NORTHLAND POWER

ONTARIO POWER GENERATION

Marmora Clean Energy Hub Project

Initial Project Description

H369550-0000-840-066-0001

May 1, 2023

HATCH

Report

Initial Project Description

H369550-0000-840-066-0001

			<Original signed by>	<Original signed by>	<Original signed by>
2023-05-01	**4**	**Approved for Use**	**J. Wain, K. Vukovics**	**C. Coughlin**	**A. Leggett**
DATE	**REV.**	**STATUS**	**PREPARED BY**	**CHECKED BY**	**APPROVED BY**
				Discipline Lead	**Functional Manager**

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Introduction

In the Municipality of Marmora and Lake, Ontario (located along Highway 7, approximately 165 kilometres northeast of Toronto) an open-pit iron-ore mine operated from 1953 to 1978. The Marmoraton mine operation involved the extraction, crushing and grinding of ore, followed by magnetic removal of the 65% iron concentrate to be roasted into hematite pellets for export. During operations, the mine void was actively pumped of groundwater seepage to allow for mining excavation. At its peak, the mine produced 520,000 tons of ore pellets annually.

The Marmoraton mine ceased production and closed in 1978, leaving a void approximately 740 metres (m) long by 450 m wide and 220 m deep (the Open Pit). The Open Pit is surrounded by over 1,500 acres of non-reclaimed inactive mining lands consisting largely of piles of by-product waste rock and processed rock. The closure of the mine pre-dated legislative rehabilitation requirements, and as such, the lands have remained essentially unchanged for 45 years. The Open Pit has continued to infill with groundwater and surface water since it ceased operations in 1978. Historical photos of the Open Pit are provided in the photo log in Appendix A.

The Marmora Clean Energy Hub Project (the Project) seeks to repurpose the abandoned Open Pit and inactive mining lands into a 400 megawatt (MW) closed-loop pumped storage hydroelectric facility, complemented by approximately 30 MW of ground-mounted solar. Power will be transmitted via a new underground transmission line to a switching station located up to 10 kilometres (km) north of the former mine site, connecting to an existing 230-kV Hydro One transmission corridor that is the main electric transmission corridor running from the two largest demand centers in the province, the Greater Toronto Area (GTA) to Ottawa.

The closed-loop pumped storage facility would recirculate water between a lower reservoir (the Open Pit) and an upper reservoir (constructed in the by-product waste rock pile west of the Open Pit). Ultimately, the Project will provide clean energy to the grid during higher demand periods and draw power from the grid during lower demand periods to optimize the use of Ontario's nuclear and hydroelectric baseload generation and intermittent renewable generation, in order to better support the growing capacity needs of the province. Pumped storage offers reliability and increased operational flexibility compared to many alternative renewable energy solutions.

With a targeted in-service date of 2029, the Project would be available to support the growing capacity needs that emerge in the mid-2020s and grow into the 2030s with clean, reliable electricity generation and the commitment to a flexible, decarbonized system.

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1. General Information

1.1 Marmora Clean Energy Hub Project

Northland Power Inc. (NPI) and Ontario Power Generation (OPG) (together, the Proponent) have partnered to develop one of Canada's first closed-loop pumped (hydroelectric) storage facilities, intended to be combined with a ground-mount solar facility in the Municipality of Marmora and Lake, Ontario (Figure 1-1). The proposed pumped storage facility seeks the transformation of the inactive, open-pit iron ore Marmoraton mine (the Open Pit) into a 400-MW clean energy storage asset. This will be combined with approximately 30 MW of ground-mounted solar to be co-located on the non-reclaimed, inactive mined lands to create a Clean Energy Hub (hereinafter referred to as "the Project') (Figure 1-2).

1.1.1 Marmora Pumped Storage Facility

The Project will feature a closed-loop pumped storage facility where water will recirculate between two reservoirs. The existing abandoned mine Open Pit will be repurposed as the lower reservoir, while the by-product waste rock piles will be reshaped to form the upper reservoir. General components of the facility would include a powerhouse (below ground) with a lower intake/outflow structure, and pumping station; a water conveyance system; auxiliary surface structures and access roads; and an approximate 10-km, 230-kV transmission line. The transmission line [proposed to be located underground, likely within the municipal road or trail allowance(s)] will connect the transformer station for the Project (to be located on site, near the existing Marmora Mine Road) to a new switching station located up to 10 km north of the Open Pit; within the vicinity of the existing Hydro One transmission lines that convey power between the greater Toronto and Ottawa regions.

Dissimilar to conventional hydroelectric facilities, the intent of the facility is energy storage, not energy production or generation. The Project seeks to transform and store energy from the grid before returning it based on demand.

1.1.2 Ground-Mounted Solar Facility

The ground-mounted solar facility will be approximately 90 hectares (ha) in size and is proposed to be located on previous coarse and fine rock deposit locations, some of which will be reshaped during the construction of the upper reservoir or other components of the pumped storage facility.

1.2 Proponent

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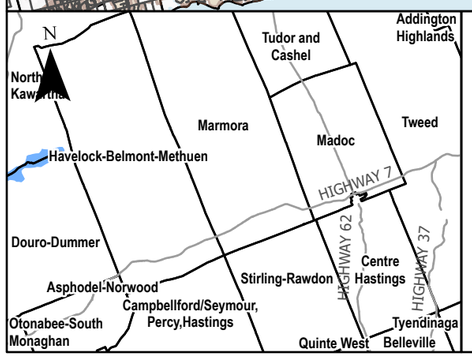
Esri, CGIAR, USGS

Bracebridge
Gravenhurst
Minden Hills
Dysart and Others
Highlands East
Faraday
Bancroft
Carlow/Mayo
Weslemkoon Lake
Limerick
Wollaston
North Kawartha
Chandos Lake
Addington Highlands
North Frontenac
Lanark Highlands
Mississippi Lake
Big Gull Lake
Bathurst Burgess Sherbrooke
OTTAWA 200 km
Tudor and Cashel
Galway Cavendish and Harvey
Central Frontenac
Bobs Lake
Elizabethtown Kitley
Big Rideau Lake
Upper Rideau Lake
Westport
Rideau Lakes
Newboro Lake
Athens
Ramara
Balsam Lake
Cameron Lake
Kawartha Lakes
Lake Simcoe
Sturgeon Lake
Pigeon Lake
Buckhorn Lake
Stony Lake
Curve Lake First Nation 35
Smith-Ennismore Lakefield
Chemong Lake
Douro-Dummer
Marmora
Havelock Belmont Methuen
Madoc
Tweed
Charleston Lake
South Frontenac
Stone Mills
Leeds and the Thousand Islands
55 km
14 km
39 km
43 km
52 km
99 km
101 km
44 km
Brock
Georgina
PETERBOROUGH
Asphodel Norwood
Stirling Rawdon
Centre Hastings
Campbellford/Seymour, Percy,Hastings
Cavan-Millbrook North Monaghan
Mississaugas of Scugog Island
Lake Scugog
Scugog
Uxbridge
Hiawatha First Nation 36
Alderville First Nation
Rice Lake
Quinte West
Belleville
Tyendinaga
Greater Napanee
Loyalist
KINGSTON
Gananoque
Lake of the Isles
Tyendinaga Mohawk Territory
Deseronto
Frontenac Islands
Alnwick/Haldimand
Cramahe
Brighton
Hamilton
Port Hope and Hope
Clarington
Cobourg
Prince Edward
Lake Ontario (lac Ontario)
Lake Ontario
West Lake
TORONTO 165 km



