevation landscape. Ecosphere 10(11):e02925. DOI: 10.1002/ecs2.2925

Slough, B.G. and Jung, T.S. 2020. Little Brown Bats Utilize Multiple Maternity Roosts Within Foraging Areas: Implications for Identifying Summer Habitat. Journal of Fish and Wildlife Management 11(1):311–320.

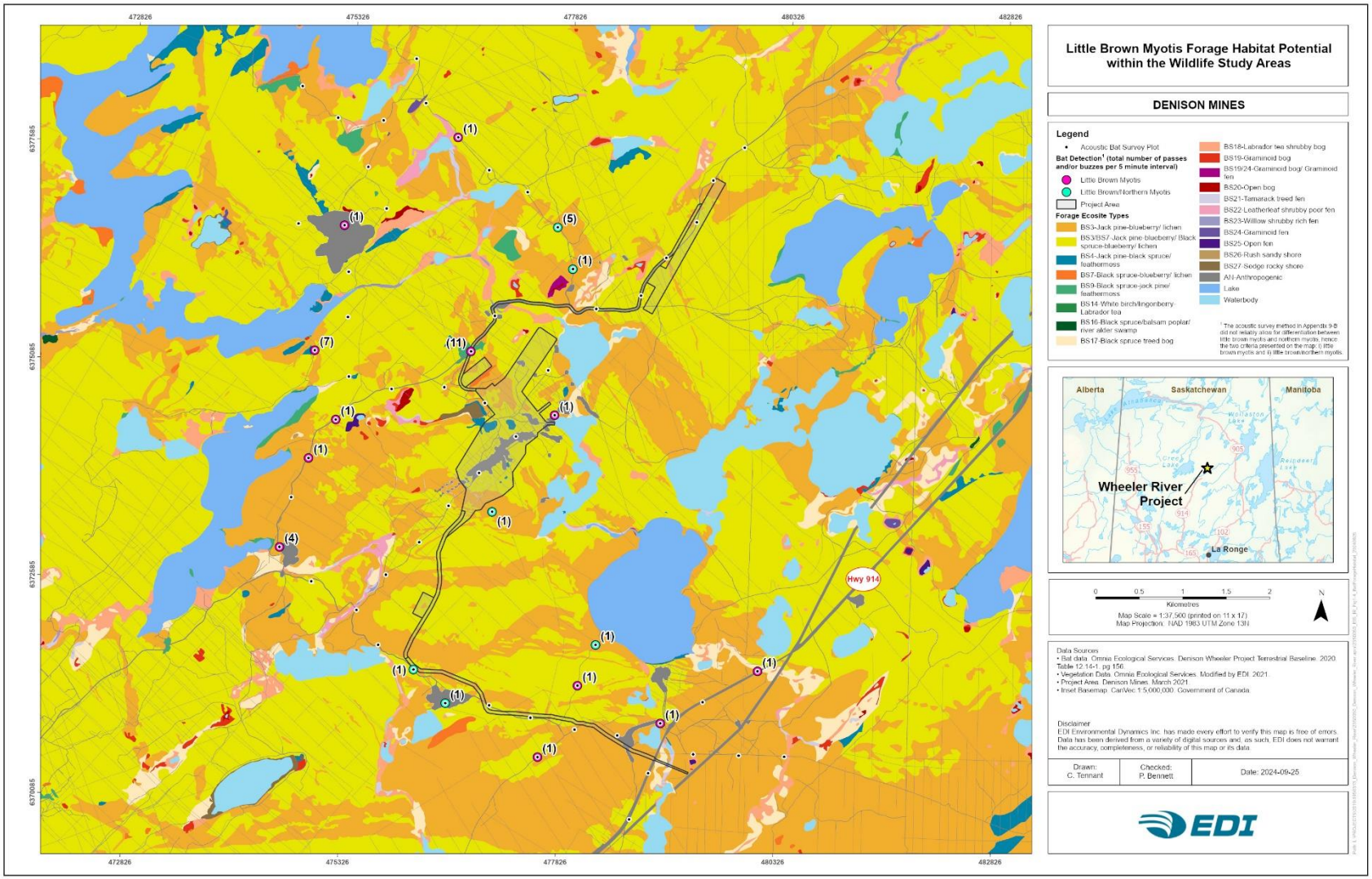

Little Brown Myotis Forage Habitat Potential within the Wildlife Study Areas
DENISON MINES
Legend
Acoustic Bat Survey Plot
Bat Detection† (total number of passes and/or buzzes per 5 minute interval)
Little Brown Myotis
Little Brown/Northern Myotis
Project Area
Forage Ecosite Types
BS3-Jack pine-blueberry/ lichen
BS3/BS7-Jack pine-blueberry/ Black spruce-blueberry/ lichen
BS4-Jack pine-black spruce/ feathermoss
BS7-Black spruce-blueberry/ lichen
BS9-Black spruce-jack pine/ feathermoss
BS14-White birch/lingonberry-Labrador tea
BS16-Black spruce/balsam poplar/ river alder swamp
BS17-Black spruce treed bog
BS18-Labrador tea shrubby bog
BS19-Graminoid bog
BS19/24-Graminoid bog/ Graminoid fen
BS20-Open bog
BS21-Tamarack treed fen
BS22-Leatherleaf shrubby poor fen
BS23-Willow shrubby rich fen
BS24-Graminoid fen
BS25-Open fen
BS26-Rush sandy shore
BS27-Sedge rocky shore
AN-Anthropogenic
Lake
Waterbody
† The acoustic survey method in Appendix 9-B did not reliably allow for differentiation between little brown myotis and northern myotis; hence, the two criteria presented on the map: i) little brown myotis and ii) little brown/northern myotis.
Alberta
Saskatchewan
Manitoba
Wheeler River Project
La Ronge
Hwy 914
0 0.5 1 1.5 2
Kilometres
Map Scale = 1:37,500 (printed on 11 x 17)
Map Projection: NAD 1983 UTM Zone 13N
N
Data Sources
• Bat data: Omnia Ecological Services. Denison Wheeler Project Terrestrial Baseline. 2020. Table 12.14-1, pg 156.
• Vegetation Data: Omnia Ecological Services. Modified by EDI. 2021.
• Project Area: Denison Mines. March 2021.
• Inset Basemap: CanVec 1:5,000,000: Government of Canada
Disclaimer
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Date: 2024-09-25
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Figure 1

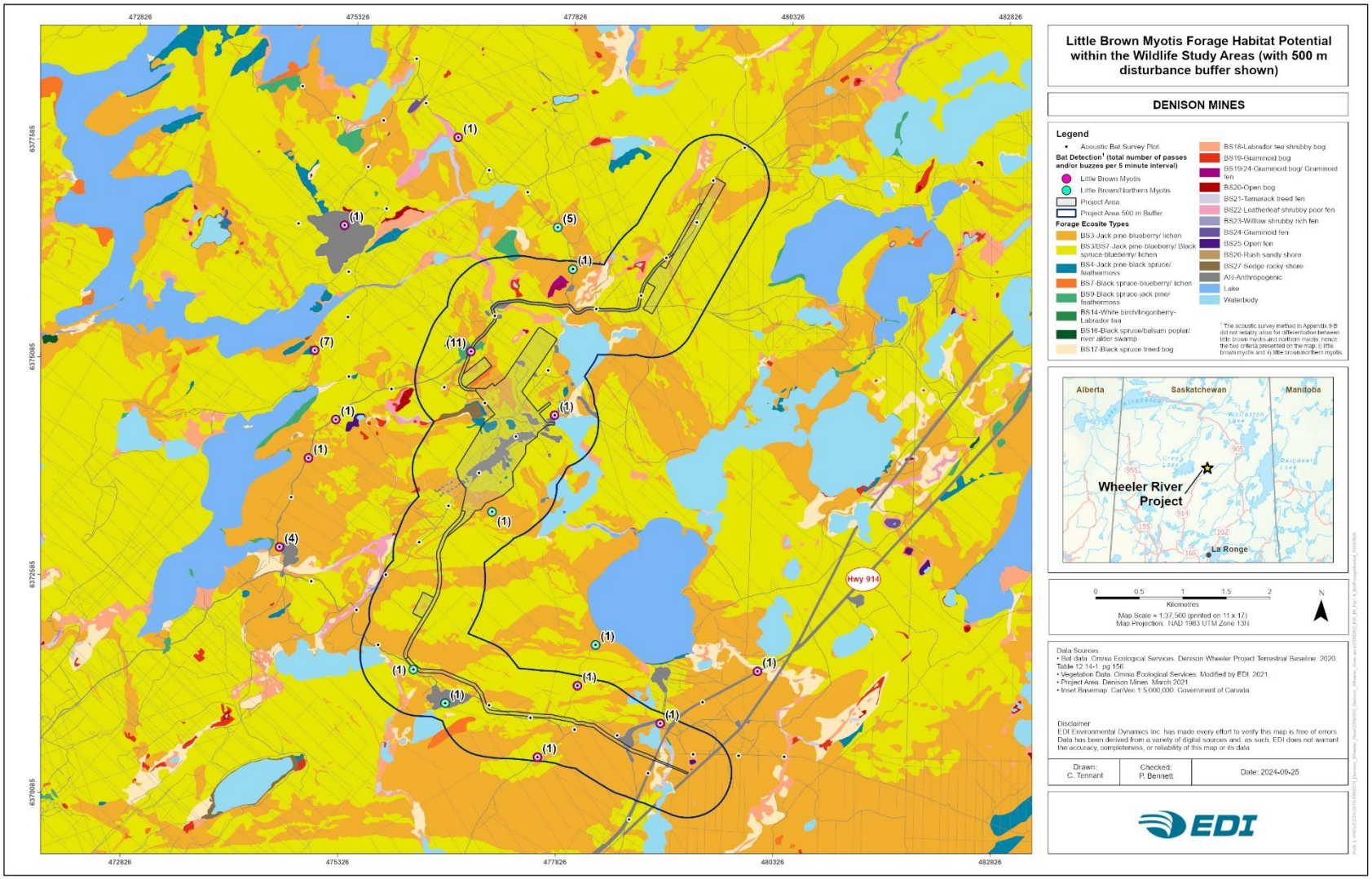

Little Brown Myotis Forage Habitat Potential within the Wildlife Study Areas (with 500 m disturbance buffer shown)
DENISON MINES
Legend
Acoustic Bat Survey Pilot
Bat Detection[1] (total number of passes and/or buzzes per 5 minute interval)
Little Brown Myotis
Little Brown/Northern Myotis
Project Area
Project Area 500 m Buffer
Forage Ecosite Types
BS3-Jack pine-blueberry/ lichen
BS3/BS7-Jack pine-blueberry/ Black spruce-blueberry/ lichen
BS4-Jack pine-black spruce/ feathermoss
BS7-Black spruce-blueberry/ lichen
BS9-Black spruce-jack pine/ feathermoss
BS14-White birch/lingonberry-Labrador tea
BS16-Black spruce/balsam poplar/ river alder swamp
BS17-Black spruce treed bog
BS18-Labrador tea shrubby bog
BS19-Graminoid bog
BS19/24-Graminoid bog/ Graminoid fen
BS20-Open bog
BS21-Tamarack treed fen
BS22-Leatherleaf shrubby poor fen
BS23-Willow shrubby rich fen
BS24-Graminoid fen
BS25-Open fen
BS26-Rush sandy shore
BS27-Sedge rocky shore
AN-Anthropogenic
Lake
Waterbody
[1] The acoustic survey method in Appendix 9-B did not reliably allow for differentiation between little brown myotis and northern myotis; hence, the two criteria presented on the map: i) little brown myotis and ii) little brown/northern myotis.
Alberta
Saskatchewan
Manitoba
Wheeler River Project
La Ronge
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Kilometres
Map Scale = 1:37,500 (printed on 11 x 17)
Map Projection: NAD 1983 UTM Zone 13N
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Data Sources
• Bat data: Omnia Ecological Services. Denison Wheeler Project Terrestrial Baseline. 2020. Table 12.14-1, pg 156.
• Vegetation Data: Omnia Ecological Services. Modified by EDI. 2021.
• Project Area: Denison Mines. March 2021.
• Inset Basemap: CanVec 1:5,000,000: Government of Canada
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Figure 2

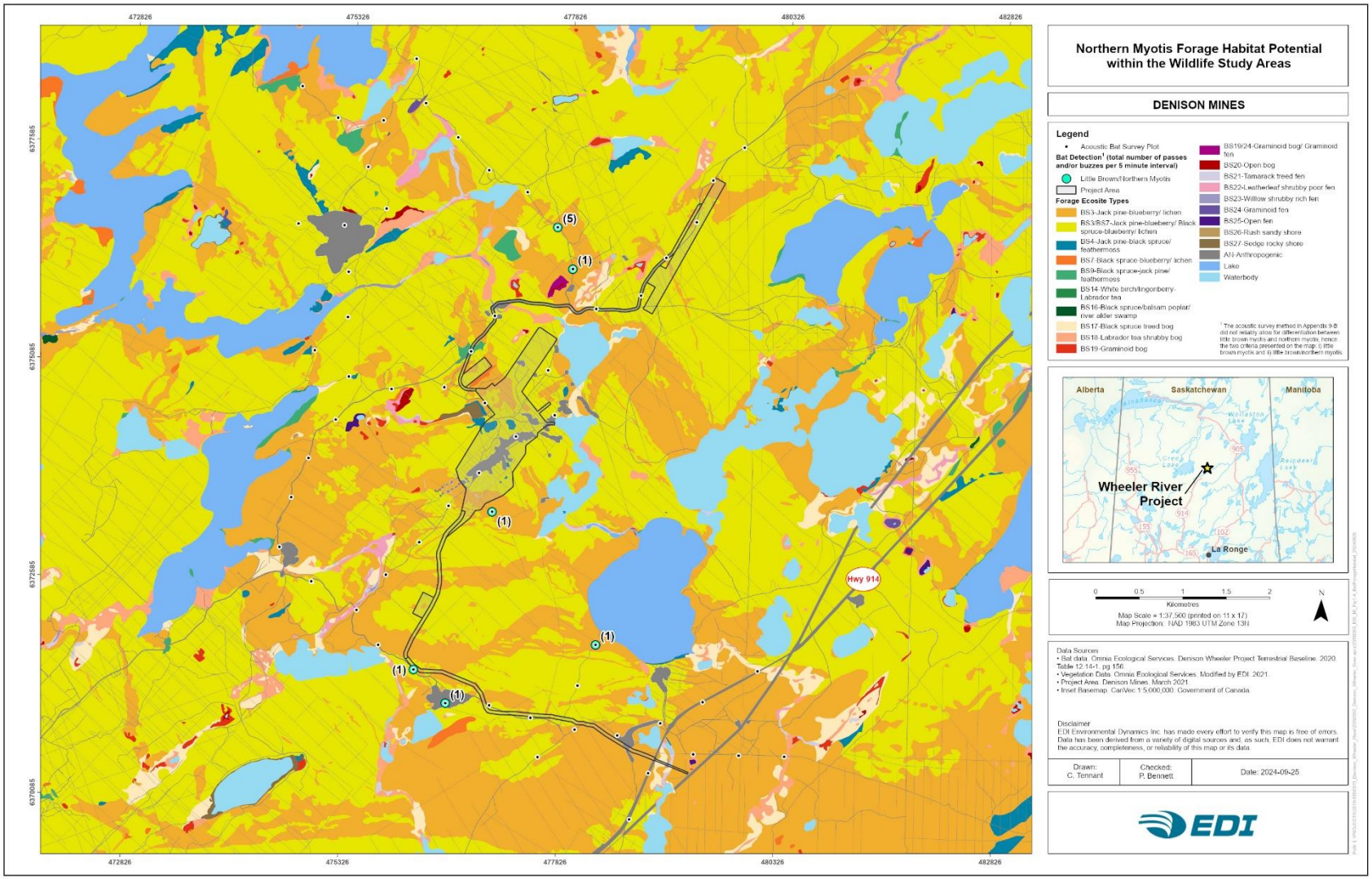

Northern Myotis Forage Habitat Potential within the Wildlife Study Areas
DENISON MINES
Legend
Acoustic Bat Survey Pilot
Bat Detection[1] (total number of passes and/or buzzes per 5 minute interval)
Little Brown/Northern Myotis
Project Area
Forage Ecosite Types
BS3-Jack pine-blueberry/ lichen
BS3/BS7-Jack pine-blueberry/ Black spruce-blueberry/ lichen
BS4-Jack pine-black spruce/ feathermoss
BS7-Black spruce-blueberry/ lichen
BS9-Black spruce-jack pine/ feathermoss
BS14-White birch/lingonberry-Labrador tea
BS16-Black spruce/balsam poplar/ river alder swamp
BS17-Black spruce treed bog
BS18-Labrador tea shrubby bog
BS19-Graminoid bog
BS19/24-Graminoid bog/ Graminoid fen
BS20-Open bog
BS21-Tamarack treed fen
BS22-Leatherleaf shrubby poor fen
BS23-Willow shrubby rich fen
BS24-Graminoid fen
BS25-Open fen
BS26-Rush sandy shore
BS27-Sedge rocky shore
AH-Anthropogenic
Lake
Waterbody
[1] The acoustic survey method in Appendix 9-B did not reliably allow for differentiation between little brown myotis and northern myotis; hence, the two criteria presented on the map: i) little brown myotis and ii) little brown/northern myotis.
Alberta
Saskatchewan
Manitoba
Wheeler River Project
La Ronge
Hwy 914
0 0.5 1 1.5 2
Kilometres
Map Scale = 1:37,500 (printed on 11 x 17)
Map Projection: NAD 1983 UTM Zone 13N
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Data Sources
• Bat data: Omnia Ecological Services. Denison Wheeler Project Terrestrial Baseline. 2020. Table 12.14-1, pg 156.
• Vegetation Data: Omnia Ecological Services. Modified by EDI. 2021.
• Project Area: Denison Mines. March 2021.
• Inset Basemap: CanVec 1:5,000,000: Government of Canada
Disclaimer
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Date: 2024-09-25
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Figure 3