Legend

- Proposed Project Location
- Road
- Built Up Area
- Muncipal Boundary
- Waterbody
- First Nations Reserve (Land Information Ontario)
- Trent-Severn Waterway - Parks Canada Agency Jurisdiction
- Canadian Forces Base Trenton

Notes
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2. Spatial referencing: NAD 83 UTM Zone 18N

0 10 20 40 Kilometers

1:630,000

PROJECT: Marmora Clean Energy Hub Project

FIGURE TITLE: Project Location, Indigenous and Federal Lands

CLIENT: NORTHLAND POWER / ONTARIO POWER GENERATION

DWG BY:	CHK BY:	FIG NO.:	REV NO.:	PROJECT No.:
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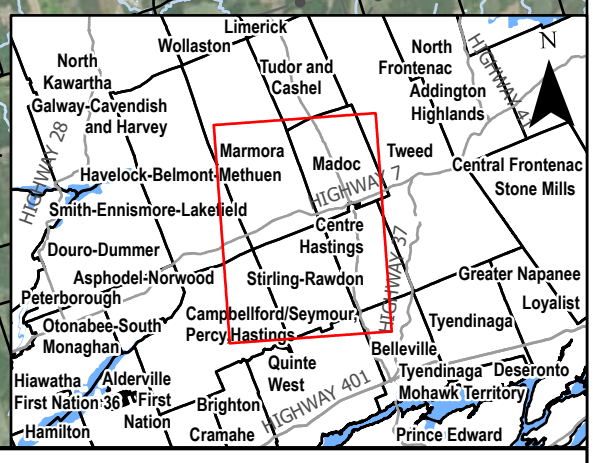
N

Buttermilk Lake
Twin Sister Lakes
Gawley Creek
Railway Creek
Eldorado Lake
Beaver Creek
Hazzard Lake
Beaver Creek
Jarvis Lake
Moira River
Crowe River
Crowe Lake
Crowe Lake Dam
HIGHWAY 7
Banker Lake
Madoc Creek
Moira Lake
Mud Lake
Snake Lake
White Lake
Rylstone Lake
Allan Mills Dam
Moreland Lake
Hourds Creek
Crowe Lake Weir
Crowe River
Rawdon Creek
Trent River



Legend

- Proposed Project Location
- Dam
- Potential Discharge Location
- Potential Water Conveyance Infrastructure
- Preliminary Preferred Transmission Line
- Road
- Operational Access Road
- Existing Transmission Line
- Watercourse
- Reservoir Location
- Construction Laydown / Facilities Area
- Proposed Operations Infrastructure & Switch Yard
- Potential Ground Mount Solar Areas
- Waterbody
- Preliminary Preferred HONI Transformer Location
- Potential Hydro One Interconnection Zone
- Potential Transmission Line Zone
- Preliminary Local Study Area

Notes
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0 1,000 2,000 4,000 Meters

1:120,000

PROJECT: Marmora Clean Energy Hub Project

FIGURE TITLE: Project Components Layout

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1.3 Summary of Engagement

NPI and OPG share a commitment to meaningful engagement with members of the public, agencies, other potentially interested parties, Indigenous communities/Nations and other rightsholders throughout the life of the Project. Together, NPI and OPG support shared priorities which include building strong communities with clean, long-lasting energy infrastructure, and creating new pathways to reduce Ontario's carbon footprint.

The following commitment underpins the Proponents approach to engagement throughout all phases of the Project:

> *NPI and OPG are committed to meaningful engagement. It creates access to information and opportunities for two-way communication. It opens doors to be heard and creates outcomes that everyone can be proud of. This is what we want to achieve with the Marmora Project*.

The communication methods that will be used to facilitate engagement will be:

- **Compliant** with Ontario accessibility standards (i.e., *Accessibility for Ontarians with Disabilities Act).*
- **Inclusive** of different learning preferences (e.g., print, digital, in-person).
- **Flexible** in how input or feedback can be provided (e.g., web, phone, in-person).
- **Accommodating** of multiple formats (e.g., virtual and in-person).
- **Informative**, up-to-date, easy-to-find and written in plain language.
- **Evolving** to accommodate different information needs over a multi-year period.

The Project has a long history of engagement, first introduced in early 2011. Previous engagement with community members and locally elected officials has included council presentations, open houses, and site tours, which have provided a platform for information sharing. The Project continues to garner support from local stakeholders and community groups at present, including:

- Council resolution by Municipality of Marmora and Lake supporting the Project (December 2021).
- Support from Hastings County (made up of the 14 area Municipalities) and Eastern Ontario Wardens' Caucus (heads of all counties in Eastern Ontario) for Municipal resolution (January 2022).
- Municipal road use agreement for underground transmission corridors.
- Written support from community members, associations and businesses.
    - The Project team has had meetings with the Ontario Mining Association (6/19/2014) and the Canadian Land Reclamation Association (6/19/2014), who have expressed support for the Project.

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- Residents Glenn and Dorothy Caverly (7/29/2011), Clarence and Barbara Reynolds (7/16/2011), and Brian and Maria Weber have provided letters of support for the Project.
- Valu-Mart (7/28/2011), Fleming College (7/13/2011), Trent University (7/11/2011), and Loyalist College (6/28/2011) have provided letters of support for the Project.
- Local businesses including Dan's Speed and Custom, Building Materials and Renovation Store, Top Quality Auto Service, and Valu-Mart, as well as AECON, have posted signage in support of the Project.
- Support for the Project has been published by International Water Power & Dam Construction (1/5/2013), the Globe and Mail (2/20/2013), Quinte News (3/6/2013), Transition Brockville (4/12/2012), the Community Press (10/5/2012, 7/17/2012, 3/14/2012, 12/14/2011, 6/16/2011), the Ontario Water Association (7/27/2011), the Belleville Intelligencer (7/26/2011), News Local (6/28/2011), and Northeast EMC News (8/4/2011). Kingston-Whig Standard (CKWS) aired a presentation on the Project and its attributes and benefits (11/24/2011).