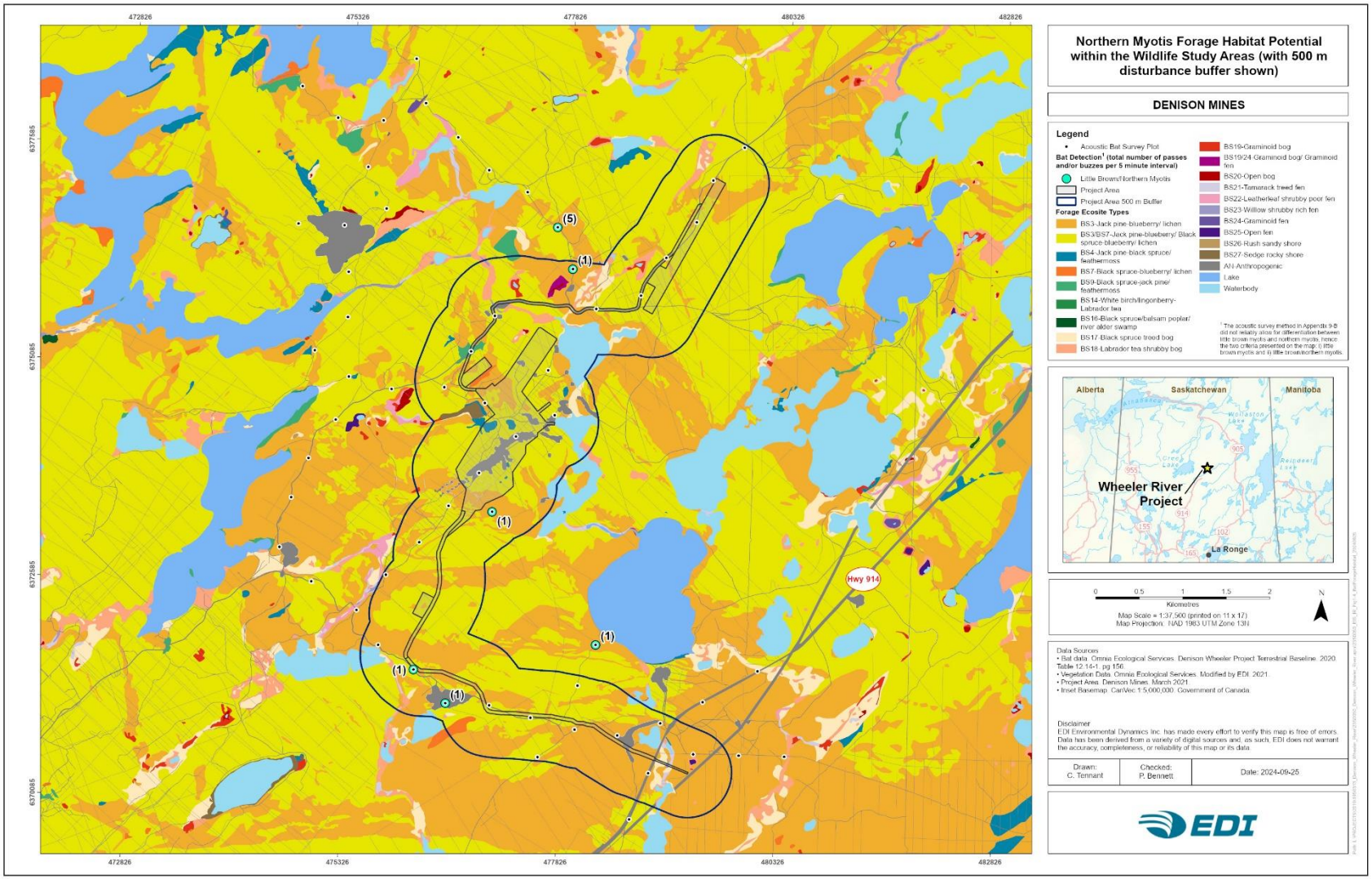

Northern Myotis Forage Habitat Potential within the Wildlife Study Areas (with 500 m disturbance buffer shown)
DENISON MINES
Legend
Acoustic Bat Survey Pilot
Bat Detection[1] (total number of passes and/or buzzes per 5 minute interval)
Little Brown/Northern Myotis
Project Area
Project Area 500 m Buffer
Forage Ecosite Types
BS3-Jack pine-blueberry/ lichen
BS3/BS7-Jack pine-blueberry/ Black spruce-blueberry/ lichen
BS4-Jack pine-black spruce/ feathermoss
BS7-Black spruce-blueberry/ lichen
BS9-Black spruce-jack pine/ feathermoss
BS14-White birch/lingonberry-Labrador tea
BS16-Black spruce/balsam poplar/ river alder swamp
BS17-Black spruce treed bog
BS18-Labrador tea shrubby bog
BS19-Graminoid bog
BS19/24-Graminoid bog/ Graminoid fen
BS20-Open bog
BS21-Tamarack treed fen
BS22-Leatherleaf shrubby poor fen
BS23-Willow shrubby rich fen
BS24-Graminoid fen
BS25-Open fen
BS26-Rush sandy shore
BS27-Sedge rocky shore
AN-Anthropogenic
Lake
Waterbody
[1] The acoustic survey method in Appendix 9-B did not reliably allow for differentiation between little brown myotis and northern myotis; hence the two criteria presented on the map: i) little brown myotis and ii) little brown/northern myotis.
Alberta
Saskatchewan
Manitoba
Wheeler River Project
La Ronge
Hwy 914
0 0.5 1 1.5 2
Kilometres
Map Scale = 1:37,500 (printed on 11 x 17)
Map Projection: NAD 1983 UTM Zone 13N
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Data Sources
• Bat data: Omnia Ecological Services. Denison Wheeler Project Terrestrial Baseline. 2020. Table 12.14-1, pg 156.
• Vegetation Data: Omnia Ecological Services. Modified by EDI. 2021.
• Project Area: Denison Mines. March 2021.
• Inset Basemap: CanVec 1:5,000,000: Government of Canada
Disclaimer
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Date: 2024-09-25
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Figure 4

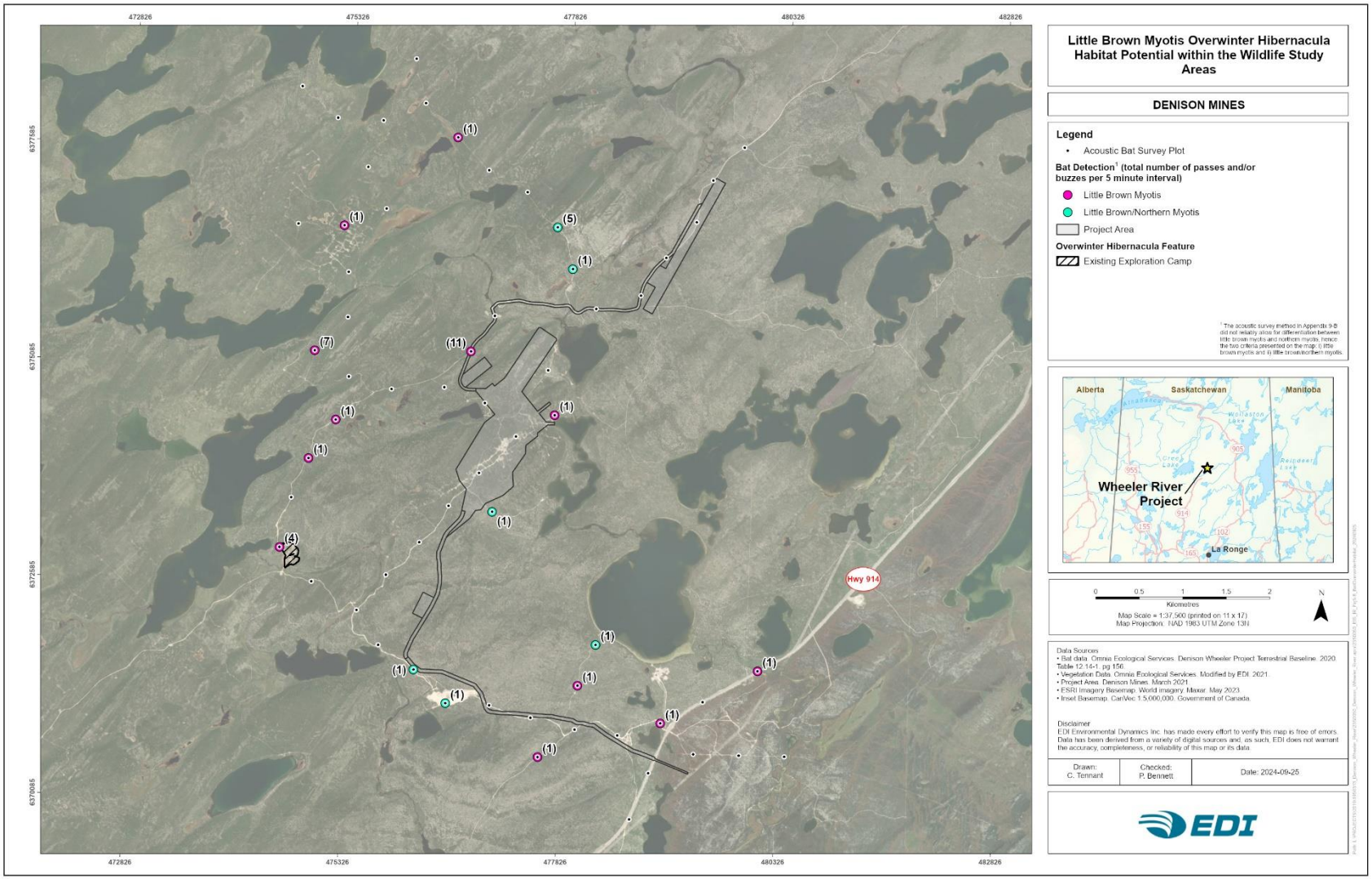

Little Brown Myotis Overwinter Hibernacula Habitat Potential within the Wildlife Study Areas
DENISON MINES
Legend
Acoustic Bat Survey Plot
Bat Detection[1] (total number of passes and/or buzzes per 5 minute interval)
Little Brown Myotis
Little Brown/Northern Myotis
Project Area
Overwinter Hibernacula Feature
Existing Exploration Camp
[1] The acoustic survey method in Appendix 9-B did not reliably allow for differentiation between little brown myotis and northern myotis; hence, the two criteria presented on the map: i) little brown myotis and ii) little brown/northern myotis.
Alberta
Saskatchewan
Manitoba
Wheeler River Project
La Ronge
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Kilometres
Map Scale = 1:37,500 (printed on 11 x 17)
Map Projection: NAD 1983 UTM Zone 13N
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Data Sources
• Bat data: Omnia Ecological Services. Denison Wheeler Project Terrestrial Baseline. 2020. Table 12.14-1, pg 156.
• Vegetation Data: Omnia Ecological Services. Modified by EDI. 2021.
• Project Area: Denison Mines. March 2021.
• ESRI Imagery Basemap: World Imagery: Maxar. May 2023.
• Inset Basemap: CanVec 1:5,000,000: Government of Canada.
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Figure 5

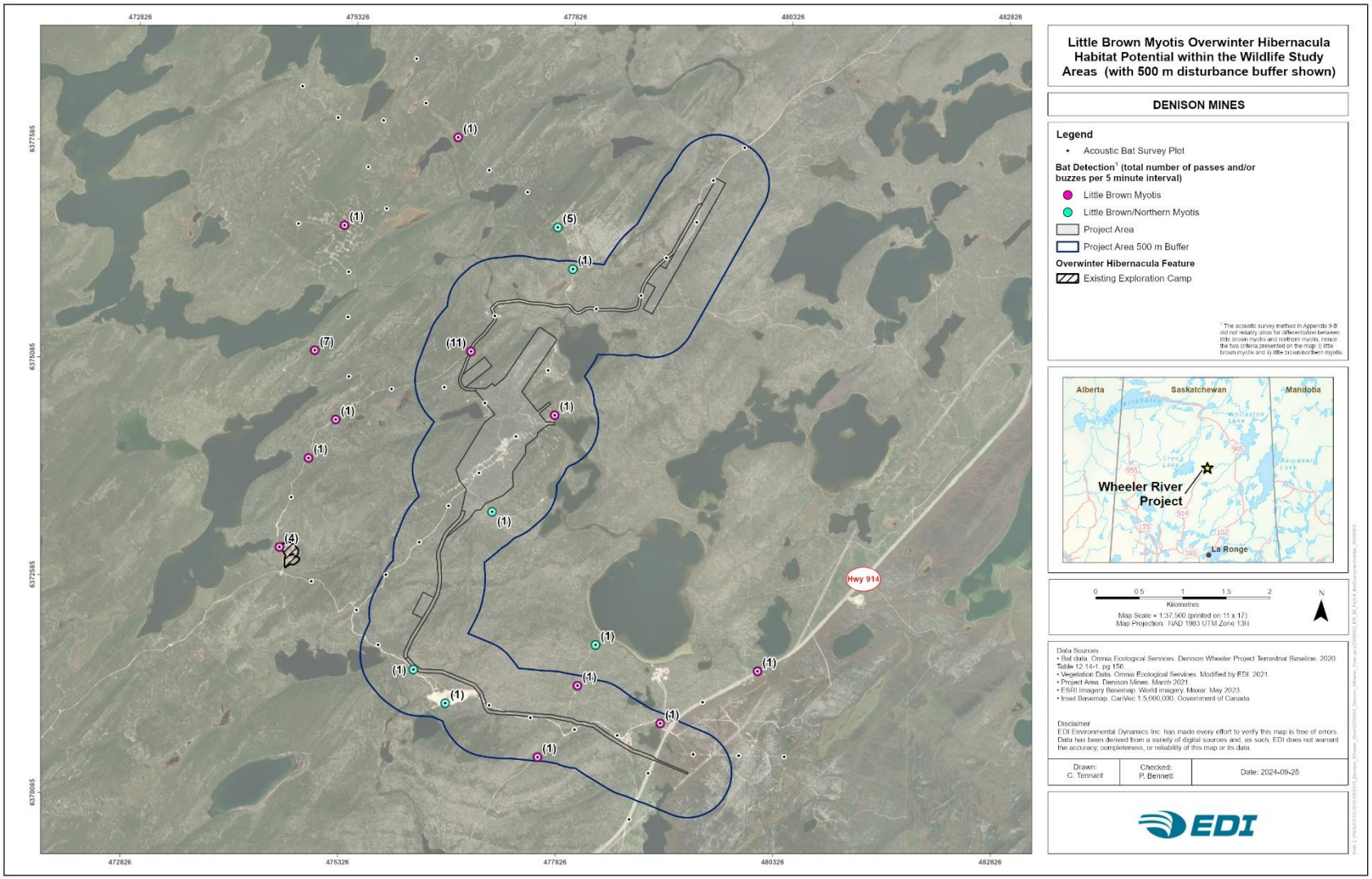

Little Brown Myotis Overwinter Hibernacula Habitat Potential within the Wildlife Study Areas (with 500 m disturbance buffer shown)
DENISON MINES
Legend
Acoustic Bat Survey Plot
Bat Detection[1] (total number of passes and/or buzzes per 5 minute interval)
Little Brown Myotis
Little Brown/Northern Myotis
Project Area
Project Area 500 m Buffer
Overwinter Hibernacula Feature
Existing Exploration Camp
[1] The acoustic survey method in Appendix 9-B did not reliably allow for differentiation between little brown myotis and northern myotis; hence the two criteria presented on the map: i) little brown myotis and ii) little brown/northern myotis.
Alberta
Saskatchewan
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Wheeler River Project
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Hwy 914
0 0.5 1 1.5 2
Kilometres
Map Scale = 1:37,500 (printed on 11 x 17)
Map Projection: NAD 1983 UTM Zone 13N
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Data Sources
• Bat data: Omnia Ecological Services. Denison Wheeler Project Terrestrial Baseline. 2020. Table 12.14-1, pg 156.
• Vegetation Data: Omnia Ecological Services. Modified by EDI. 2021.
• Project Area: Denison Mines. March 2021.
• ESRI Imagery Basemap: World Imagery: Maxar. May 2023.
• Inset Basemap: CanVec 1:5,000,000: Government of Canada.
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Figure 6

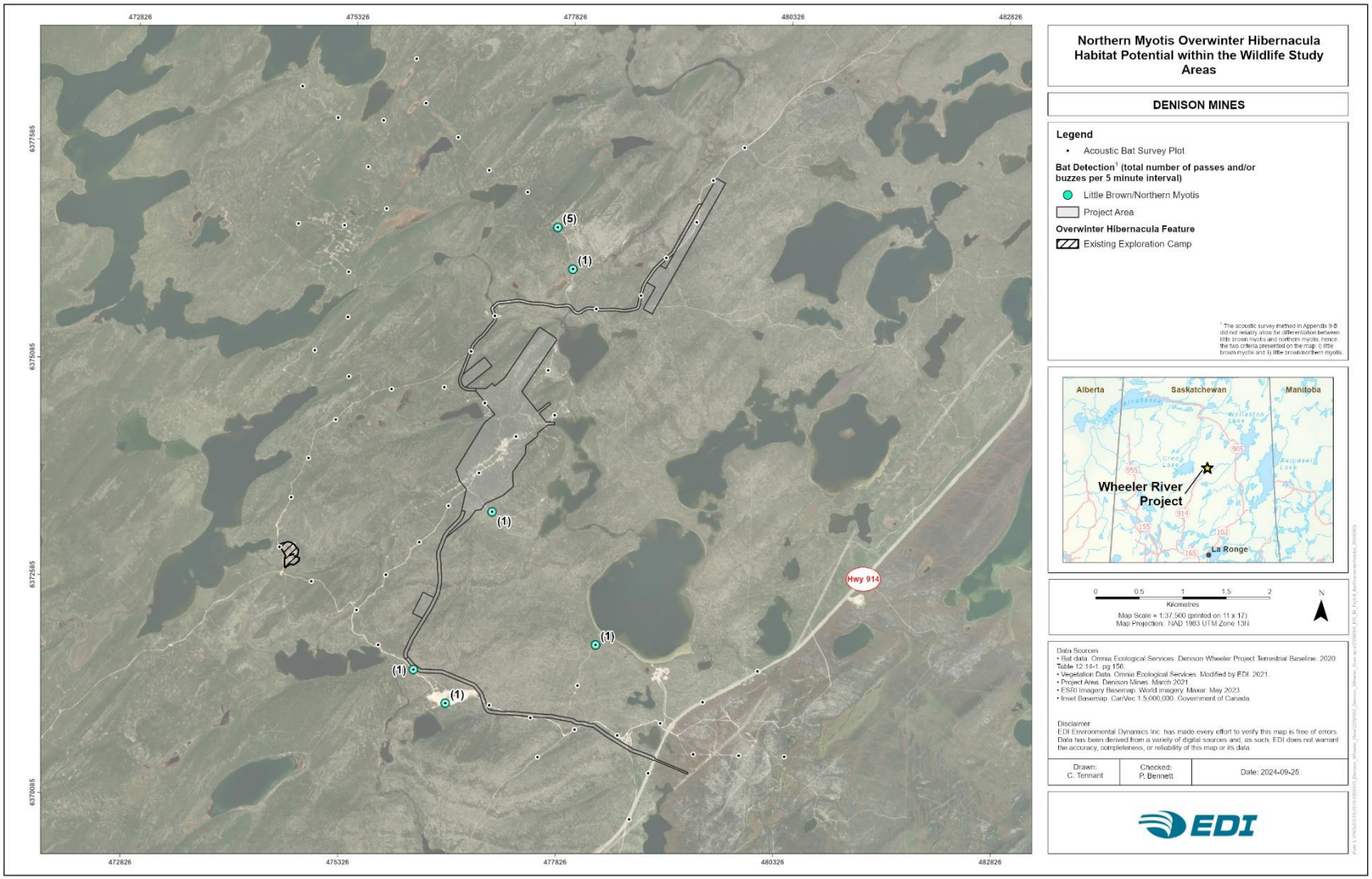

Northern Myotis Overwinter Hibernacula Habitat Potential within the Wildlife Study Areas
DENISON MINES
Legend
Acoustic Bat Survey Plot
Bat Detection[1] (total number of passes and/or buzzes per 5 minute interval)
Little Brown/Northern Myotis
Project Area
Overwinter Hibernacula Feature
Existing Exploration Camp
[1] The acoustic survey method in Appendix 9-B did not reliably allow for differentiation between little brown myotis and northern myotis; hence, the two criteria presented on the map: i) little brown myotis and ii) little brown/northern myotis.
Alberta
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Wheeler River Project
La Ronge
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Kilometres
Map Scale = 1:37,500 (printed on 11 x 17)
Map Projection: NAD 1983 UTM Zone 13N
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Data Sources
• Bat data: Omnia Ecological Services. Denison Wheeler Project Terrestrial Baseline. 2020. Table 12.14-1, pg 156.
• Vegetation Data: Omnia Ecological Services. Modified by EDI. 2021.
• Project Area: Denison Mines. March 2021.
• ESRI Imagery Basemap: World Imagery: Maxar. May 2023.
• Inset Basemap: CanVec 1:5,000,000: Government of Canada.
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Date: 2024-09-25
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Figure 7