- The Project also has had, and continues to have, positive engagement with Alderville First Nation (AFN), which is one the closet First Nations to the Project Location. Engagement with Indigenous communities/Nations is described in Section 1.3.2.

1.3.1 Summary of Recent Engagement with Members of the Public, Agencies and Other Potentially Interested Parties

The following engagement activities have been undertaken to share information with respect to the Project as currently proposed:

- Meetings with Ministry of Environment, Conservation and Parks (MECP) on May 9, 2022 and July 20, 2022.
- On-site meeting with Quinte Conservation and Crowe Valley Conservation, during the morning of October 6, 2022.
- On-site meeting with municipal staff, during the afternoon of October 6, 2022.
- The Project website was updated and re-launched in November 2022: www.marmorapumpedstorage.com.
- Meeting with MECP on November 24, 2022 to discuss the Project background, history, pumped storage, dewatering, alternatives considered, the preliminary preferred transmission route, environmental features, ongoing and planned investigation programs, permits and approvals, Project benefits. Topics raised by the MECP included consideration for Renewable Energy Approval requirements, the potential effects of dry summer months on pumped storage, support from Indigenous communities/Nations, and schedule. Following the meeting, the MECP provided the government review team list.
- Initial meeting with the Impact Assessment Agency of Canada (IAAC) on December 1, 2022 to discuss Pre-Planning Phase activities including next steps and timing.

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- Meeting with Quinte Conservation and Crowe Valley Conservation on December 5, 2022 to discuss the Project background, history, pumped storage, dewatering, alternatives considered, the preliminary preferred transmission route, environmental features, ongoing and planned investigation programs, permits and approvals, Project benefits. Topics raised by conservation authorities included consideration for hydrology within their respective watersheds as well as potential thermal considerations should pit waters differ from the receiving waters.
- A Community Information Session was held in Marmora and Lake on December 15, 2022.
- In January 2023, a comment form was posted to the Project website to allow stakeholders/interested parties to provide input. The form asks for the submitter's name and place of residence in relation to the Project (adjacent to the Project Location, within Marmora and Lake (permanent or seasonal resident), within Hastings County or other). The form has several prompts for feedback, using fields that question feelings on assessment of potential impacts, considerations for transmission line route selection, focus of baseline studies, and excess land use. The form also includes a field to provide any Project-related comments, questions or concerns.
- Presentations to Municipal (February 7, 2023) and Hastings County (February 23, 2023) Councils with a focus on high level Project description and the EA process.
- All-Agency kick-off meeting on February 24, 2023 to provide a Project overview/update and open discussion.
- Meeting with IAAC on March 23, 2023 to discuss Indigenous consultation and engagement.

The following provides a list of public, agency and other potentially interested parties identified to date. The table is subject to change pending joint discussions between NPI/OPG, MECP and IAAC.

Table 1-1: Public, Agency and Other Potentially Interested Parties Identified to Date

Federal Agencies
Canadian Council of Ministers of the Environment (CCME)
Canada Energy Regulator (CER)
Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)
Environment and Climate Change Canada (ECCC)
Fisheries and Oceans Canada (DFO)
Health Canada (HC)
Impact Assessment Agency of Canada (IAAC)
Indigenous Services Canada (ISC)
Innovation, Science and Economic Development Canada (ISED)
Parks Canada Agency (PCA)
Natural Resources Canada (NRCan)
Public Services and Procurement Canada (PSPC)

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Transport Canada (TC)
Members of Parliament (MP)
Provincial Agencies
Ministry of Agriculture, Food and Rural Affairs (OMAFRA)
Ministry of Community and Social Services (MCSS)
Ministry of Energy (MOE)
Ministry of Environment, Conservation and Parks (MECP)
Ministry of Health (MOH)
Ministry of Indigenous Affairs
Ministry of Infrastructure (MOI)
Ministry of Mines
Ministry of Municipal Affairs and Housing (MMAH)
Ministry of Natural Resources and Forestry (MNRF)
Ministry of Public and Business Service Delivery (MPBSD)
Ministry of Tourism, Culture and Sport (MTCS)
Ministry of Citizenship and Multiculturalism (MCM)
Ministry of Transportation (MTO)
Ontario Energy Board (OEB)
Members of Provincial Parliament (MPP)
Municipalities and Townships
Hastings Highland
Madoc & District Chamber of Commerce
Municipality of Centre Hastings
Municipality of Marmora and Lake
Municipality of Tweed
Town of Bancroft
Town of Deseronto
Township of Carlow/Mayo
Township of Faraday
Township of Havelock-Belmont-Methuen
Township of Limerick
Township of Madoc
Township of Sterling-Rawdon
Township of Tudor and Cashel
Township of Tyendinaga
Counties (Eastern Ontario Warden's Caucus)
City of Kawartha Lakes
County of Frontenac
County of Haliburton
County of Hastings
County of Lanark
County of Lennox and Addington
County of Northumberland
County of Peterborough

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County of Prince Edward
County of Renfrew
United Counties of Leeds and Grenville
United Counties of Prescott and Russell
United Counties of Stormont, Dundas and Glengarry
Conservation Authorities
Crowe River Conservation Authority (CRCA)
Quinte Conservation Authority (QCA)
Other Potentially Interested Parties
Crowe Lake Waterway Association
Fleming College
Havelock & District Snowmobile Club
Hydro One
Independent Electricity System Operator (IESO)
Loyalist College
Marmora Tourism Centre
Nogojiwanong Friendship Centre
Ontario Federation of Anglers and Hunters
Ontario Sustainable Energy Association
Ontario Waterpower Association
PTBO (Peterborough) Trails ATV Club
Trent Source Protection Coalition
Trent University
Utility Companies

1.3.1.1 Plan for Future Engagement

It is the Proponent's intention to facilitate regular engagement activities with stakeholders as the Project progresses. Future engagement activities may include those identified in the following table.

Table 1-2: Proposed Communication Methods

Online	In-Person	Media
Project Website E-mail E-newsletter (bi-annual) Social Media	Open Houses (bi-annual) Community Meetings Site Tours Community Event Participation Roundtable Discussions Focus Groups	Newspaper Radio Media Release

The frequency of engagement and communication products may increase at certain times over the course of the Project development process to best facilitate input during specific planning and/or decision-making points.

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Members of the public, agencies and other interested parties will be kept informed of all outcomes, decisions and opportunities for input as they arise. Reporting will be offered in various formats to ensure information remains transparent and easily accessible.

In addition to regular reporting, efforts will also be made to evaluate engagement efforts throughout the life of the Project so that adjustments can be made, and interests better served as a result.

The following engagement activities are currently ongoing or planned/scheduled:

- In Q2/Q3, provide communication to stakeholders regarding draft Terms of Reference (Notice of Commencement & Review) and Initial Project Description (IPD), and post the draft Terms of Reference, IPD and Detailed Project Description (DPD) to the Project website.
- In July 2023, provide communication to stakeholders regarding submission of final Terms of Reference (Notice of Submission) and post to Project website.
- Community Information Session #2: Summer 2023.
- Community Information Session #3: Fall 2023.

1.3.2 Summary of Engagement with Indigenous Communities/Nations

The Project is proposed within two historical First Nation treaties; the northern portion lies in Treaty 27/Treaty 27¼ (1819), and the southern portion lies in the Crawford Purchase. Both treaties and the Crawford Purchase, are the traditional and treaty territory of Alderville First Nation (AFN) and territory covered by the 2018 Williams Treaties settlement agreement. NPI and OPG have ongoing consultations with interested Williams Treaties First Nations (WTFN). Consultation milestones and intervals have been committed to with WTFN and are considered the basis of engagement.

NPI and OPG also have ongoing consultation with Métis Nation of Ontario (MNO), Mohawks of the Bay of Quinte First Nation, Algonquins of Ontario, Huron-Wendat Nation and Kawartha Nishnawbe Community.

A summary of engagement activities with Indigenous communities/Nations is provided in Section 1.3.2.1 and Section 1.3.2.2. Currently, engagement is focused on describing the Project components and their various alternatives to allow for discipline-specific consideration early in the decision-making process. Specifically, current and potential future traditional land-use, natural heritage interests and archeological interests are a focus to determine the preliminary preferred water conveyance route (see Sections 3.9 and 5.3), plans for Open Pit dewatering and operational water management (see Section 2.4.2.3.1), transmission line routing and methods (see Sections 2.4.1 and 2.7.3) as well as general layouts of components with some design flexibility (i.e., ground mount solar, electrical components, site access, etc.).

NPI and OPG are committed to developing mutually beneficial outcomes and opportunities with potentially interested Indigenous communities/Nations and rightsholders. The following table provides a list of Indigenous communities/Nations recommended by IAAC and MECP to

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be engaged with regards to the Project. The WTFN are shaded in orange. The communities/Nations in bold are those identified by both IAAC and MECP. Métis Nation of Ontario and Algonquins of Ontario were identified by IAAC only.

Table 1-3: Potentially Interested Indigenous Communities/Nations

Indigenous Communities/Nations
Alderville First Nation
Beausoleil First Nation
Chippewas of Georgina Island First Nation
Chippewas of Rama First Nation
Curve Lake First Nation
Hiawatha First Nation
Mississaugas of Scugog Island First Nation
Métis Nation of Ontario – Region 6
Mohawks of the Bay of Quinte First Nation
Algonquins of Ontario: - Antoine - Bonnechere - Greater Golden Lake - Kijicho Manito Madaouskarini (Bancroft) - Mattawa/North Bay - Ottawa - Pikwàkanagàn First Nation - Shabot Obaadjiwan (Sharbot Lake) - Snimikobi (Ardoch) - Whitney and Area
Huron-Wendat Nation
Kawartha Nishnawbe Community

1.3.2.1 Williams Treaties First Nations

For the communities/Nations that will be engaged, the Project team intends to implement a multi-tiered approach, looking to AFN as the lead for consultation and engagement.

The following engagement activities have been undertaken to share information with respect to the Project:

- Meeting with AFN on October 30, 2013, to introduce the Project and pumped storage, and discuss the Project Location, scale, importance and context.
- On-site meeting with AFN on January 12, 2022 to tour the Project Location and provide a Project overview.
- Virtual meetings with AFN on February 9, April 29, 2022, and May 17, 2022 to discuss confidential materials.
- Virtual meeting with AFN on May 30, 2022 to discuss employment opportunities and heavy machinery operation.

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- Meeting at AFN on June 13, 2022 to discuss invitation to participate in consultation activities and Project dewatering concerns.
- Virtual meeting with AFN on July 8, 2022 to discuss confidential materials and hiring an Indigenous Community Liaison.
- Meeting at AFN on July 22, 2022 to discuss confidential materials and Project dewatering concerns.
- Meeting at AFN on August 17, 2022 to review confidential materials.
- Meeting at AFN on September 21, 2022 to discuss confidential materials.
- Meeting at AFN on November 28, 2022 for day-long celebration of Treaty 27 and Treaty 27¼ intended to share information regarding these Treaties for invited guests.
- Invitation sent October 3, 2022 from AFN to all WTFN to participate in October 21, 2022 consultation meeting to be held at AFN.
- Virtual meeting on October 21, 2022 with AFN and Mississaugas of Scugog Island (MSIFN) to present the Project, and plan for future consultation.
- On February 14, 2023, an introductory letter and invitation to the first official consultation meeting for the Project (February 27, 2023) was sent to WTFN.
- Meeting in Cobourg, Ontario (also held virtually) with representatives from Curve Lake First Nation, MSIFN, Hiwatha First Nation, and Beausoleil First Nation on February 27, 2023. The meeting included a Project information sharing session, a Project overview presentation and an open discussion.
- On March 6, 2023, NPI/OPG reached out to Curve Lake First Nation and Hiawatha First Nation to confirm the correct consultation contacts for Project-related communication.
- On March 8, 2023, a representative form the Chippewas of Rama First Nation requested a map of the Project Location which NPI/OPG provided via email.
- On March 17, 2023, all Nations were notified that preliminary site activities (monitoring well installations) would be beginning the following weeks and running until late May.
- On March 28, 2023, NPI/OPG followed up with Chippewas of Georgina Island on the Project introduction/consultation meeting invitation letter via voicemail, and offered to present to the Nation, as they were not in attendance at the February 27, 2023 consultation meeting.
- On April 5, 2023, NPI/OPG followed up with Hiawatha First Nation again to confirm the correct consultation contacts for Project-related communication. In an ensuing phone call with a representative of the Nation, it was confirmed that an external consultant would be hired by the Nation and would contact NPI/OPG to discuss next steps, in addition to the Nation's consultation staff continuing to be included in consultation communications.

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- On April 6, 2023, a representative of AFN emailed NPI/OPG to inquire about accessing the Project site area to conduct studies (e.g. species at risk). In response, NPI/OPG committed to discussing the logistics of this request and would get back to the Nation. On April 20, 2023, NPI/OPG responded to the representative of the Nation requesting more information on what these studies would entail and their duration.
- Weekly touchpoint meetings occur with Chief Mowat of AFN to discuss any Project and/or consultation updates. In total, eight touchpoints have occurred since January 1, 2023.