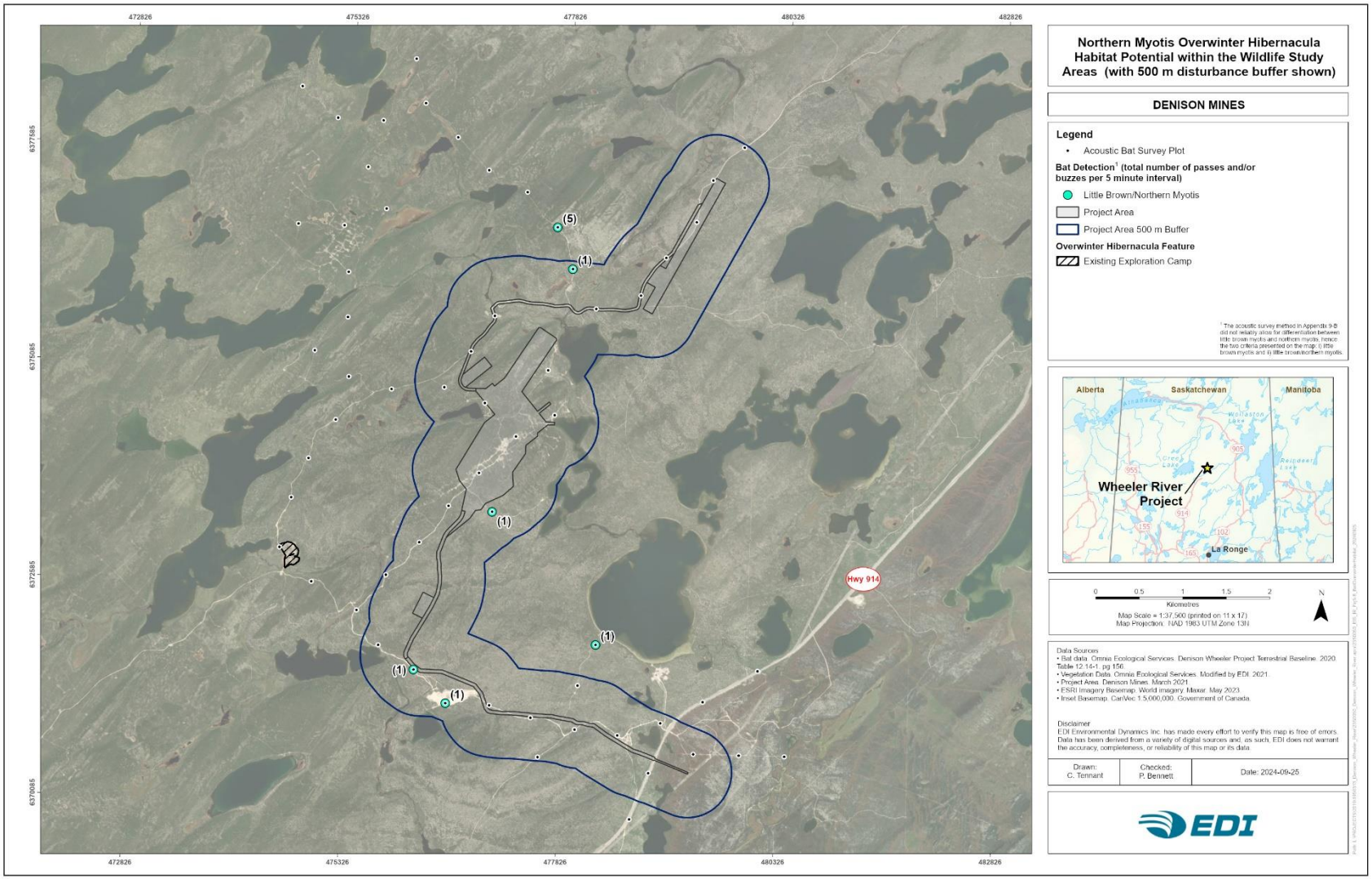

Northern Myotis Overwinter Hibernacula Habitat Potential within the Wildlife Study Areas (with 500 m disturbance buffer shown)
DENISON MINES
Legend
Acoustic Bat Survey Plot
Bat Detection[1] (total number of passes and/or buzzes per 5 minute interval)
Little Brown/Northern Myotis
Project Area
Project Area 500 m Buffer
Overwinter Hibernacula Feature
Existing Exploration Camp
[1] The acoustic survey method in Appendix 9-B did not reliably allow for differentiation between little brown myotis and northern myotis; hence, the two criteria presented on the map: i) little brown myotis and ii) little brown/northern myotis.
Alberta
Saskatchewan
Manitoba
Wheeler River Project
La Ronge
Hwy 914
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Kilometres
Map Scale = 1:37,500 (printed on 11 x 17)
Map Projection: NAD 1983 UTM Zone 13N
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Data Sources
• Bat data: Omnia Ecological Services. Denison Wheeler Project Terrestrial Baseline. 2020. Table 12.14-1, pg 156.
• Vegetation Data: Omnia Ecological Services. Modified by EDI. 2021.
• Project Area: Denison Mines. March 2021.
• ESRI Imagery Basemap: World Imagery: Maxar. May 2023.
• Inset Basemap: CanVec 1:5,000,000: Government of Canada.
Disclaimer
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Drawn: C. Tennant
Checked: P. Bennett
Date: 2024-09-25
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Figure 8

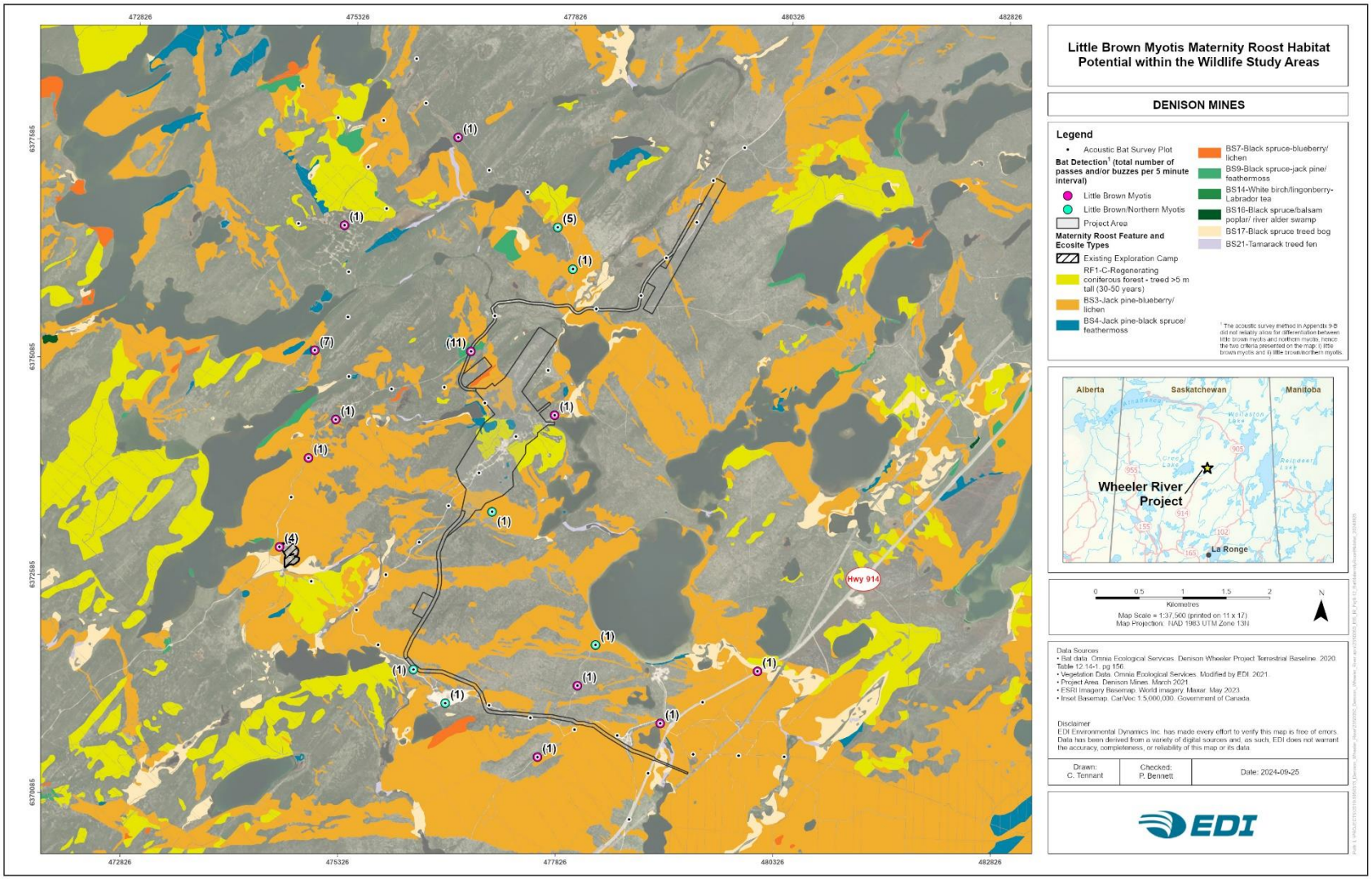

Little Brown Myotis Maternity Roost Habitat Potential within the Wildlife Study Areas
DENISON MINES
Legend
Acoustic Bat Survey Plot
Bat Detection[1] (total number of passes and/or buzzes per 5 minute interval)
Little Brown Myotis
Little Brown/Northern Myotis
Project Area
Maternity Roost Feature and Ecosite Types
Existing Exploration Camp
RF1-C-Regenerating coniferous forest - treed >5 m tall (30-50 years)
BS3-Jack pine-blueberry/ lichen
BS4-Jack pine-black spruce/ feathermoss
BS7-Black spruce-blueberry/ lichen
BS9-Black spruce-jack pine/ feathermoss
BS14-White birch/lingonberry-Labrador tea
BS16-Black spruce/balsam poplar/ river alder swamp
BS17-Black spruce treed bog
BS21-Tamarack treed fen
[1] The acoustic survey method in Appendix 9-B did not reliably allow for differentiation between little brown myotis and northern myotis; hence, the two criteria presented on the map: i) little brown myotis and ii) little brown/northern myotis.
Alberta
Saskatchewan
Manitoba
Wheeler River Project
La Ronge
Hwy 914
Kilometres
Map Scale = 1:37,500 (printed on 11 x 17)
Map Projection: NAD 1983 UTM Zone 13N
Data Sources
• Bat data: Omnia Ecological Services. Denison Wheeler Project Terrestrial Baseline. 2020. Table 12.14-1, pg 156.
• Vegetation Data: Omnia Ecological Services. Modified by EDI. 2021.
• Project Area: Denison Mines. March 2021.
• ESRI Imagery Basemap: World Imagery: Maxar. May 2023.
• Inset Basemap: CanVec 1:5,000,000. Government of Canada.
Disclaimer
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Drawn: C. Tennant
Checked: P. Bennett
Date: 2024-09-25
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Figure 9

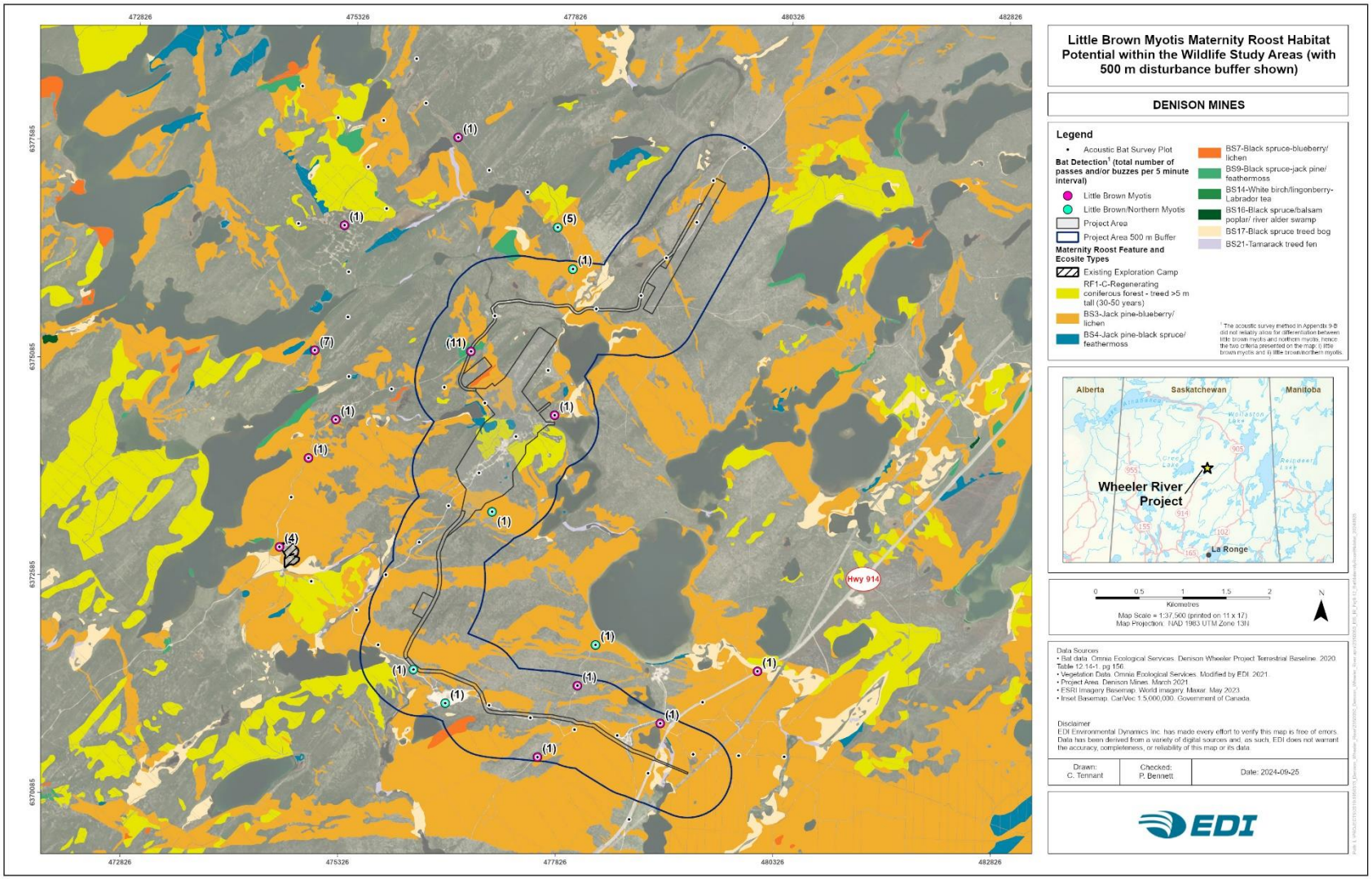

Little Brown Myotis Maternity Roost Habitat Potential within the Wildlife Study Areas (with 500 m disturbance buffer shown)
DENISON MINES
Legend
Acoustic Bat Survey Plot
Bat Detection[1] (total number of passes and/or buzzes per 5 minute interval)
Little Brown Myotis
Little Brown/Northern Myotis
Project Area
Project Area 500 m Buffer
Maternity Roost Feature and Ecosite Types
Existing Exploration Camp
RF1-C-Regenerating coniferous forest - treed >5 m tall (30-50 years)
BS3-Jack pine-blueberry/ lichen
BS4-Jack pine-black spruce/ feathermoss
BS7-Black spruce-blueberry/ lichen
BS9-Black spruce-jack pine/ feathermoss
BS14-White birch/lingonberry-Labrador tea
BS16-Black spruce/balsam poplar/ river alder swamp
BS17-Black spruce treed bog
BS21-Tamarack treed fen
[1] The acoustic survey method in Appendix 9-B did not reliably allow for differentiation between little brown myotis and northern myotis; hence, the two criteria presented on the map: i) little brown myotis and ii) little brown/northern myotis.
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Map Scale = 1:37,500 (printed on 11 x 17)
Map Projection: NAD 1983 UTM Zone 13N
Data Sources
• Bat data: Omnia Ecological Services. Denison Wheeler Project Terrestrial Baseline. 2020. Table 12.14-1, pg 156.
• Vegetation Data: Omnia Ecological Services. Modified by EDI. 2021.
• Project Area: Denison Mines. March 2021.
• ESRI Imagery Basemap: World Imagery. Maxar. May 2023.
• Inset Basemap: CanVec 1:5,000,000. Government of Canada.
Disclaimer
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Figure 10

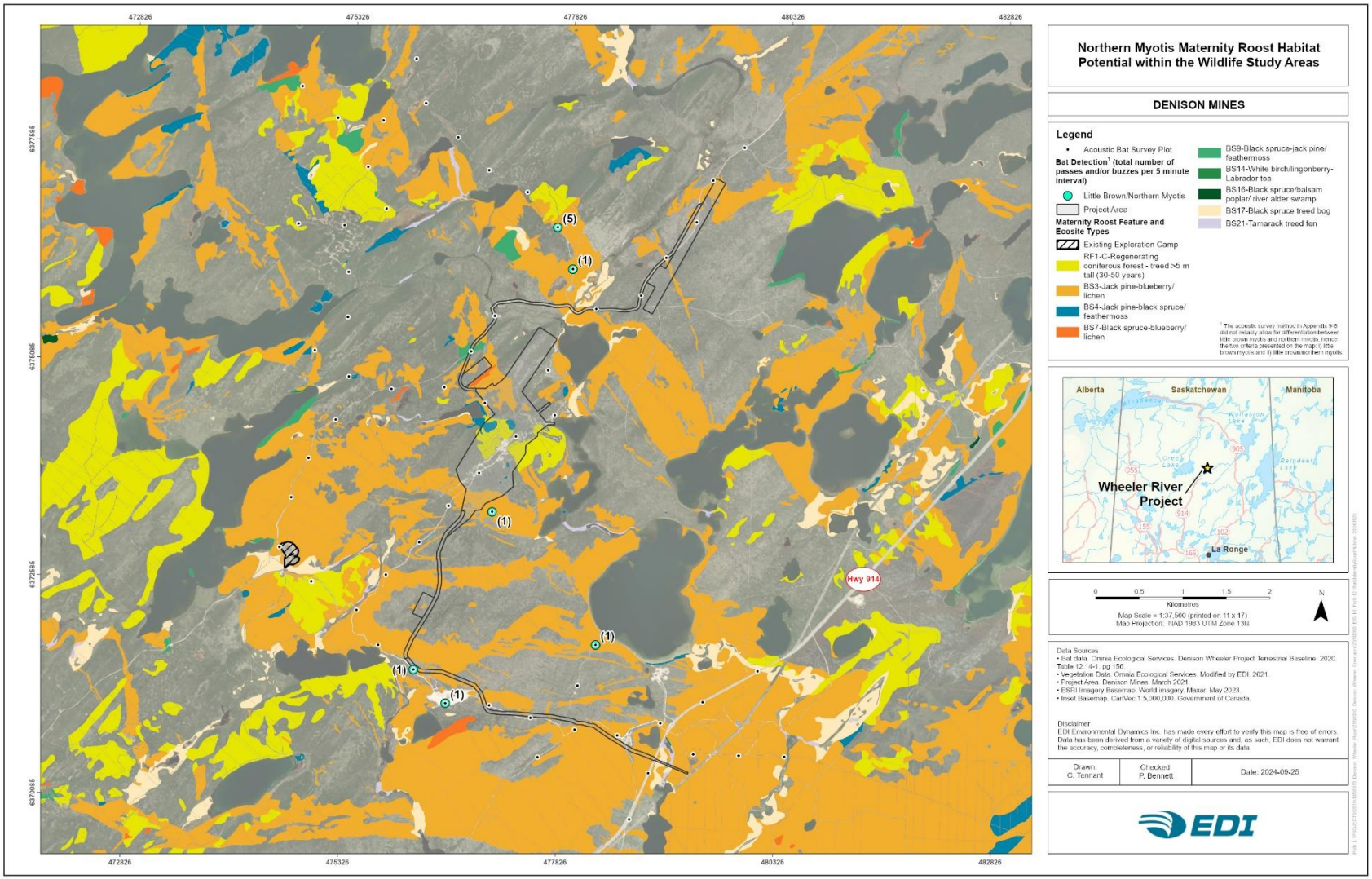

Northern Myotis Maternity Roost Habitat Potential within the Wildlife Study Areas
DENISON MINES
Legend
Acoustic Bat Survey Plot
Bat Detection[1] (total number of passes and/or buzzes per 5 minute interval)
Little Brown/Northern Myotis
Project Area
Maternity Roost Feature and Ecosite Types
Existing Exploration Camp
RF1-C-Regenerating coniferous forest - treed >5 m tall (30-50 years)
BS3-Jack pine-blueberry/ lichen
BS4-Jack pine-black spruce/ feathermoss
BS7-Black spruce-blueberry/ lichen
BS9-Black spruce-jack pine/ feathermoss
BS14-White birch/lingonberry-Labrador tea
BS16-Black spruce/balsam poplar/ river alder swamp
BS17-Black spruce treed bog
BS21-Tamarack treed fen
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Figure 11

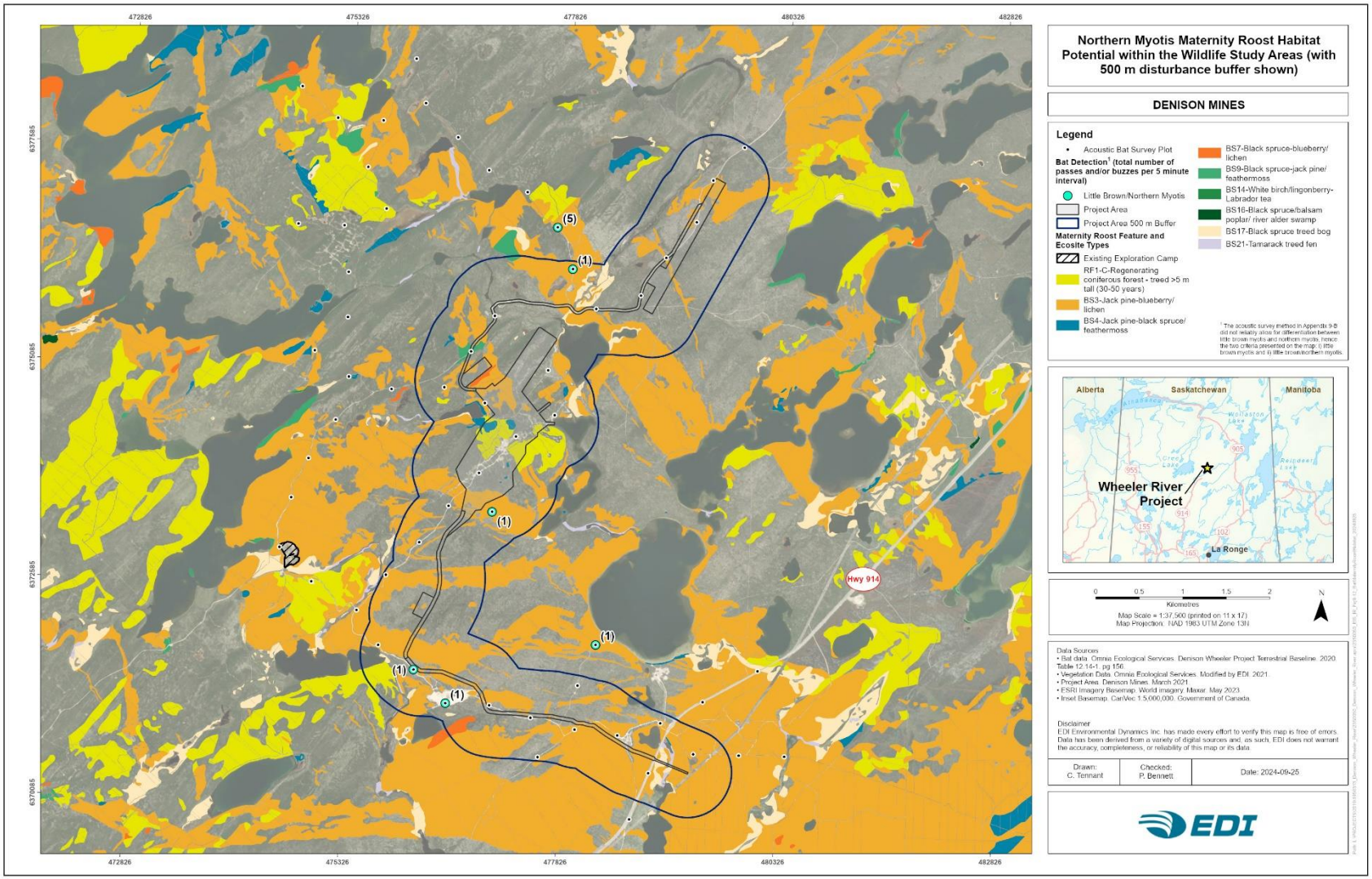

Northern Myotis Maternity Roost Habitat Potential within the Wildlife Study Areas (with 500 m disturbance buffer shown)
DENISON MINES
Legend
Acoustic Bat Survey Plot
Bat Detection[1] (total number of passes and/or buzzes per 5 minute interval)
Little Brown/Northern Myotis
Project Area
Project Area 500 m Buffer
Maternity Roost Feature and Ecosite Types
Existing Exploration Camp
RF1-C-Regenerating coniferous forest - treed >5 m tall (30-50 years)
BS3-Jack pine-blueberry/ lichen
BS4-Jack pine-black spruce/ feathermoss
BS7-Black spruce-blueberry/ lichen
BS9-Black spruce-jack pine/ feathermoss
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Figure 12

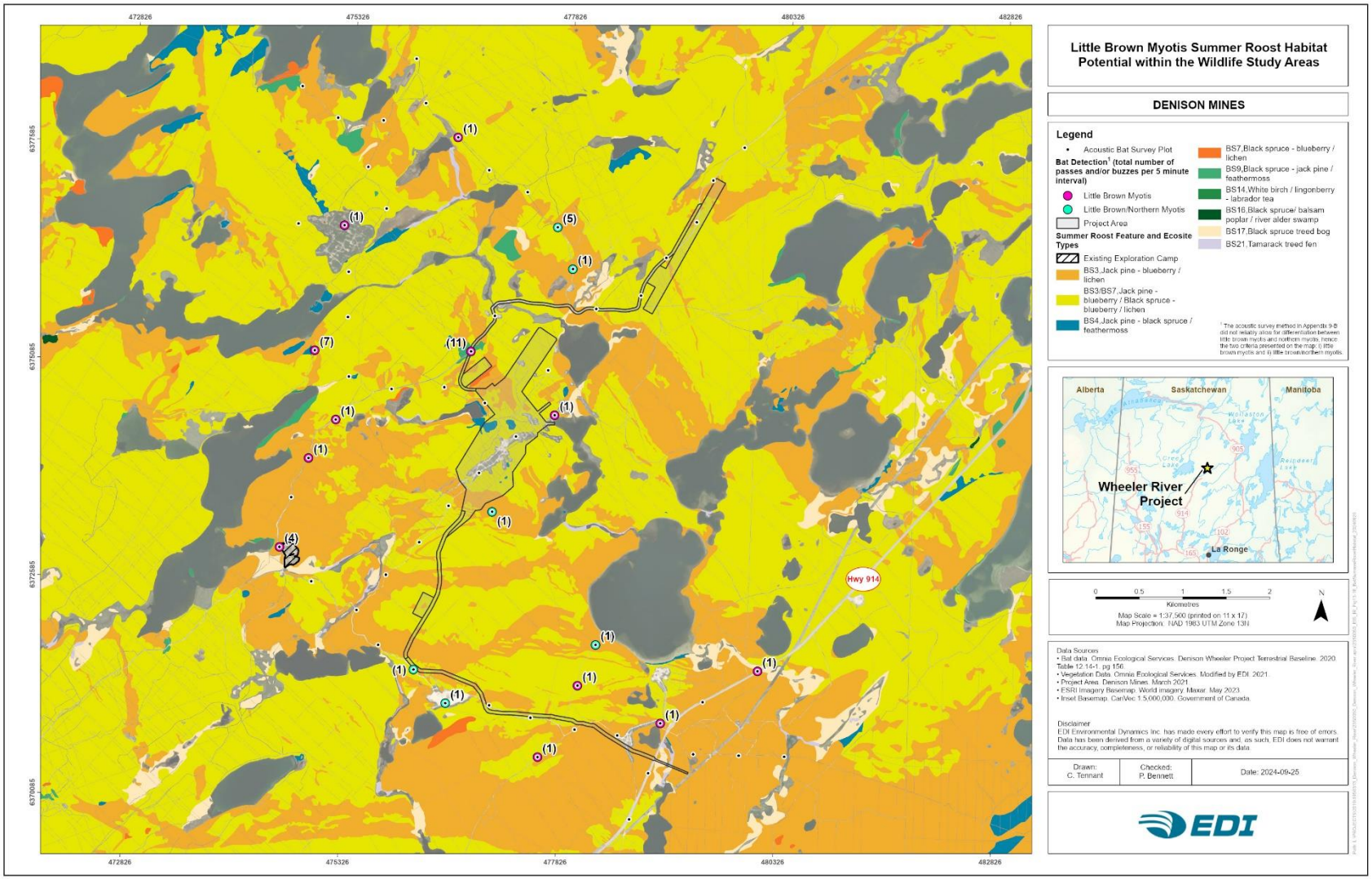

Little Brown Myotis Summer Roost Habitat Potential within the Wildlife Study Areas
DENISON MINES
Legend
Acoustic Bat Survey Plot
Bat Detection[1] (total number of passes and/or buzzes per 5 minute interval)
Little Brown Myotis
Little Brown/Northern Myotis
Project Area
Summer Roost Feature and Ecosite Types
Existing Exploration Camp
BS3,Jack pine - blueberry / lichen
BS3/BS7,Jack pine - blueberry / Black spruce - blueberry / lichen
BS4,Jack pine - black spruce / feathermoss
BS7,Black spruce - blueberry / lichen
BS9,Black spruce - jack pine / feathermoss
BS14,White birch / lingonberry - labrador tea
BS16,Black spruce/ balsam poplar / river alder swamp
BS17,Black spruce treed bog
BS21,Tamarack treed fen
[1] The acoustic survey method in Appendix 9-B did not reliably allow for differentiation between little brown myotis and northern myotis; hence, the two criteria presented on the map: i) little brown myotis and ii) little brown/northern myotis.
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Map Scale = 1:37,500 (printed on 11 x 17)
Map Projection: NAD 1983 UTM Zone 13N
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Data Sources
• Bat data: Omnia Ecological Services. Denison Wheeler Project Terrestrial Baseline. 2020. Table 12.14-1, pg 156.
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Figure 13

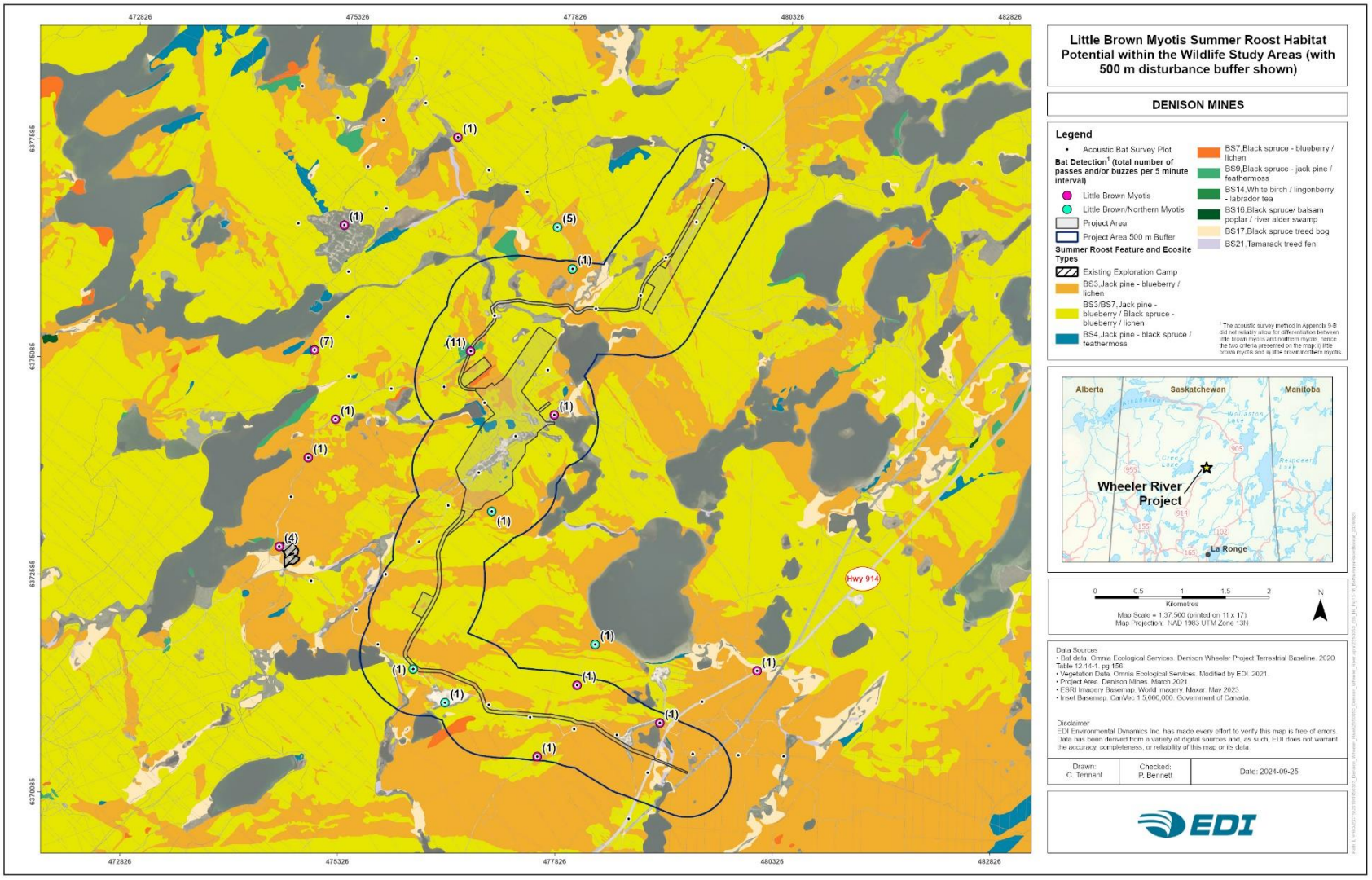

Little Brown Myotis Summer Roost Habitat Potential within the Wildlife Study Areas (with 500 m disturbance buffer shown)
DENISON MINES
Legend
Acoustic Bat Survey Plot
Bat Detection[1] (total number of passes and/or buzzes per 5 minute interval)
Little Brown Myotis
Little Brown/Northern Myotis
Project Area
Project Area 500 m Buffer
Summer Roost Feature and Ecosite Types
Existing Exploration Camp
BS3,Jack pine - blueberry / lichen
BS3/BS7,Jack pine - blueberry / Black spruce - blueberry / lichen
BS4,Jack pine - black spruce / feathermoss
BS7,Black spruce - blueberry / lichen
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Figure 14