1.3.2.2 Other Indigenous Communities

- On March 17, 2023, a Project consultation request was sent to Métis Nation of Ontario – Region 6 (MNO), Mohawks of the Bay of Quinte First Nation, Huron-Wendat Nation, and Kawartha Nishnawbe Community.
- On March 28, 2023, NPI/OPG left voicemails for representatives of Mohawks of the Bay of Quinte and Huron-Wendat Nation to follow up on the Project consultation request letters sent March 17, 2023.
- On March 30, 2023, NPI/OPG received a response from MNO to the introductory letter for the Project. MNO expressed interest in learning more about the Project via a presentation meeting. An introductory meeting has been scheduled with MNO Region 6 Consultation Committee for May 4, 2023.
- On March 31, 2023, NPI/OPG received a response from Huron-Wendat Nation to the introductory letter for the Project. Huron-Wendat Nation expressed interest in learning more about the Project via a presentation meeting to assess their level of involvement. Huron-Wendat Nation would also like to explore reaching a letter of agreement with NPI/OPG to define how the Nation would prefer to be consulted. An introductory meeting has been scheduled for May 9, 2023.
- On March 31, 2023, a representative of the Huron-Wendat Nation phoned to inquire about where the upper reservoir of the Project would be located, and NPI/OPG explained it would be built into the existing rock pile on site.
- On April 3, 2023, a letter introducing the Project was sent to Algonquins of Ontario (AOO). The letter recognizes AOO's interest in the natural environment and indicates the Proponent's commitment to sharing information regarding the Project through regular updates and notices as it progresses.
- On April 13, 2023, NPI/OPG were provided with updated contact information for Kawartha Nishnawbe Community, and therefore sent an email to these contacts providing the past emails which had been sent and offered to arrange a meeting.

A summary of key issues raised from the engagement activities to date is presented in Table 1-4 below.

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Table 1-4: Summary of Key Issues Raised from Indigenous Engagement Activities to Date

Environmental Component	Potential Effect	Project Phase	Summary of Key Issues Raised	Outcome of Engagement	Mitigation Measures, Avoidance or Regulatory Considerations
Water Quality	Dewatering of the Open Pit, operational water level management, site preparation	Preliminary Investigations, Construction, Operations	Potential for legacy pollution/contamination of the Open Pit water from historic mining activities.	Significance of water quality collection program and transparency/method of sharing testing frequency and results. These studies are described in Section 2.4.2.1.	Seasonal water quality and volumes of Open Pit and natural waters will inform which receiving water(s) are selected for discharge as part of the alternatives assessment. Dewatering flow rates, diffusion and treatment (if needed) will be explored as needed following MECP's most recent guidance (e.g.*, B-1-5 Deriving Receiving Water Based Point Source Effluent Requirements for Ontario Waters)*, as well as CCME quality standards with CCME's *Environmental Risk Management: Framework* informing the effluent discharge objectives. Offsite discharges of water will be approved through an MECP Environmental Compliance Approval and/or through conditions within the Permit to Take Water (PTTW). Water quality discharge will be evaluated and provided to DFO as part of the request for review process under the *Fisheries Act*, although it is understood that water quality or deleterious substance items submitted under the Fisheries Act are generally deferred to ECCC for review.
Groundwater	Dewatering of the Open Pit, operational water level management	Construction, Operation	Potential effects on groundwater levels and water wells of nearby residents.	Significance of hydrogeology data collection program (deep and shallow testing, community well testing) and transparency/method of sharing testing and results. These studies are described in Section 2.4.2.1.	Groundwater effects mitigation could take on several forms depending on potential impact and their geographical extent. The Project anticipates a groundwater well monitoring program will be implemented as part of the Project and conditions within the MECP PTTW are likely to require longer term monitoring of potentially impacted wells. The PTTW conditions will also include an appropriate conflict resolution process (e.g., installation of new or deeper wells) with appropriate contingency measures. Should planned hydrogeological evaluation and proceeding impact assessment show potential for significant impacts, the Project could explore the

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Environmental Component	Potential Effect	Project Phase	Summary of Key Issues Raised	Outcome of Engagement	Mitigation Measures, Avoidance or Regulatory Considerations
					feasibilities of additional mitigations *such as altering* the operational Open Pit water levels, reducing seepage into the Open Pit, and if applicable/suitable, artificial groundwater recharge following MECP's *Water management: policies, guidelines, provincial water quality objectives.*
Species at Risk (SAR)	Dewatering of the Open Pit, operational water level management, site preparation	Preliminary Investigations, Construction, Operation	Potential effects on species at risk (e.g., Mottled duskywing) from Project infrastructure (e.g., dewatering conveyance infrastructure).	Completion of coordinated field surveys (where appropriate) to assess for potential presence of Species at Risk. This can be captured under the natural heritage investigations described in Section 2.4.2.1.	Indigenous valued Species at Risk and other valued species will be considered within the final alternatives assessment, Project planning/layouts, reclamation and future decommissioning plans. The Project site offers a plethora of opportunity to achieve overall benefits to species at risk (See Section 5.6) for species of interest. For example, a reclamation or decommissioning objective may be to encourage prairie grassland or oak savannah type habitat, which has the potential for direct betterment of various species listed in Section 3.8.4. Additional species would benefit if this habitat were to also create a more robust riparian area along Marmora Mines Provincially Significant Wetland (PSW). During construction and operations (when applicable), the Project will abide by mitigative timing windows wherever possible and understands that some Project areas or components may have conflicting timing windows based on baseline investigation outcomes. A Project component/ location specific mitigation plan will be developed in conjunction with Indigenous communities (i.e., WTFN) and MECP.

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Environmental Component	Potential Effect	Project Phase	Summary of Key Issues Raised	Outcome of Engagement	Mitigation Measures, Avoidance or Regulatory Considerations
Use of Lands and Resources for Traditional Purposes by Indigenous People	Dewatering of the Open Pit, site preparation, operations	Construction	Inability to use the Open Pit for swimming and potential hunting/harvesting. Rights of access for dewatering conveyance infrastructure. Consideration of Wild Rice harvest for timing of dewatering to Crowe River. Consideration of traditional use within treaty areas for hunting, fishing and trapping, wetlands being crucial.	Survey communities/ Nations on traditional land use in Project study areas. Inclusion of land use and traditional land use in alternatives assessment for dewatering conveyance route.	NPI and OPG are committed to maintaining and where possible improving land-use and available resources to Indigenous peoples. The Project offers a unique opportunity with over 1,500 acres of land and private access to wetlands, lakes, agricultural lands and general green space that could potentially be used by Indigenous peoples through suitable access agreements or other arrangements. Additionally, this Project has the potential ability to create more greenspace than what currently exists and improve upon general current conditions that should lead additional resources for future generations. For example, improvement of fish and wildlife passage through the Marmora Provincial Significant Wetland (where current obstructions exist, blocking fish and aquatic wildlife passage between Mud Lake and Moira River), and/or improvement of riparian areas for the betterment of water quality and reducing potential wildlife conflicts (e.g., turtle nesting on the mine site). Through Project engagement with Indigenous peoples, land-use has been and will continue to be taken into consideration during the alternatives assessment and overall Project planning. Specifically, Wild Rice harvesting on the Crowe River has been mentioned. Wild Rice is known to grow within relatively stable/shallow waters with organics substrates. Due to the regulated nature of the Crowe River, water levels are not expected to change because of any Open Pit dewatering to the Crowe River. Exact location of Wild Rice harvesting was not shared; however, a 2013 MNRF wetland evaluation spanning from Highway 7 to near Callaghan Rapids did identify a Wild Rice area within the Crowe River PSW. The location of the 2013 Wild Rice area is between the upper most two Crowe River potential discharge location points shown in Figure 1-2.