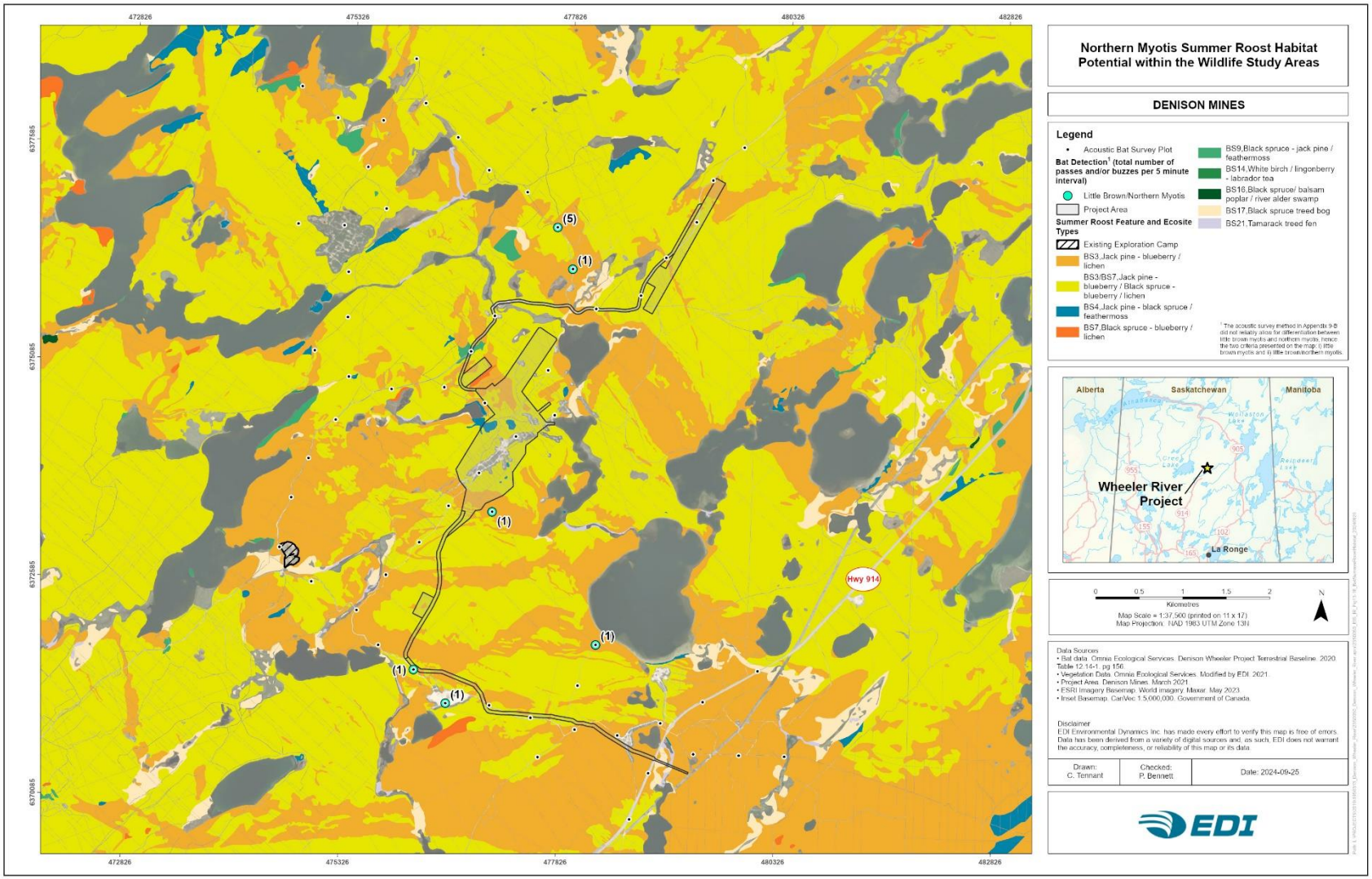

Northern Myotis Summer Roost Habitat Potential within the Wildlife Study Areas
DENISON MINES
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Bat Detection[1] (total number of passes and/or buzzes per 5 minute interval)
Little Brown/Northern Myotis
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Summer Roost Feature and Ecosite Types
Existing Exploration Camp
BS3,Jack pine - blueberry / lichen
BS3/BS7,Jack pine - blueberry / Black spruce - blueberry / lichen
BS4,Jack pine - black spruce / feathermoss
BS7,Black spruce - blueberry / lichen
BS9,Black spruce - jack pine / feathermoss
BS14,White birch / lingonberry - labrador tea
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Alberta
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Figure 15

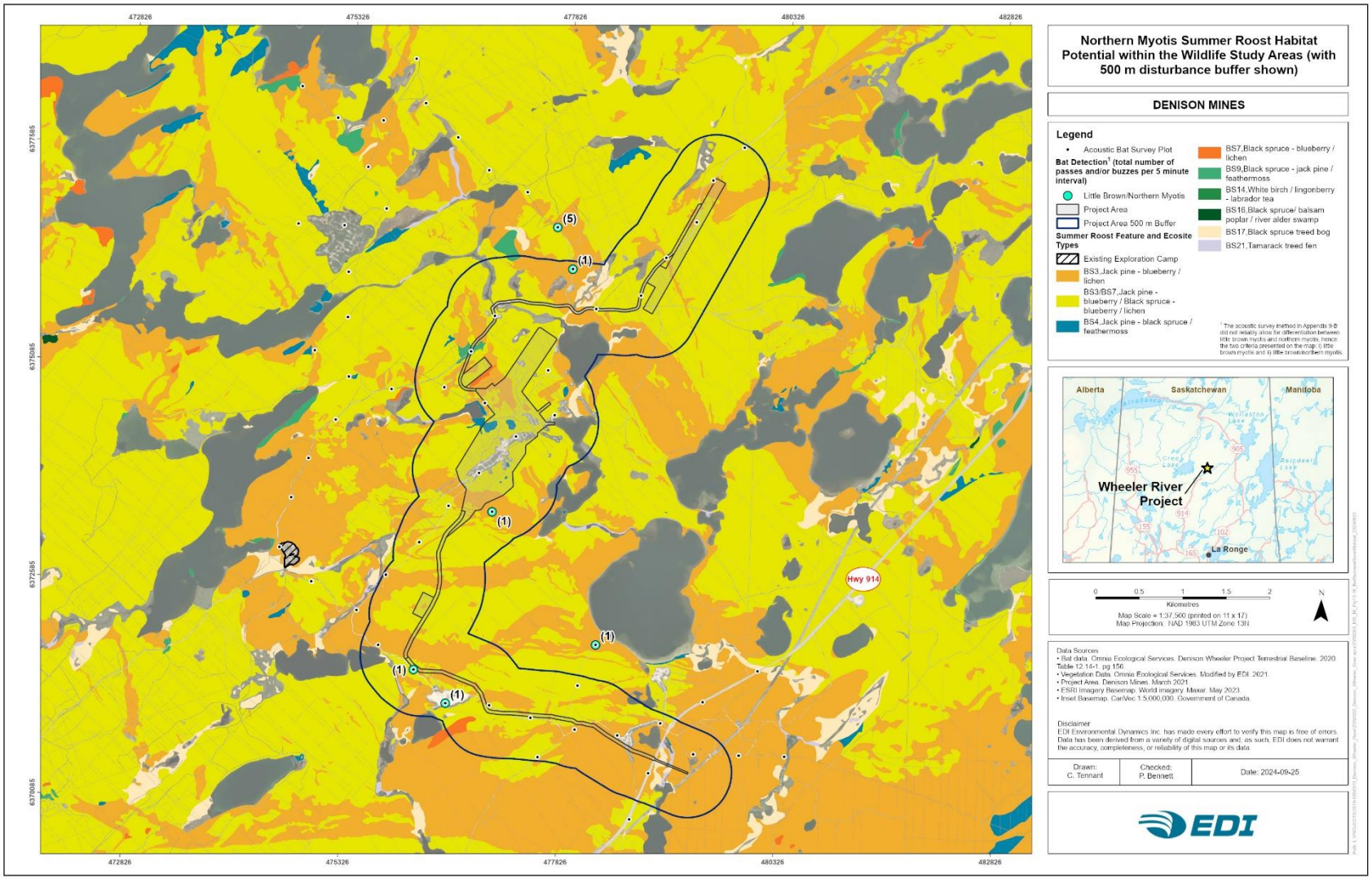
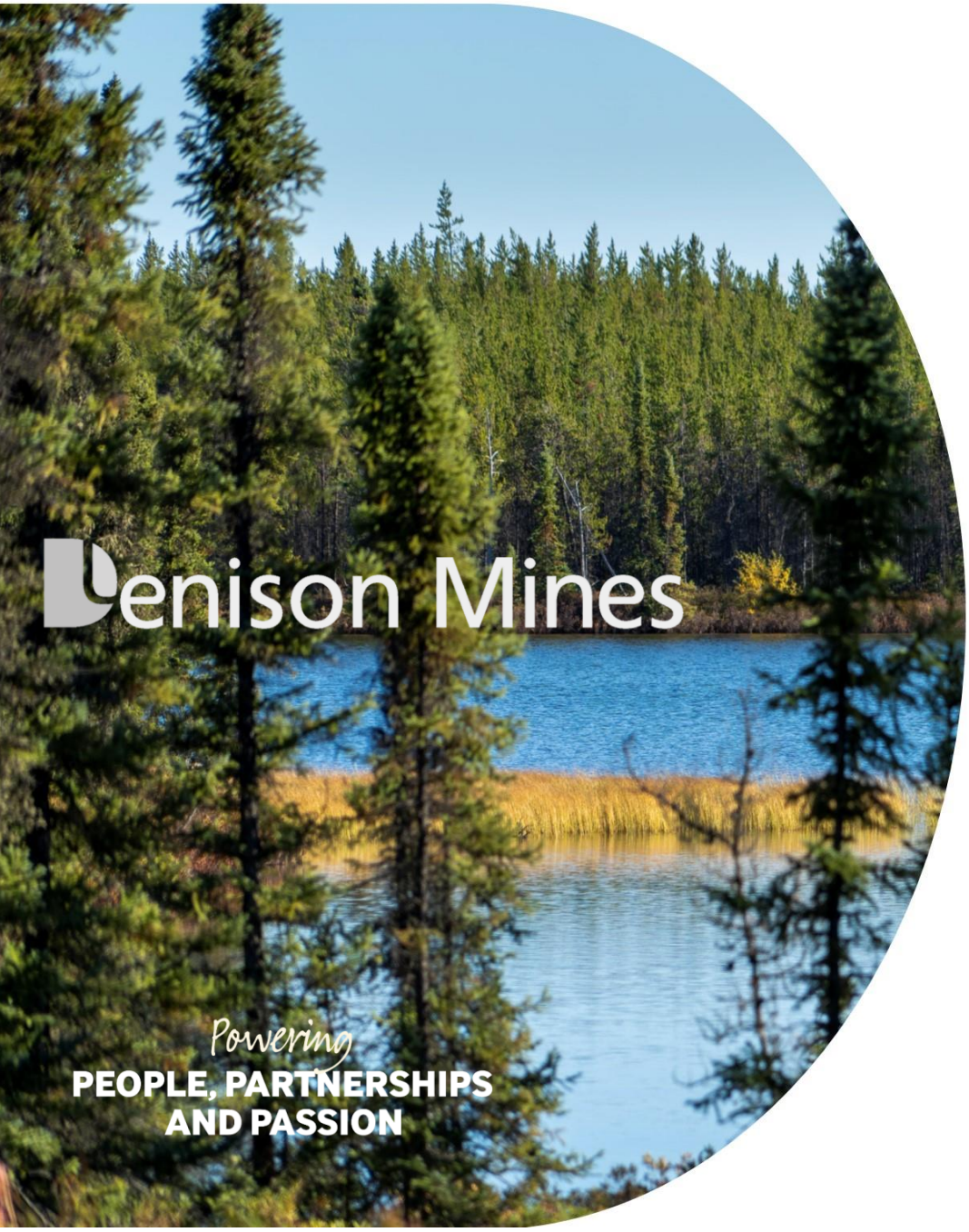

Northern Myotis Summer Roost Habitat Potential within the Wildlife Study Areas (with 500 m disturbance buffer shown)
DENISON MINES
Legend
Acoustic Bat Survey Plot
Bat Detection[1] (total number of passes and/or buzzes per 5 minute interval)
Little Brown/Northern Myotis
Project Area
Project Area 500 m Buffer
Summer Roost Feature and Ecosite Types
Existing Exploration Camp
BS3,Jack pine - blueberry / lichen
BS3/BS7,Jack pine - blueberry / Black spruce - blueberry / lichen
BS4,Jack pine - black spruce / feathermoss
BS7,Black spruce - blueberry / lichen
BS9,Black spruce - jack pine / feathermoss
BS14,White birch / lingonberry - labrador tea
BS16,Black spruce/ balsam poplar / river alder swamp
BS17,Black spruce treed bog
BS21,Tamarack treed fen
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Map Projection: NAD 1983 UTM Zone 13N
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Data Sources
• Bat data: Omnia Ecological Services. Denison Wheeler Project Terrestrial Baseline. 2020. Table 12.14-1, pg 156.
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• Project Area: Denison Mines. March 2021.
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Figure 16


Denison Mines
Powering
PEOPLE, PARTNERSHIPS
AND PASSION

Denison Mines Corp.

Appendix 9-F Supplemental Information

~~New Appendix to Revised Draft EIS, Updated for Final EIS, Section 9~~

Version ~~3~~2

~~July 2024~~October 2024

Denison Mines

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1 Introduction

On October 21, 2022, Denison Mines Corp. (Denison) submitted a draft Environmental Impact Statement (EIS) for the proposed Wheeler River Project (the Project). Based on their initial review, the Canadian Nuclear Safety Commission indicated that the submission contained the required information to proceed with the Federal-Indigenous Review Team (FIRT) technical review of the draft EIS. On March 20, 2023, the FIRT provided Denison with an initial list of information requests (IRs) for Denison to respond to and eventually submit a final EIS document. Denison compiled a list of responses to these initial IRs and provided the FIRT with a revised draft on August 18, 2023. Following the review of these documents, the FIRT provided Denison with a subsequent list of IRs on November 27, 2023. This Appendix provides additional information to address several IRs provided by Environment and Climate Change Canada (ECCC) related to woodland caribou, migratory songbird species, and species at risk (SAR) listed under Schedule 1 of the federal *Species at Risk Act* (SARA).

2 Supplemental Information

2.1 Woodland Caribou

The following information is intended to provide additional context to the responses provided in the IR tracking sheet, particularly in regard to the following: IR-137, IR-143, IR 144, IR 145, IR-143/144R1, IR-143/145R1, IR-149, IR-149-R1A and R1B, IR-151, IR-155, and IR-156.

Figure 2-1 illustrates the location of woodland caribou observed during the baseline field program in association with the ecosite types as classified by the Saskatchewan Ministry of Environment as having the potential to develop into low, moderate, or high-quality habitat to support woodland caribou in relation to the SK1 range. These habitat potential categories are based on the overall habitat suitability ranking for the life history requirements, including forage, refuge, and calving habitat for caribou (Saskatchewan Ministry of Environment 2019). Figure 2-2 provides further insight as to the woodland caribou observed during the baseline field program in association with the ecosite types as classified by the Saskatchewan Ministry of Environment but in context with the Wildlife Study Areas.

To provide further context on the biophysical attributes for woodland caribou, as referenced in the 2020 Amended Recovery Strategy for the Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada (ECCC 2020), Figure 2-3 to Figure 2-8 illustrate the location of caribou observations from the baseline field program in relation to calving, foraging, and refuge habitat, based on information received from the Saskatchewan Ministry of Environment (2023). These figures present the information at two different scales: (1) in context with the Wildlife Study Areas, and (2) in relation to the Project Footprint.

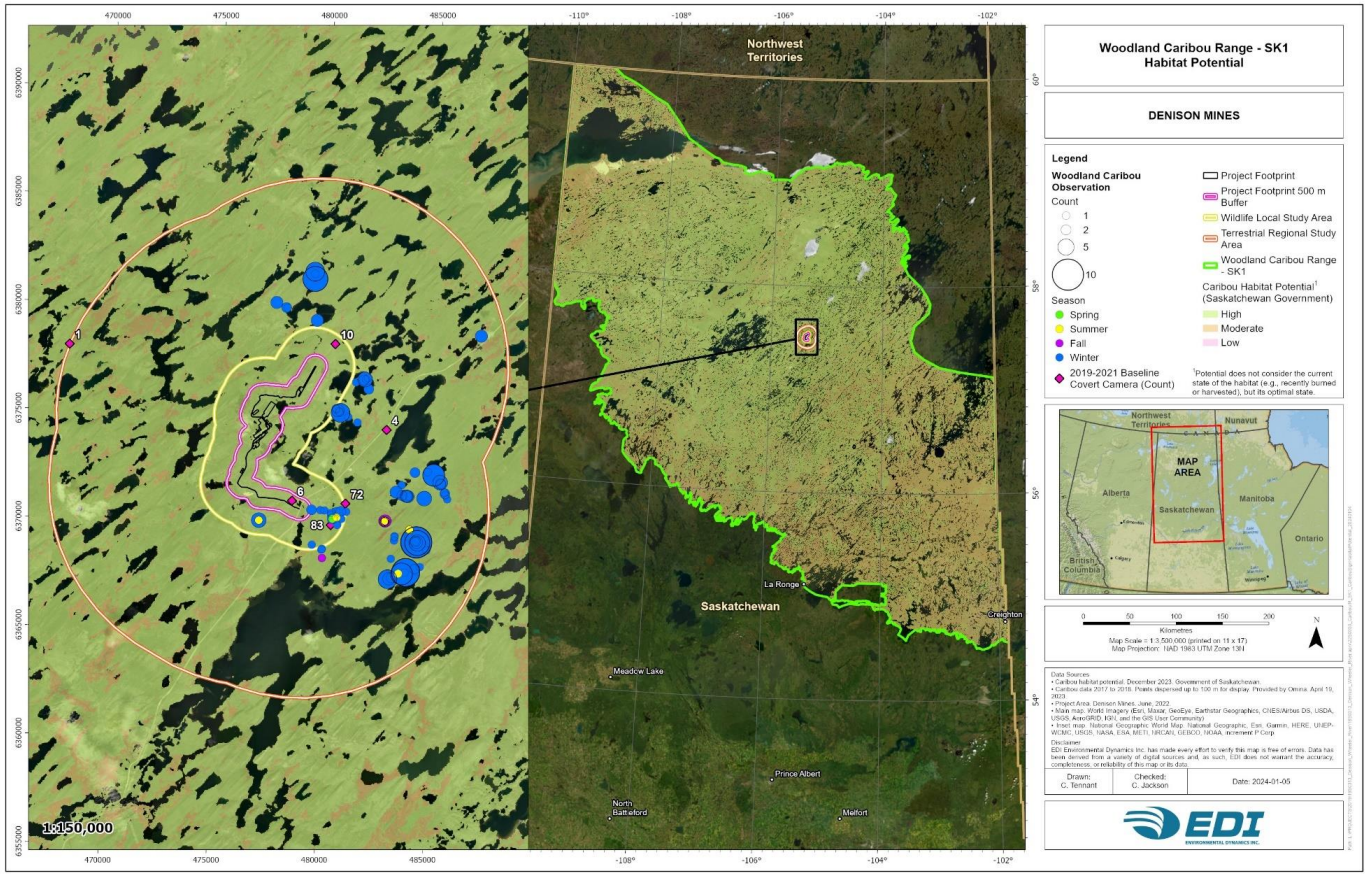


Figure 2-1: Woodland Caribou Range – SK1, Habitat Potential

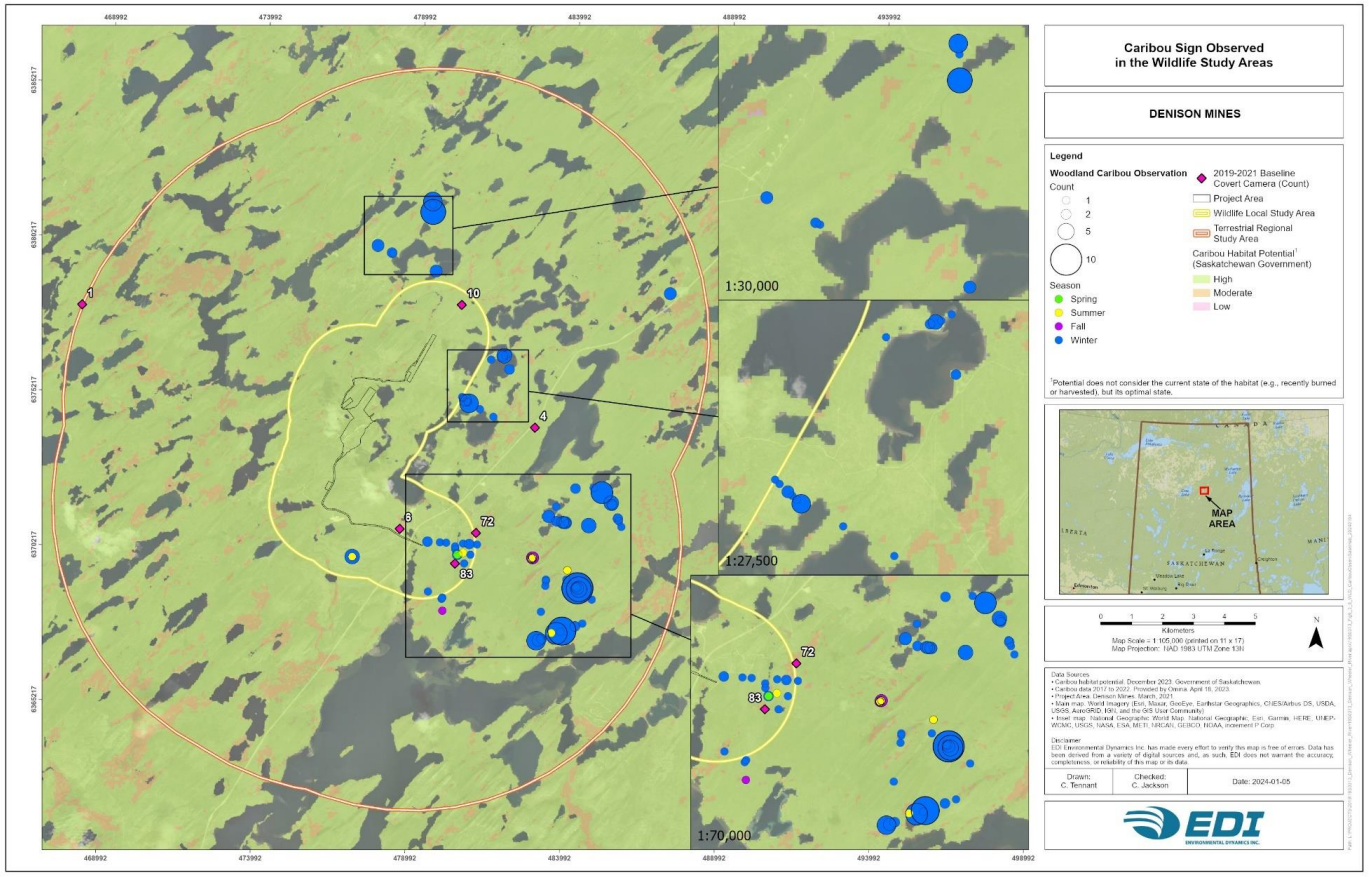


Figure 2-2: Caribou Sign Observed in the Wildlife Study Areas

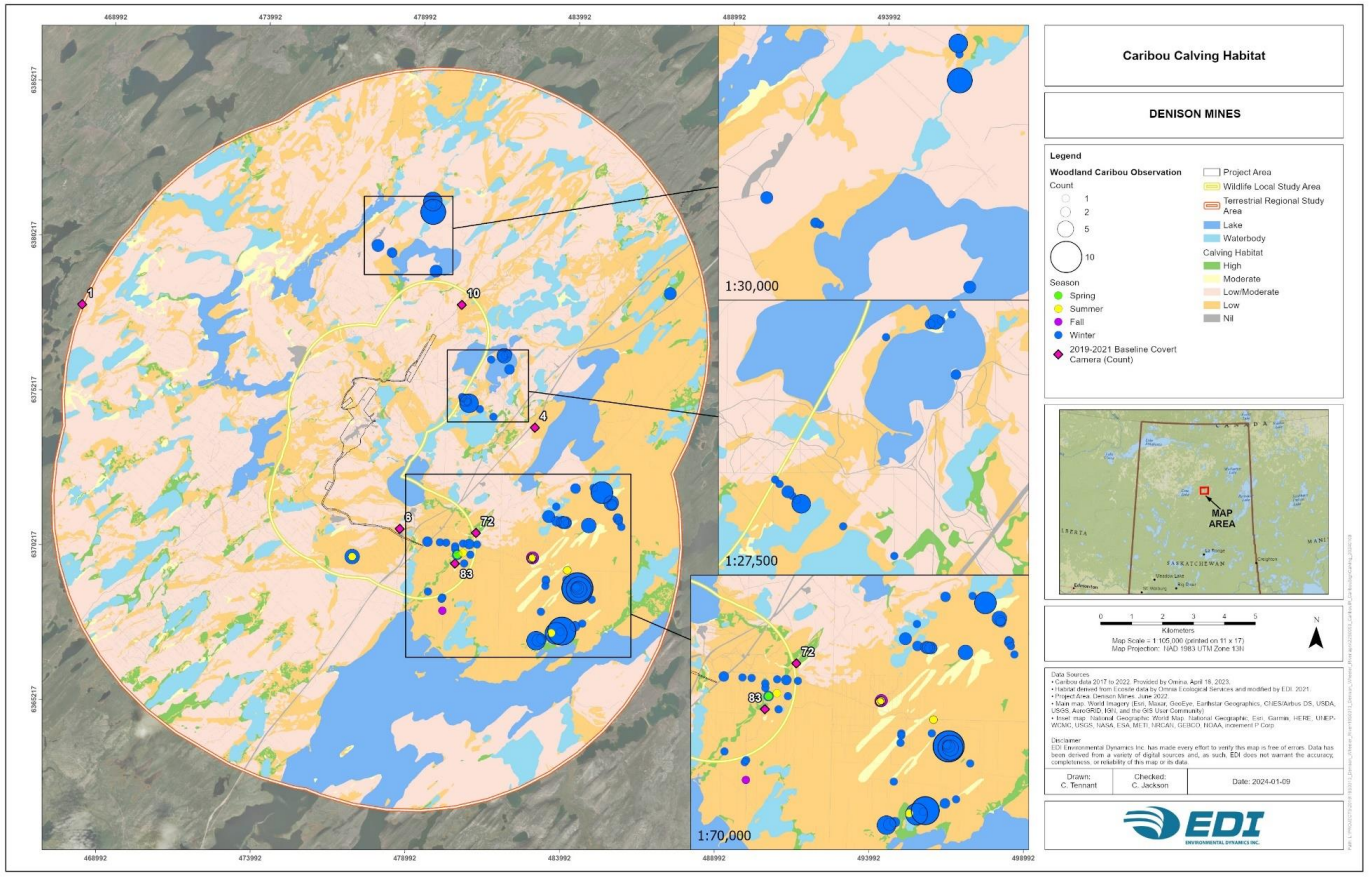


Figure 2-3: Caribou Calving Habitat Potential within the Wildlife Study Areas

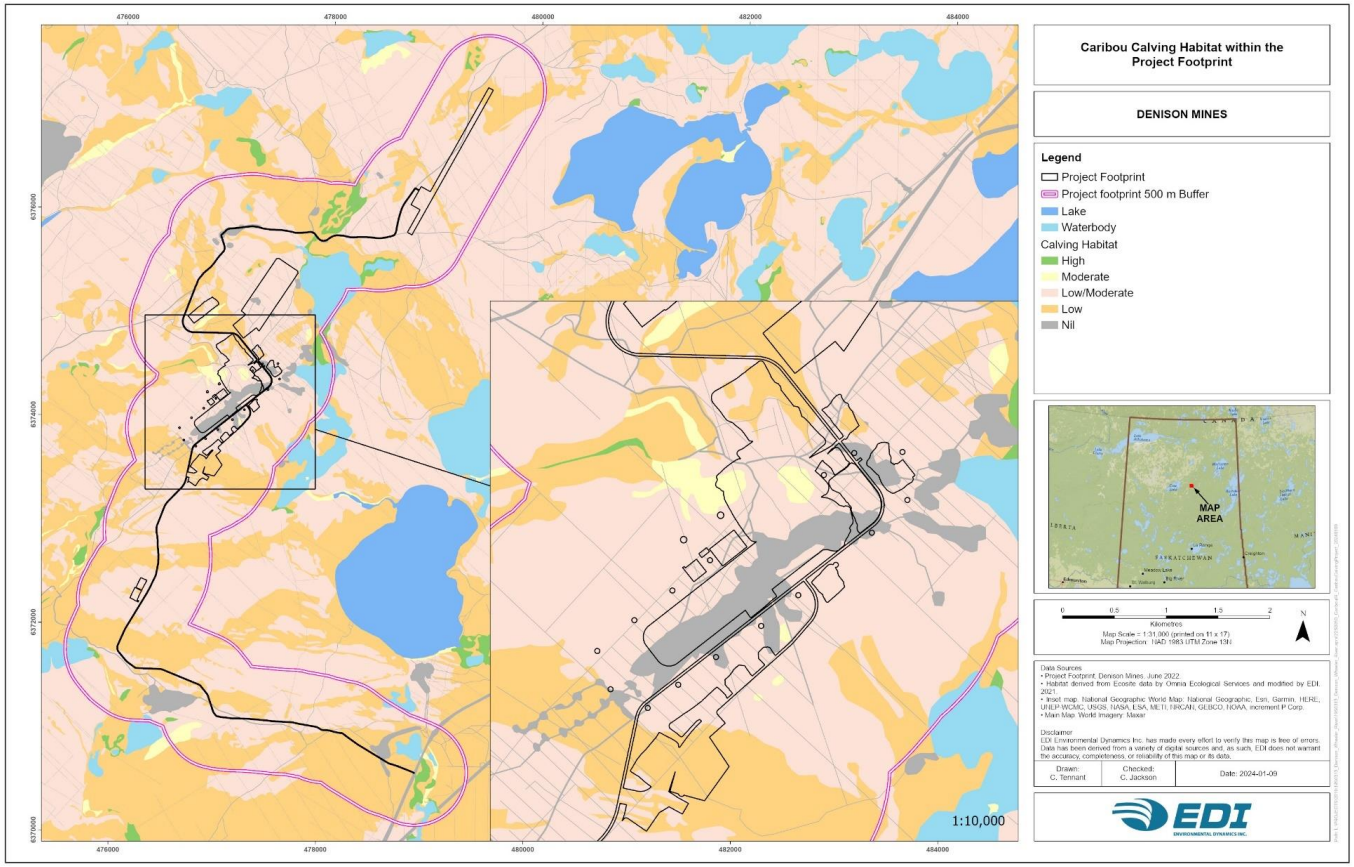


Figure 2-4: Caribou Calving Habitat Potential within the Project Footprint

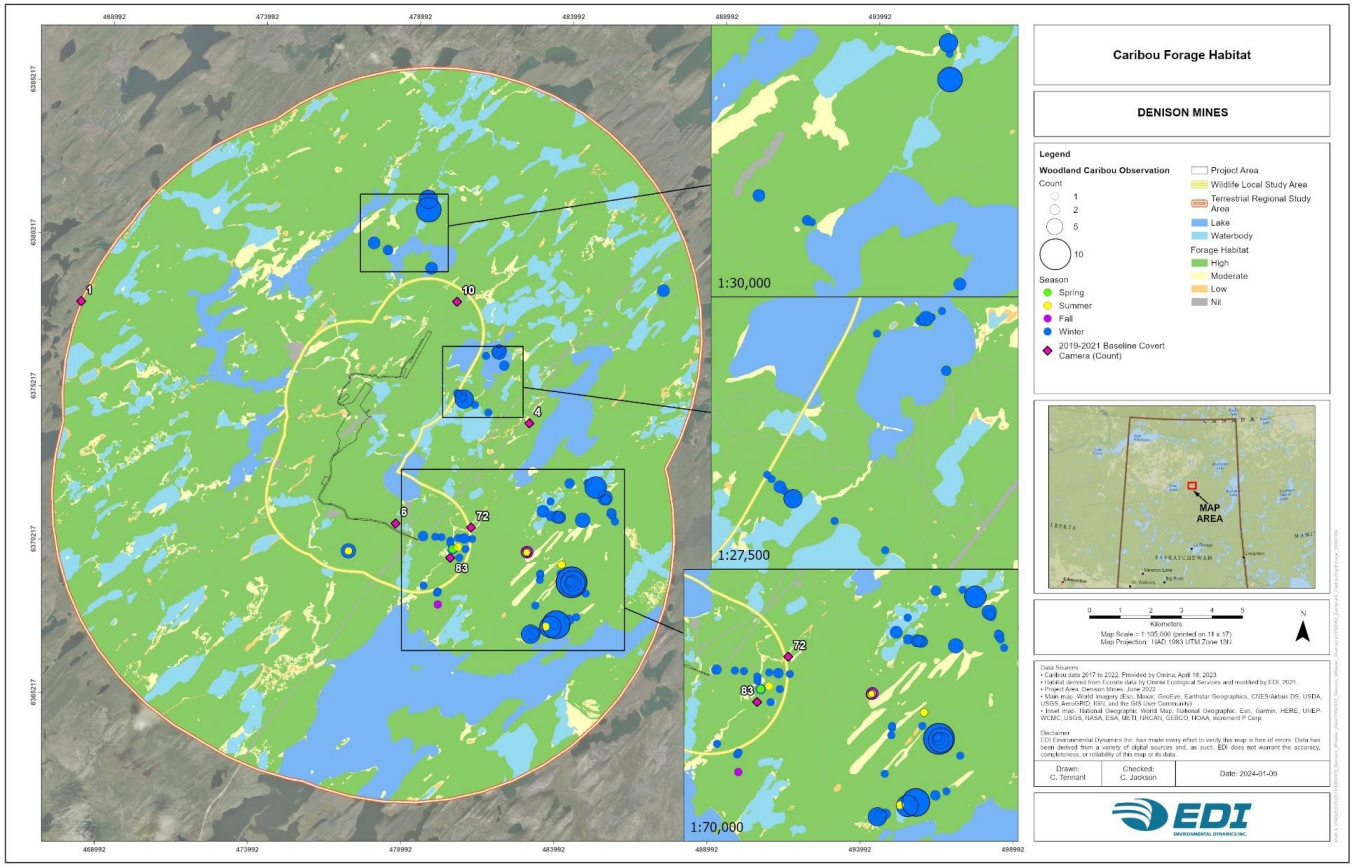


Figure 2-5: Caribou Forage Habitat Potential within the Wildlife Study Areas

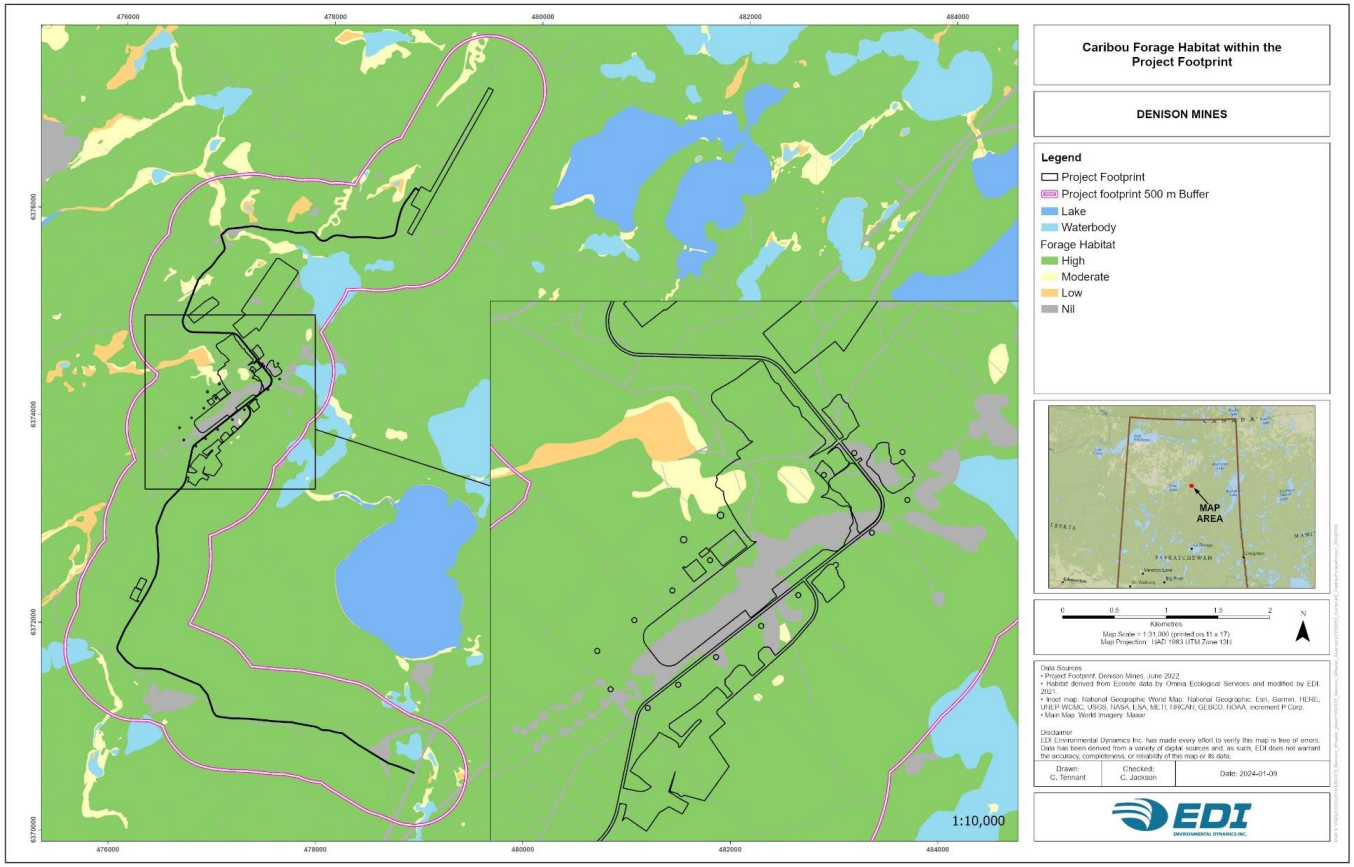


Figure 2-6: Caribou Forage Habitat Potential within the Project Footprint

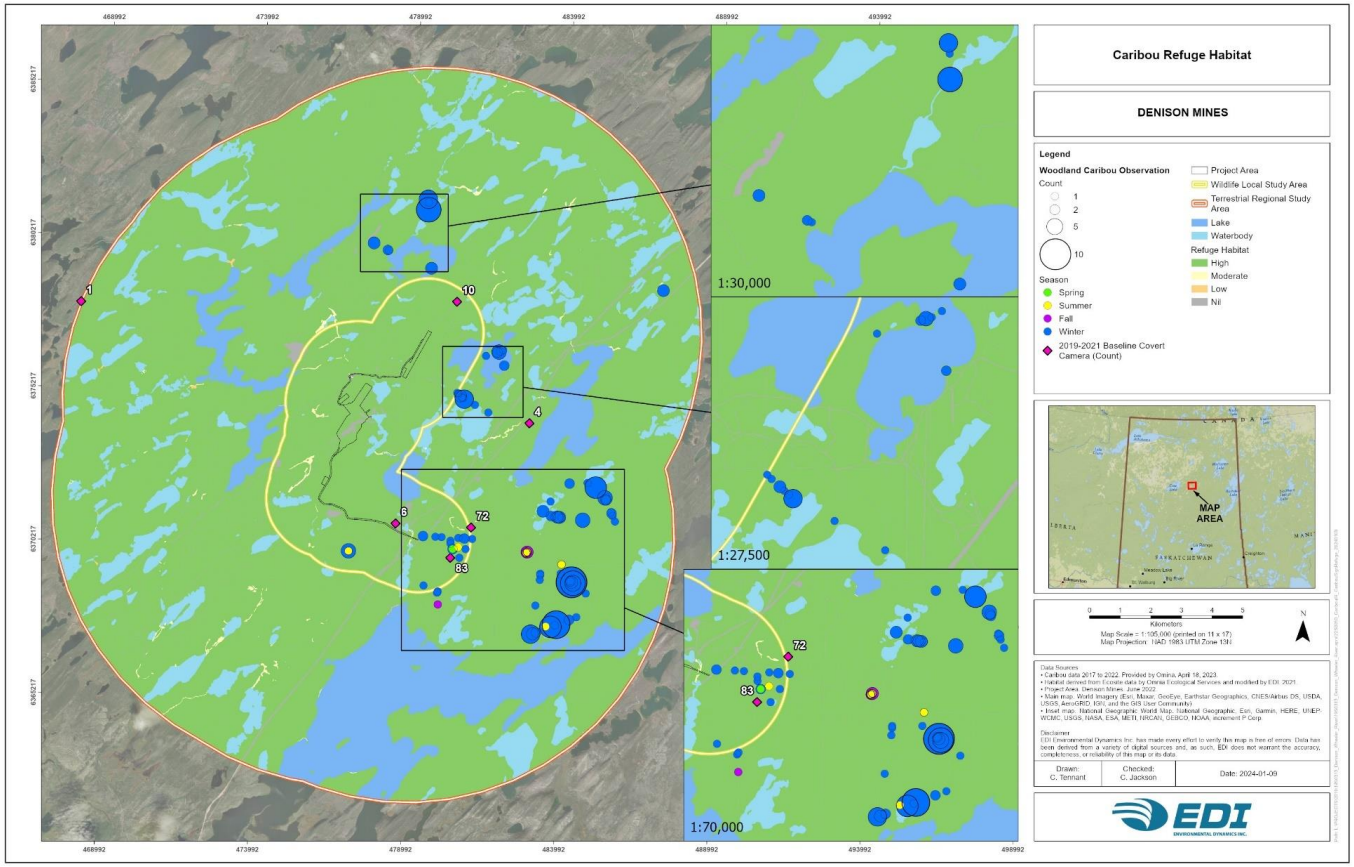


Figure 2-7: Caribou Refuge Habitat Potential within the Wildlife Study Areas

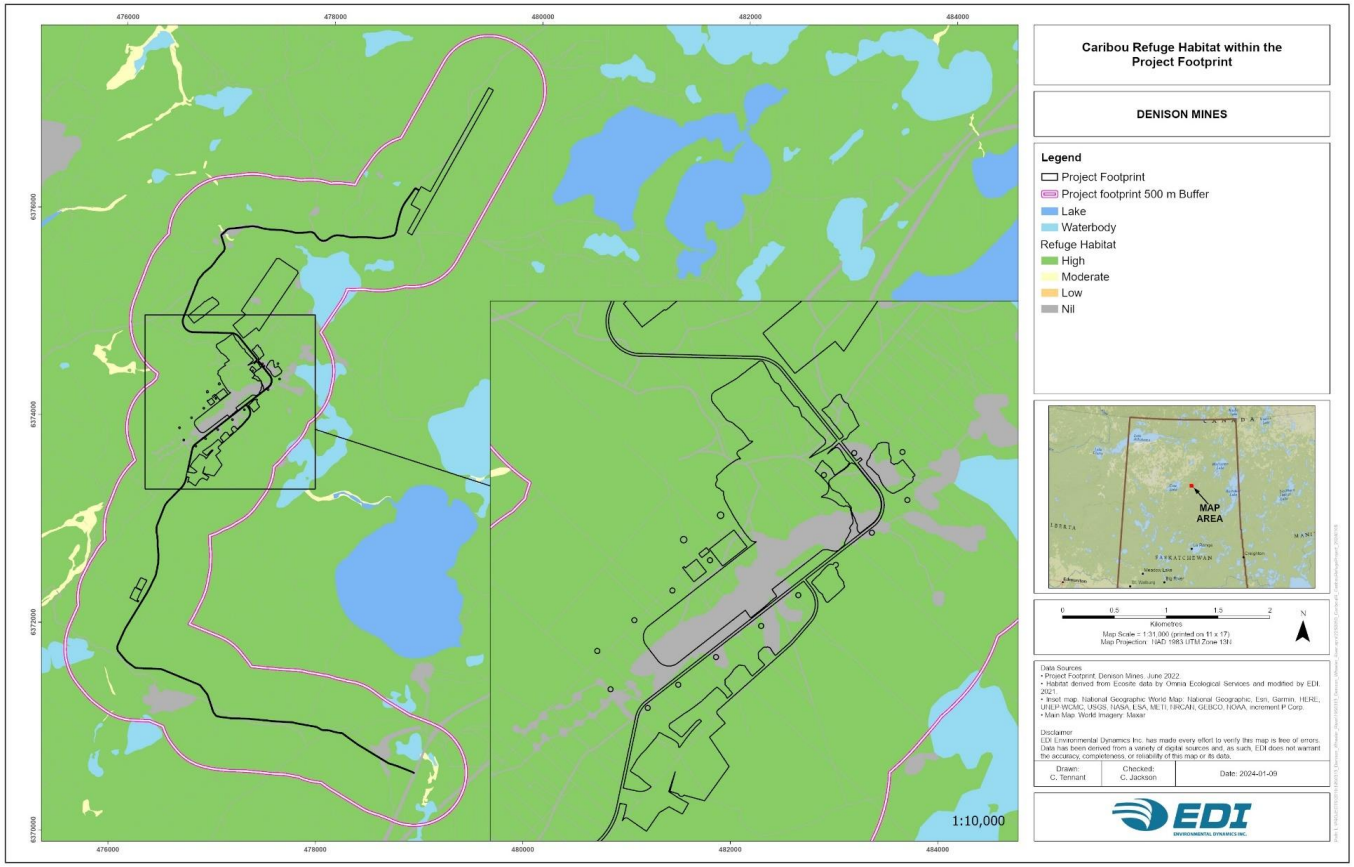


Figure 2-8: Caribou Refuge Habitat Potential within the Project Footprint

2.2 Migratory Birds

The following information is intended to provide additional context to the responses provided in the IR tracking sheet, particularly in regard to the following: IR-159 and IR-162. For IR-160, IR-164, IR-169, and IR-170, the updates were made in Section 9 of the EIS.

Number	IR-159_WRP
Dept.	ECCC
Project effects link	Migratory Birds
Reference to EIS, appendices, or supporting documentation	9.4.3.2.3 Baseline Studies – Migratory Songbirds Appendix 9-B, Section 2.10.2, Results
Context and Rationale	**Context and Rationale:** Information presented in the draft EIS is insufficient to accurately predict Project impacts to breeding birds. The Proponent collected a single year of breeding songbird point counts and aerial waterfowl surveys (including avian species at risk). A single year of surveys in which birds may be unusually scarce or abundant could severely compromise interpretation of post- construction monitoring data. Additionally, data presented in the draft EIS is from 2017 and ECCC advises that more recent data is needed for a comprehensive baseline to verify Project impacts. Data from the Saskatchewan Conservation Data Centre (HABISask), the Saskatchewan Breeding Bird Atlas and the Boreal avian Modelling project contain information on avian densities and avian species at risk that could supplement field data. The national standard for major projects recommends a minimum of two years of field surveys to be provided, so that temporal variability can be considered when comparing post-construction against baseline records and other available data. **Updated Rationale:** ECCC recommends that for major projects, a minimum of two years of field surveys should be provided so that temporal variability can be considered when comparing post-construction against baseline records and other available data. More recent data is needed. due to landscape changes that may have occurred since 2017 as well as cumulative effects that have occurred in that time. Additionally, if there was an unusually high population density of birds in 2017 due to extraneous circumstances, Project effects may be attributed to a non-existent decline in the population when the discrepancy can be due to natural variability. A more recent baseline will account for interannual variation and any regional effects and will allow for a more accurate review of mitigation and follow-up measures. Data from the Saskatchewan Conservation Data Centre (HABISask), the Saskatchewan Breeding Bird Atlas and the Boreal Avian Modelling project contain information on avian densities and avian species at risk that could supplement field data.
Information Requirement	Supplement breeding bird point count data and aerial waterfowl data collected during 2017 with additional pre-construction field data or existing post-2017 data/modelling to provide a comprehensive baseline that can be used to verify Project impacts during construction and operational phases.

Response:

The EA used an accepted, proven habitat-based EA approach to address the variability of population surveys. Further, the EA used all available, recent/relevant survey data collected in appropriately timed and executed methodologies, including TK. However, supplemental surveys would not be expected to provide any information/data that would affect or alter the findings of the habitat-based EA.

The supplemental avian data received from records from the Saskatchewan Breeding Bird Atlas downloaded through the NatureCounts web portal (Saskatchewan Breeding Bird Atlas 2017), which also includes data received as part of the Saskatchewan Boreal Monitoring Strategy program. These data represent bird observations from 24-point counts conducted on June 7 and June 9, 2019. Nine point-counts are located approximately 6.5 km east of the Project footprint, the majority of which are located in the BS3 ecosite type; 15 point-counts are located approximately 7.7 km south of the Project footprint, the majority of which are located in the BS3/BS7 ecosite type. During this survey effort, 24 migratory songbird species were documented. A summary of the total number of individuals observed for each species across all plots are presented below.

Common Name	Scientific Name	Number of Individuals Observed
American Robin	*Turdus migratorius*	8
Bald Eagle	*Haliaeetus leucocephalus*	1
Canada Goose	*Branta canadensis*	50
Canada Jay	*Perisoreus canadensis*	10
Chipping Sparrow	*Spizella passerina*	19
Common Loon	*Gavia immer*	2
Common Tern	*Sterna hirundo*	1
Dark-eyed Junco	*Junco hyemalis*	10
Greater Yellowlegs	*Tringa melanoleuca*	1
Hermit Thrush	*Catharus guttatus*	11
Lincoln's Sparrow	*Melospiza lincolnii*	8
Orange-crowned Warbler	*Leiothlypis celata*	2
Palm Warbler	*Setophaga palmarum*	10
Red-breasted Merganser	*Mergus serrator*	2
Ruby-crowned Kinglet	*Corthylio calendula*	14
Savannah Sparrow	*Passerculus sandwichensis*	1
Solitary Sandpiper	*Tringa solitaria*	0
Song Sparrow	*Melospiza melodia*	2
Spotted Sandpiper	*Actitis macularius*	1

Common Name	Scientific Name	Number of Individuals Observed
White-crowned Sparrow	*Zonotrichia leucophrys*	6
White-throated Sparrow	*Zonotrichia albicollis*	24
White-winged Crossbill	*Loxia leucoptera*	40
Yellow Warbler	*Setophaga petechia*	3
Yellow-rumped Warbler	*Setophaga coronata*	12

Number	IR-162_WRP
Dept.	ECCC
Project effects link	Migratory birds
Reference to EIS, appendices, or supporting documentation	Section 9.4.3.3, Bird Species at Risk