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Environmental Component	Potential Effect	Project Phase	Summary of Key Issues Raised	Outcome of Engagement	Mitigation Measures, Avoidance or Regulatory Considerations
					Through proper discharge location selection, planning, timing, frequency, flow rates and diffuser design (if needed) can be managed to ensure areas of organic substrates remain relatively unchanged. This evaluation would be included within the IA/EA as well as the MECP PTTW application. In both evaluations, the Project will be utilizing MECP's *Technical guidance document for surface water studies in support of category 3 applications* Specifically, the Project has completed a frequency analysis of the 7Q20 flows of the Crowe and Moira Rivers to inform Project decisions. As per MECP's technical guidance, "In Ontario, stream low flow has typically been derived from a frequency analysis of the 7Q20 which the Ministry uses as a minimum flow criterion for an assimilative capacity assessment of a municipal or industrial direct discharge. Several methods are available to calculate 7Q indices, and they serve as a practical screening tool for a desk-top assessment." As the Project advances, a site-specific stand-alone assessment is expected to be completed to inform potential impacts and any relevant mitigations that may be needed. Given the last known mapping of the Wild Rice Stands from 2013, the wetland will be resurveyed as part of baseline investigations to better understand current conditions.

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Environmental Component	Potential Effect	Project Phase	Summary of Key Issues Raised	Outcome of Engagement	Mitigation Measures, Avoidance or Regulatory Considerations
Economic Context	Economic Benefits	Construction	Interest in opportunities for training, apprenticeship, employment and procurement, specifically for trades and heavy equipment operation.	NPI/OPG's commitment to creating opportunities for Indigenous communities/Nations can be reflected in plans for future engagement focussing on potential opportunities as the Project progresses.	NPI and OPG are currently in discussion with WTFN regarding potential involvement in baseline data collection programs and review of environmental documents. As engagement advances and relationships mature, NPI and OPG expect further opportunities will present themselves and are open to discussions of this nature. Specifically, a significant opportunity exists during the construction phase, provided there will be hundreds of construction staff onsite over the 4 to 5-yr period. This construction Project offers an excellent opportunity for experienced Indigenous peoples to find meaningful employment, as well as Indigenous peoples that may be new to the construction workforce to find and complete apprenticeships, build their professional network, and promote long term prosperity.

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1.3.2.3 Plan for Future Engagement

NPI and OPG are committed to working respectfully with Indigenous Peoples by:

- Listening to Indigenous perspectives.
- Engaging in meaningful consultation early, often and throughout the life of the proposed Project.
- Undertaking work in a manner that seeks to preserve Indigenous heritage, cultures and values.
- Performing a social impact assessment that will consider Indigenous perspectives, including traditional knowledge.

Future engagement with Indigenous communities/Nations may include the following:

- Determining whether communities/Nations will assist in the baseline investigations (described in Section 2.4.2.1) and work toward building Indigenous values and survey techniques into the upcoming Site investigations.
- Collaborating with Indigenous communities/Nations to incorporate Indigenous knowledge into the baseline characterizations as well as the impact assessment.
- Sharing information and gathering feedback.
- A site tour in Spring 2023.

1.4 Relevant Regional Studies, Plans and Assessments

No relevant regional studies or plans, nor Regional Assessments carried out under the Impact Assessment or by any other jurisdiction are known to be available.

1.5 Strategic Assessments

The following strategic assessment, relevant to the Project, has been carried out under section 95 of the *Impact Assessment Act.* This assessment will enable consistent, predictable, efficient and transparent consideration of climate change throughout the impact assessment process:

- Environment and Climate Change Canada (ECCC), 2020. Strategic Assessment of Climate Change. Available online at: https://www.strategicassessmentclimatechange.ca/. Revised October 2020.

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2. Project Information

2.1 Project Purpose and Need

To achieve net-zero emissions by 2050, Canada's economy will need to be powered by both clean electricity and low-carbon fuels. Contributions to this effort, specific to Canada and Ontario respectively, include achieving net-zero emissions by 2050, and reaching zero emissions in the electricity system by 2035 (Government of Canada, 2022).

The Project has a targeted an in-service timeframe of 2029 and will feed clean energy to the grid during higher demand periods and draw power from the grid during lower demand. By 2029, the Project would be available to support the growing capacity needs that emerge in the mid-2020s and grow into the 2030s with clean, reliable electricity generation and the commitment to a flexible, decarbonized system.

2.2 Potential Project Benefits

A shift to an electrified economy with increased renewables has implications for energy system planning. Renewables generate when the resource (wind, sun) is available and generally cannot provide the energy reserves that are vital to electricity grid stability. Therefore, the energy transition will require large quantities of long duration storage to maintain security of supply, avoid wasted energy, and provide large-scale balancing and grid services (Pumped Storage Hydropower International Forum, 2021). Pumped storage hydropower offers a cost-effective, efficient solution.

This Project represents a bold step into a new era of energy management, as it would be the first closed-loop pumped storage and mine repurposed for hydroelectric generation in Canada. The Project presents an opportunity to diversify Ontario's energy supply and strengthen the overall flexibility, reliability and resilience of the province's power system, allowing it to accommodate new peak demand over the next 90+ years.

The Project is optimally located between Ontario's two largest load demand centers (Toronto and Ottawa). It is close to existing infrastructure (direct access to Highway 7; Hydro One transmission corridor located approximately 10 km north; and within close proximity by vehicle to multiple communities) and located outside of a snow belt, which minimizes scheduling risk, reduces capital costs, and supports construction and operations.

The Project represents a $2.0 billion investment for electricity system infrastructure that has the potential to provide a major electricity system asset and economic development engine for eastern Ontario. The investment is supported with more than 70% of construction costs expected from the Canadian supply chain.

There is also opportunity for economic development in the form of job creation, tourism and education. Approximately 3,500 jobs (direct and indirect) are expected to be created over the lifespan on the Project, and total wages earned by Marmora and Lake residents could be increased by 15% to 20% (A-Frame Content & Marketing, 2014).