Context and Rationale	**Context and Rationale:** Not all avian species at risk present in the study area were included as Key Indicators in the avian species at risk (SAR) valued component (VC). Barn swallow and horned grebe were recorded in the study area, but not included as VCs. Additionally, bank swallow may inhabit the Project area. Impacts to Species at Risk Act Schedule 1 listed species need to be identified, avoided, lessened and monitored. In Section 9.4.3.3. the Proponent states: "It is acknowledged that the listed Barn Swallow (Hirundo rustica) and Horned Grebe (Podiceps auratus) could potentially occur in the Terrestrial RSA. Incidental observations occurred during the baseline studies (Appendix 9-B). To focus the effects assessment on a few key species (described in the following) it was decided to use Olive-sided Flycatcher and Common Nighthawk to represent Barn Swallow as well, and to use Yellow Rail and Rusty Blackbird as a substitute for Horned Grebe. Unlike Horned Grebe, Yellow Rail and Rusty Blackbird are also listed provincially." Barn swallow, bank swallow and horned grebe may have different nesting habitat requirements than the representative species discussed in the draft EIS. An explanation of how differing species are representative of one another is required, or if an explanation cannot be provided, the species should be assessed individually. **Updated Rationale:** The management plans for these three species demonstrate the variability in their habitat selection. The Management Plan for the Yellow Rail (*Coturnicops noveboracensis*) in Canada (Environment Canada, 2013) states "Yellow Rails inhabit shallow wetlands and other wet areas with grass-like vegetation. They breed in wetlands such as damp hay fields or meadows, floodplains, bogs, upper levels of estuaries, salt marshes (Bookhout 1995, Alvo and Robert

	1999, COSEWIC 2009), shallow prairie wetlands, and wet montane meadows (Peabody 1922, Sherrington 1994, Popper and Stern 2000). " The Management Plan for the Rusty blackbird (*Euphagus carolinus*) in Canada (Environment Canada 2015), states: "Rusty Blackbirds tend to select breeding sites with a combination of freshwater bodies with shallow water and emergent vegetation for foraging that are adjacent to wetlands with conifers or tall shrubs with cover for nesting (Matsuoka et al. 2010a, Matsuoka et al. 2010b, Greenberg et al. 2011)." The Management Plan for the Horned Grebe (*Podiceps auritus*), Western population, in Canada (ECCC, 2022) states: "The Horned Grebe breeds in small (generally 0.5 to 2 ha, but ranging from 0.24 to 18.2 ha), shallow (at least 20 cm deep, but on average 40 cm), and usually fishless, perennial wetlands, but they can also nest on larger lakes with shallow edges and sufficient emergent vegetation. Breeding sites usually contain at least 40% open water with beds of emergent vegetation, such as sedges (Carex spp.), rushes (Juncus spp.) and cattails (Typha spp.) (Faaborg 1976, Kuczynski et al. 2012, Routhier 2012, Stedman 2018)." Due to differing habitat selection and use, ECCC recommends that each selected VC is given an individual assessment with specific mitigation measures. This will allow for a more accurate review of the chosen mitigation measures.
Information Requirement	Explain how nesting habitat requirements of barn swallow is represented by common nighthawk and olive-sided flycatcher as a VC or assess individually each SAR that overlaps with the Project and is likely to be affected. Explain how nesting habitat requirements of horned grebe are represented by yellow rail and rusty blackbird as a VC, or assess individually each SAR that overlaps with the Project and is likely to be affected. Assess individually each SAR that overlaps with the Project and is likely to be affected. See also related IRs: IR-160 and IR-161.

Response:

As per accepted, proven EA methodology, Denison used a habitat-based methodology to determine the Project's effects on VCs, using an accepted Key Indicator methodology, and not every species, to focus and inform the EA.

Nesting habitat requirements of the horned grebe are similar at a landscape level to those represented by yellow rail and rusty blackbird in that they are typically found associated with northern waterbodies and watercourses with various forms of emergent vegetation. At a site-specific scale, there are subtle differences in nesting habitat requirements, as summarized previously by ECCC in the Context and Rationale response.

Given the nesting habitat requirements of these species, the available habitat types within the Denison study areas (e.g., Project Area, Wildlife Local Study Area, and the Terrestrial Regional Study Area) for use by these species include the following ecosite types: Labrador tea shrubby bog (BS18), graminoid bog (BS 19), graminoid bog/graminoid fen (BS19/BS24), open bog (BS 20), leatherleaf shrubby poor fen (BS22), willow shrubby rich fen (BS23), graminoid fen (BS24), open fen (BS25), and waterbodies and lakes. The habitat-based methodology of the environmental assessment adequately and appropriately addresses effects on these habitat types and the associated migratory bird species that could potentially use these

habitat types. Further assessment of each species would not be expected to affect or alter the findings of the habitat-based environmental assessment.

The characterization of the alteration and/or habitat loss residual effect considers the Project effects on available habitat used by these three migratory breeding birds within the Wildlife LSA and Terrestrial RSA. As outlined in Table 9.3-18, 0.05% of the Project Area, 11.5% of the Wildlife LSA, and 24.2% of the Terrestrial RSA provide habitat types that are potentially available to these three migratory breeding bird species.

Direct habitat loss is calculated as the area of available habitat lost due to site clearing within the Project Area. Direct habitat loss has been mitigated by reducing the size of the Project Area to the extent practicable during Project design; however, available habitat is still predicted to be cleared during Construction. In the Project Area, 0.09 ha or 100% of available habitat is assumed to be removed and will not be available to these species for the duration of the Project (Table 9.3-19). This considers that the Project Area has previously been disturbed (i.e., almost 15% of the Project Area is disturbed by anthropogenic activities) and includes only 0.02 ha (0.01%) of landscape covered by waterbodies. This relates to a removal of 0.02% of available habitat within the Wildlife LSA and 0.001% in the Terrestrial RSA.

An additional 93.9 ha (17.0%) of available habitat in the Wildlife LSA may experience habitat alteration resulting from indirect Project effects, such as sensory disturbance (Table 9.3-19). This area of indirect effect represents 1.0% of available habitat in the Terrestrial RSA that may experience habitat alteration.

2.3 Species At Risk – *Myotis* Species

The following information is intended to provide additional context to the responses provided in the IR responses to for IR-174 associated with both the Round 2 and Round 3 responses.

Acoustic bat surveys were completed between July 22 and 23, 2019 with 61 survey points sampled across five ecosite types (refer to Appendix 9-B). The location of the survey points, species detected, and frequency of detections are included in Figure 2-9.

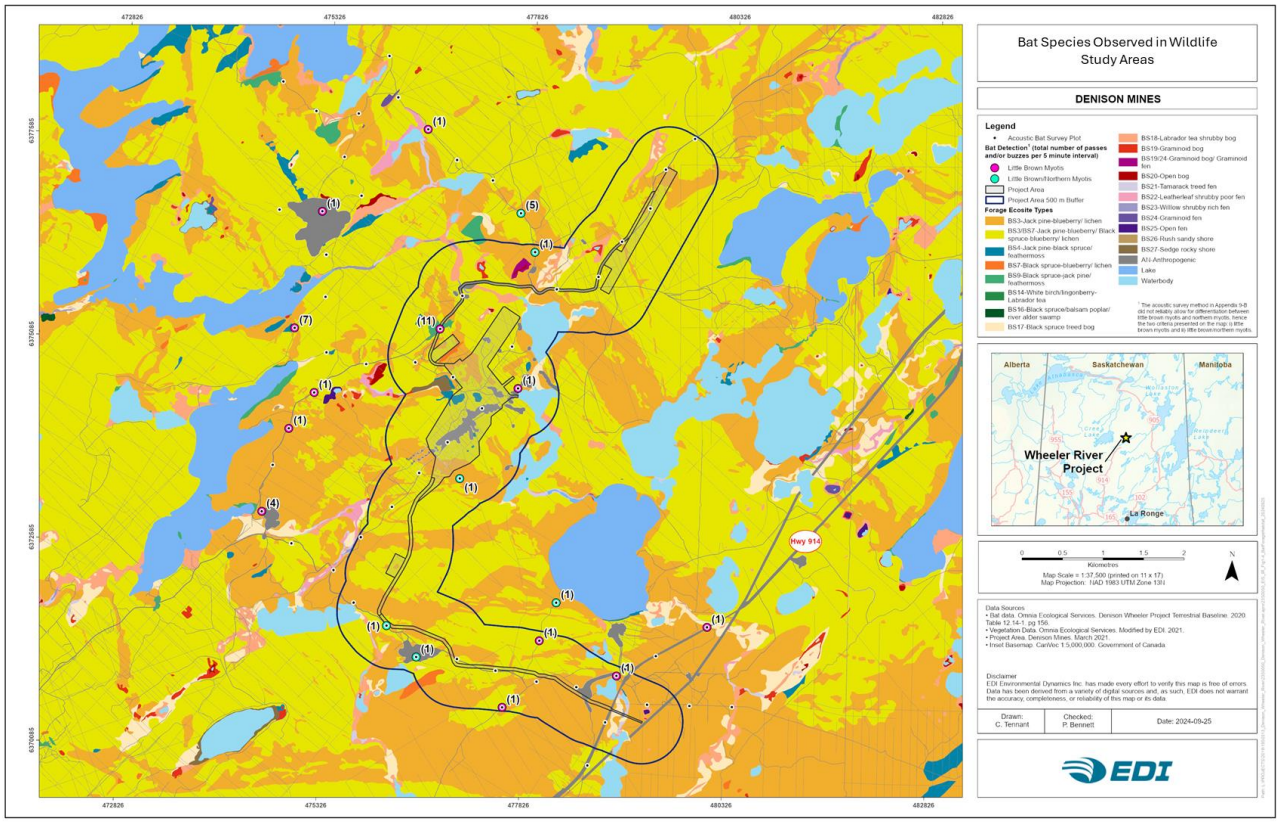
As noted in Appendix 9-D, habitat for the little brown myotis is composed of (1) overwintering hibernacula that are sufficiently cool and humid and (2) summering areas that provide foraging areas and suitable locations for roosting and maternity colonies (COSEWIC 2013). Hibernacula and maternity sites are reported as being the main limiting habitat features for this species (COSEWIC 2013), and this, as described below, is consistent with conditions at the Project site and surrounding area.

Hibernacula occur in parts of caves, mines (openings to surface for ramps and raises for example), and buildings that have stable and specific temperature (-4 to 13°C) and humidity (>80%) conditions (COSEWIC 2013). Based on existing environment information presented in the EIS including the terrain and vegetation and ecosystem existing environment sections, there are no hibernacula anticipated in the Project Area (i.e., caves, mines, buildings with stable and specific temperatures per COSEWIC 2013). Terrain is low relief due to flat-lying sandstone and almost continuous cover of sandy glacial deposits (i.e., surface is predominately sand textured and there are no rocky outcrops or bedrock at surface for cave habitats); there are no man-made structures (e.g., mine openings or buildings) in the Project Area. As noted in the EIS, the terrain and vegetation communities are fairly uniform throughout the study areas and the habitat considerations in the Project Area are considered representative of the landscape in the wildlife LSA and RSA.

Maternity sites can occur in large-diameter trees, rock crevices, buildings, and bat houses that offer warm and relatively stable microclimate conditions that allow females to avoid going into torpor so they can focus on caring for their young (COSEWIC 2013a, Slough and Jung 2020). As highlighted above, since there are no rock crevices, buildings, or bat houses in the Project Area, a consideration for maternal roost potential was focused on the areas where larger diameter trees may be present.

Existing ecosite information was reviewed and ecosites with higher potential for maternity roosts (i.e., larger diameter trees) were selected. The ecosites with the potential for larger diameter trees are shown in Figure 2-10 below, and include ecosites RF1 (regenerating forest >5m tall; per Appendix 9-B), BS3 jack pine/blueberry/lichen, BS4 jack pine – black spruce/feathermoss, BS7 black spruce/blueberry/lichen, BS9 black spruce – jack pine/feathermoss, BS14 white birch/lingonberry – labrador tea, BS16 black spruce/ balsam poplar/river alder swamp, BS17 black spruce treed bog, and BS21 tamarack treed fen. While these ecosites were selected for the *potential* to have larger diameter trees, it is important to note that the majority of these ecosites have trees with diameter at breast height <10 cm. Refer to Appendix 9-B for representative photos of the selected ecosites.

Based on this conservative mapping exercise, the Project Area contains small areas of suitable potential maternal roost habitat. The total Project Area is around 170 ha and potential bat maternal roost ecosites represent less than 49 ha, when as noted above it is assumed that the ecosites identified above provide trees suitable for maternity roosts across their entirety. As noted in the EIS, the terrain and vegetation communities are fairly uniform throughout the study areas and the habitat considerations in the Project Area are considered representative of the landscape in the wildlife LSA and RSA.


Bat Species Observed in Wildlife Study Areas
DENISON MINES
Legend
Acoustic Bat Survey Plot
Bat Detection[1] (total number of passes and/or buzzes per 5 minute interval)
Little Brown Myotis
Little Brown/Northern Myotis
Project Area
Project Area 500 m Buffer
Forage Ecosite Types
BS3-Jack pine-blueberry/ lichen
BS3/BS7-Jack pine-blueberry/ Black spruce-blueberry/ lichen
BS4-Jack pine-black spruce/ feathermoss
BS7-Black spruce-blueberry/ lichen
BS9-Black spruce-jack pine/ feathermoss
BS14-White birch/lingonberry-Labrador tea
BS16-Black spruce/balsam poplar/ river alder swamp
BS17-Black spruce treed bog
BS18-Labrador tea shrubby bog
BS19-Graminoid bog
BS19/24-Graminoid bog/ Graminoid fen
BS20-Open bog
BS21-Tamarack treed fen
BS22-Leatherleaf shrubby poor fen
BS23-Willow shrubby rich fen
BS24-Graminoid fen
BS25-Open fen
BS26-Rush sandy shore
BS27-Sedge rocky shore
AI-Anthropogenic
Lake
Waterbody
[1] The acoustic survey method in Appendix 9-B did not reliably allow for differentiation between little brown myotis and northern myotis, hence the two species are identified as little brown myotis and its little brown/northern myotis.
Alberta
Saskatchewan
Manitoba
Wheeler River Project
La Ronge
Hwy 914
Kilometres
Map Scale = 1:37,500 (printed on 11 x 17)
Map Projection: NAD 1983 UTM Zone 13N
Data Sources
• Bat data. Omnia Ecological Services. Denison Wheeler Project Terrestrial Baseline. 2020. Table 12.14-1, pg 156.
• Vegetation Data. Omnia Ecological Services. Modified by EDI. 2021.
• Project Area. Denison Mines. March 2021.
• Inset Basemap. CanVec 1:5,000,000. Government of Canada.
Disclaimer
EDI Environmental Dynamics Inc. has made every effort to verify this map is free of errors. Data has been derived from a variety of digital sources and, as such, EDI does not warrant the accuracy, completeness, or reliability of this map or its data.
Drawn: C. Tennant
Checked: P. Bennett
Date: 2024-09-25
EDI

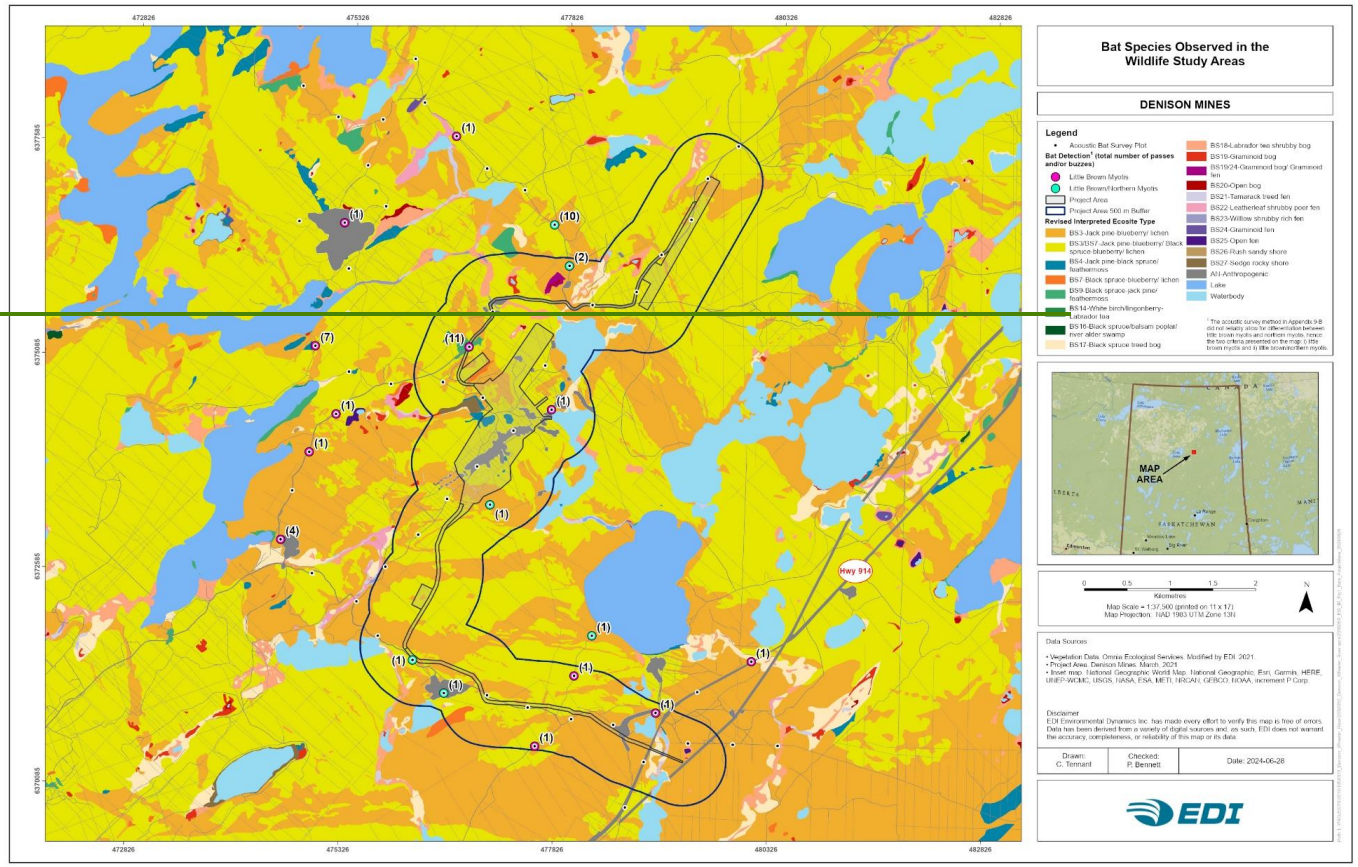

Bat Species Observed in the Wildlife Study Areas
DENISON MINES
Legend
Acoustic Bat Survey Plot
Bat Detection¹ (total number of passes and/or buzzes)
Little Brown Myotis
Little Brown/Northern Myotis
Project Area
Project Area 500 m Buffer
Revised Interpreted Ecosite Type
BS3-Jack pine-blueberry/ lichen
BS3/DS7-Jack pine-blueberry/ Black spruce-blueberry/ lichen
BS4-Jack pine-black spruce/ feathermoss
BS7-Black spruce-blueberry/ lichen
BS9-Black spruce-jack pine/ feathermoss
BS14-White birch/lingonberry-Labrador tea
BS16-Black spruce/balsam poplar/ river alder swamp
BS17-Black spruce treed bog
BS18-Labrador tea shrubby bog
BS19-Graminoid bog
BS19/24-Graminoid bog/ Graminoid fen
BS20-Open bog
BS21-Tamarack treed fen
BS22-Leatherleaf shrubby poor fen
BS23-Willow shrubby rich fen
BS24-Graminoid fen
BS25-Open fen
BS26-Rush-sandy shore
BS27-Sedge rocky shore
AI1-Anthropogenic
Lake
Waterbody
¹The acoustic survey methods in Appendix 9-B did not reliably allow for differentiation between little brown myotis and northern myotis, hence the two criteria presented on the map: Little brown myotis and/ or little brown/northern myotis.
MAP AREA
SASKATCHEWAN
Hwy 914
Kilometres
Map Scale = 1:37,500 (printed on 11 x 17)
Map Projection: NAD 1983 UTM Zone 13N
Data Sources
• Vegetation Data: Omnia Ecological Services. Modified by EDI, 2021.
• Project Area: Denison Mines, March, 2021.
• Inset map: National Geographic World Map. National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
Disclaimer
EDI Environmental Dynamics Inc. has made every effort to verify this map is free of errors. Data has been derived from a variety of digital sources and, as such, EDI does not warrant the accuracy, completeness, or reliability of this map or its data.
Drawn: C. Tennant
Checked: P. Bennett
Date: 2024-06-28
EDI
472826
475326
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480326
482826
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6375085
6372585
6370085

Figure 2-9: Bat Species Observed within the Wildlife Study Areas

Commented [A1]: Update the dots

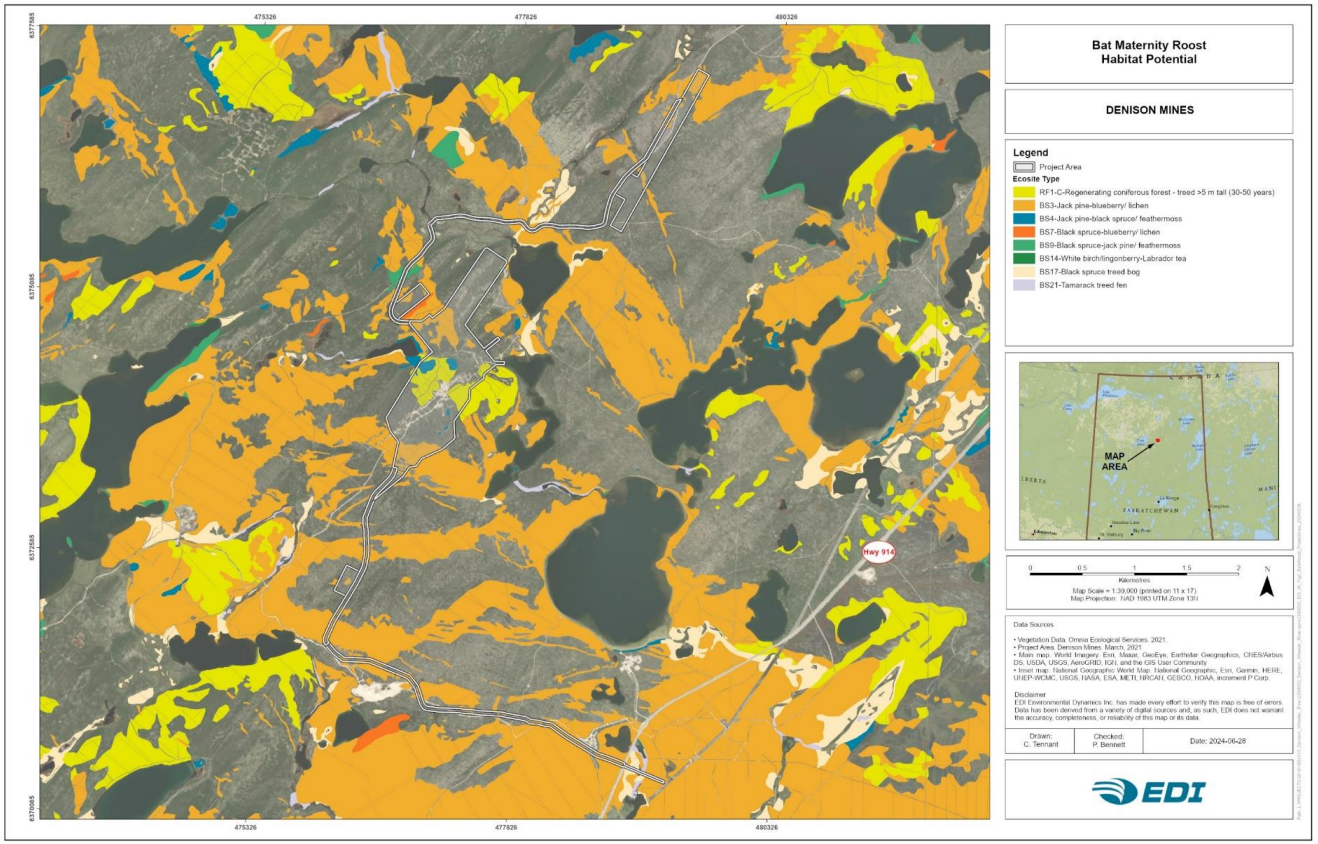


Figure 2-10: Bat Maternity Roost Habitat Potential

3 References

COSEWIC. 2013. COSEWIC assessment and status report on the Little Brown Myotis *Myotis lucifugus*, Northern Myotis *Myotis septentrionalis*, and Tri-colored Bat *Perimyotis subflavus* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. xxiv + 93 pp.

Environment and Climate Change Canada (ECCC). 2020. *Amended Recovery Strategy for the Woodland Caribou (Rangifer tarandus caribou), Boreal Population, in Canada. Species at Risk Act* Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. xiii + 143pp.

Saskatchewan Breeding Bird Atlas. 2017. Data accessed from NatureCounts, a node of the Avian Knowledge Network, Birds Canada. (http://www.naturecounts.ca/). Accessed January 15, 2024.

Saskatchewan Ministry of Environment (SK MOE). 2019c. *Range Plan for Woodland Caribou in Saskatchewan – Boreal Plain Ecozone - SK2 Central Caribou Administration Unit*. July 2019. 90 pp.

Saskatchewan Ministry of Environment (SK MOE). 2023. *SK1 habitat potential raster data for woodland caribou in Saskatchewan*. Email from Lisa Stuart, GIS analyst, Saskatchewan Ministry of Environment. December 8, 2023 email.

Slough, B.G. and Jung, T.S. 2020. Little Brown Bats Utilize Multiple Maternity Roosts Within Foraging Areas: Implications for Identifying Summer Habitat. Journal of Fish and Wildlife Management 11(1):311–320.