The Open Pit is designated a provincially significant Earth Science Area of Natural and Scientific Interest (ANSI) by the MNRF and attracts visitors every year to appreciate its

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geologic uniqueness. Per the Earth Science Inventory Checklist provided by MNRF, the Marmoraton Mine Earth Science feature is the unconformable contact of the Precambrian and Paleozoic (Shadow Lake Formation) bedrock. Since the mine ceased operation in 1978, the Open Pit has continued to infill with groundwater and precipitation. Based on the current water level in the Open Pit (approximately 180 m), the Shadow Lake Formation is partially underwater, with the additional wall features expected to be further inundated until such a time the Open Pit water elevation stabilizes. The Project intends to lower the water level within the Open Pit, thus improving the visibility of the geological features in the upper portions of the Open Pit. Further, development of the Project could draw visitors (similar to other pumped storage sites around the world); one geographically comparable pumped storage site attracts over 200,000 visitors annually. The Project is projected to generate an economic impact of up to $32 million per year (A-Frame Content & Marketing, 2014).

2.3 Regulatory Requirements

2.3.1 Impact Assessment Act

The undertaking is a designated project under the Canadian Impact Assessment (IA) Act (S.C. 2019) expected to meet (IAAC confirmation needed) the definition of “the construction, operation, decommissioning and abandonment of a new hydroelectric generating facility with a production capacity of 200 MW or more;” per Section 42(a) of the Physical Activities Regulation (SOR/2019-285).

2.3.2 Ontario Environmental Assessment Act

In accordance with the Electricity Projects Regulation (O. Reg. 116/01) of the Ontario Environmental Assessment Act, new waterpower projects greater than 200 MW in capacity must undergo an Individual Environmental Assessment (EA). The Project will have a name plate capacity of approximately 400 MW and, therefore, must undergo an Individual EA.

As specified in the Ontario Guide to Environmental Assessment Requirements for Electricity Projects, the Project’s associated 230-kV, approximate 10-km transmission line that is proposed to run from the pumped storage/solar facility to the switching station near Quinn Road would trigger the need for an Environmental Screening per O. Reg 116/01. However, as a component of a Category C electricity project, the transmission line would be assessed under the Individual EA process described above.

2.3.3 Additional Permitting and Approval Requirements

A summary of key permits, approvals and authorization requirements is provided in Table 2-1.

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Table 2-1: Summary of Key Permits, Approvals and Authorization Requirements

Legislation	Agency	Permit, Approval or Authorization	New or Amendment of Existing Approval	Likelihood	Rationale	Stakeholder Considerations/Interests (Mitigation Measures)
Impact Assessment Act	IAAC	Impact Assessment Approval	New	Required	Considered a designated project: the construction and operation of a new hydroelectric generating facility with a production capacity of 200 MW or more.	General environmental effects evaluation for Project components during the Project lifecycle.
Fisheries Act	DFO	Letter of Advice or Section 35(2)(b) – Authorization for Serious Harm to Fish	New	Required	Approval type dependent on any Open Pit dewatering impacts, as well as outfall footprints and upgrades, replacements, or additions to culverts.	Impacts to fish and downstream water use/quality during construction and operations. MECP and CCME effluent frameworks and guidance to be used to ensure quality and flows meet Industry standards. Industry standard erosion and sediment control measures can mitigate potential effects. Open Pit is not thought to be considered fish habitat. As per DFO's Project near water website; isolated quarries, aggregate, privately owned or commercially owned ponds do not require review by DFO.
Species at Risk Act (SARA)	DFO	Permit for activities that may affect species listed on Schedule 1	New	Dependent on potential dewatering impacts to Moira River	Required for work that may affect defined aquatic species at risk (Channel Darter habitat is available in the Moira River).	Impacts to SARA fish during construction and operations. Impacts to SARA fish within Moira River heavily weighted during alternatives assessments, helping to determine the Crowe River as the preliminary preferred discharge location for Open Pit dewatering. Quinte Conservation has noted a possible overall benefit of dewatering to Moira watercourse, wetland and river. As a result operational water being discharged to the system will be

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Legislation	Agency	Permit, Approval or Authorization	New or Amendment of Existing Approval	Likelihood	Rationale	Stakeholder Considerations/Interests (Mitigation Measures)
						evaluated moving forward and include any potential beneficial or adverse impacts to SARA fish as well as general SARA wildlife.
Canadian Navigable Waters Act (CNWA)	TC	Approval from Navigation Protection Program Major/Minor Works	New	Unlikely – provided design avoidance strategy taken into consideration	May be required if the outfall for dewatering is considered to have the potential to interfere with navigation.	No watercourses within the Study Area are scheduled waterways under CNWA. The regulated nature of Crowe River will mitigate alterations to flows and velocities; furthermore, dams and weirs limit boat traffic. Hydrology review of Crowe and Moira Rivers indicates Crowe River is more accustomed to larger flows. Open Pit dewatering discharge volumes are not expected to present any abnormal navigation flows or velocities on Crowe River. Conversely, discharge volumes would likely be noticeable on Moira River during low flow times. This supports Crowe River as preliminary preferred discharge location for dewatering. Public safety considerations on navigable waters during minimal in-stream construction activities. Management Plans including signage and communication plans can manage potential effects.
Migratory Birds Convention Act	ECCC	Compliance with the migratory breeding bird timing windows	N/A	Required	Required for site preparation activities that have the potential to result in destruction of nests or individuals.	Potential effects on birds during construction. Timing considerations, work phasing, and isolation can manage potential effects during construction and operations. .

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Legislation	Agency	Permit, Approval or Authorization	New or Amendment of Existing Approval	Likelihood	Rationale	Stakeholder Considerations/Interests (Mitigation Measures)
Aeronautics Act	TC	Section 601.23 (1) Aeronautical Obstruction Clearance Approval	New	Not expected to be required as the Project does not have any components that would obstruct air navigation	Required to prevent obstruction with air navigation.	N/A
Transportation of Dangerous Goods Act	TC	Explosives Transportation Permit	New	Potentially Required	Required for the transportation of explosives by road in loads greater than 2000 kg.	Public safety will be addressed and managed through traffic management plans during construction and operations.
Explosives Act	NRCan	License	New	Potentially Required	Required to store blasting explosives or any other type of industrial explosives (if the quantity exceeds 75 kg or 100 detonators, or the period of storage exceeds 90 days).	Noise and vibration, public safety during construction. Air and noise baseline monitoring will be conducted. Management Plans can manage potential effects.
Environmental Assessment Act	MECP	Individual EA under the Electricity Projects Regulation (O. Reg. 116/01)	New	Required	The pumped storage facility would have a nameplate capacity greater than 200 MW and uses water power as its primary source.	General environmental effects evaluation during the Project lifecycle.
		Class EA for Minor Transmission Facilities (O. Reg. 116/01)	N/A	Requirements addressed in Individual EA	The proposed ~10-km, 230-kV transmission line would be subject to the Class EA for Minor Transmission Facilities if Individual EA was not being completed. All requirements will be completed under IA/EA.	

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Legislation	Agency	Permit, Approval or Authorization	New or Amendment of Existing Approval	Likelihood	Rationale	Stakeholder Considerations/Interests (Mitigation Measures)
Ontario Water Resources Act, 1990	MECP	Section 34: Category 3 Permit to Take Water (PTTW) – Surface Waters for Dewatering	New	Required	Required for Open Pit dewatering to complete geotechnical investigations or for construction dewatering (see Section 2.4.2.3.1).	Potential effects to groundwater wells, water quality and quantity, discharge, during construction and operation. Various guidance, policies and frameworks to be followed to minimize potential effects and implement adjustments where needed (see Table 1-4).
		Section 34: Category 3 PTTW – Surface Waters for Operations	Amendment	Required	Required for discharge of Open Pit infill waters during Operations assuming 10-L/S surplus = 864,000 L/day.	
Public Transportation and Highway Improvement Act, 1990	MTO	Work Permit	New	Required	Required if a building, structure or entrance of any road is placed within 45 m of the limit of any highway, or 180 m of the center point of any intersection. Expected to be required for transmission line installation beneath Highway 7. Also for potential alterations of the Highway 7 culverts to accommodate additional flows during dewatering.	Traffic considerations and road conditions for access (construction and operations).
Endangered Species Act, 2007	MECP	Letter of Advice or Overall Benefit Permit	New	Likely Required	Required for works affecting SAR and their habitat.	SAR, Species of Indigenous Significance are being reviewed with Indigenous peoples for design considerations. Discussions ongoing for collaborative approach to SAR, including data collection. Opportunities to create and encourage SAR habitat (See Table 1-4).

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Legislation	Agency	Permit, Approval or Authorization	New or Amendment of Existing Approval	Likelihood	Rationale	Stakeholder Considerations/Interests (Mitigation Measures)
Conservation Authorities Act, 1990	Quinte Conservation Authority, Crowe Valley Conservation Authority	Work Permit (O. Reg. 319/09, O. Reg. 159/06)	New	Required for dewatering	Permission required to straighten, change, divert or interfere with the existing channel of a river, creek, stream or watercourse or change or interfere with a wetland during construction and/or operations.	Potential effects of dewatering and site preparation on surface water during construction and operations. Industry standard erosion and sediment control measures can mitigate potential effects. Data shared with Conservation Authorities to manage water resources in the watershed.
			Amendment	Required for main works		
				Required for operations		
Ontario Water Resources Act, 1990	MECP	Section 53: Environmental Compliance Approval (ECA) – Industrial Sewage	New	Required – stormwater strategy, possibly combined with operation discharge PTTW	Required for the discharge of sewage (i.e., drainage, stormwater) to ground or surface water; to establish, alter, extend or replace any sewage works (i.e., any works for the collection, transmission, treatment and disposal of sewage).	Potential effects to groundwater wells, water quality and quantity, discharge, etc.
Environmental Protection Act, 1990	MECP	Section 9 (1): ECA – Air & Noise	New	Required	Required to permit construction, operation or alteration of a plant or production process that discharges a contaminant into any part of the natural environment other than water (i.e., air).	Air quality, noise. (Air and noise baseline monitoring).
Environmental Protection Act	MECP	*Renewable Energy Approvals (REA)*	New	Required	Required for solar portion of the Project. Specific REA requirements to be included within Individual EA.	General environmental effects evaluation and mitigation measures will be addressed through the Terms of Reference and Individual EA.

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Legislation	Agency	Permit, Approval or Authorization	New or Amendment of Existing Approval	Likelihood	Rationale	Stakeholder Considerations/Interests (Mitigation Measures)
Aggregate Resources Act, 1990	MNRF	Aggregate License	Potential for amendment	Not expected to be required	Potential for existing aggregate permits to exist based on past use by Aecon. Aggregate permits often come with closure conditions. Permit may need to be amended if one exists. The material from the Open Pit has already been extracted and therefore a permit is not anticipated.	Material sourcing. (Criteria development for alternatives assessment).
Lakes and Rivers Improvement Act (LRIA), 1990	MNRF	Section 14(1): Work Permit Approval	New	Likely Required for upper reservoir and potentially for transfer of water between watersheds	Required for work involving dams (any structure of work forwarding, holding back or diverting water). Required for the transfer of waters between watersheds, Open Pit dewatering to Crowe River may trigger LRIA review, likely to be addressed during PTTW and Conservation Authority Permits.	Public safety. (Criteria development for alternatives assessment).

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Legislation	Agency	Permit, Approval or Authorization	New or Amendment of Existing Approval	Likelihood	Rationale	Stakeholder Considerations/Interests (Mitigation Measures)
Fish and Wildlife Conservation Act, 1997	MNRF	License to Collect Fish (O. Reg. 664/98)	New	Required	Required for fish salvages/rescues and baseline investigations.	Presence of fish within the Open Pit. Any fish collections within the Moira Watershed where SARA Channel Darter exists. Prior to construction dewatering proper mitigations will be determined through agency, public and Indigenous consultation. Applicability/practically fish rescue/salvage within the Open Pit evaluated. Baseline collections will be limited to where information gaps exist. Proper handling techniques and overall personnel qualifications included within the licence will mitigate potential effects during data collection.
Crown Forest Sustainability Act, 1994	MNRF	Forest Resource License	New	Not expected to be required	Required should there be cutting of Crown timber. Land ownership confirmation required, specifically if tree clearing is needed to install intake/outfall within Crowe/Moira River riparian areas.	Tree clearing will be required on-site. Timber management measures will be employed based on confirmation of land ownership off-site. (Criteria development for alternatives assessment).
Occupational Health and Safety Act, 1990	Ministry of Labour	Notice of Project	New	Required	Required prior to starting a construction project.	Public safety. Communications and Safety Plans will address these considerations. (Criteria development for alternatives assessment).

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Legislation	Agency	Permit, Approval or Authorization	New or Amendment of Existing Approval	Likelihood	Rationale	Stakeholder Considerations/Interests (Mitigation Measures)
Ontario Heritage Act, 1990	MTCS	Compliance with the Ontario Heritage Act	N/A	Required	Required for site preparation activities that have the potential to result in destruction or disturbance of cultural heritage resources of nests or individuals.	Preservation of cultural heritage resources have been and will continue to be identified through Archaeological and Cultural Assessments with mitigation measures during construction. (Criteria development for alternatives assessment).
Planning Act, 1990	County of Hastings, Municipality of Marmora and Lake	Municipal approvals: Official Plan Amendment (Provincial Policy Statement), Site Plan Approval, Re-Zoning	New	Required	Required for the development of the proposed facility (changes to Official Plans are subject to the Provincial Planning Policy). Site currently considered an ANSI under the official plan.	Traffic considerations and road conditions during construction and operations will be addressed through the Traffic Management Plan. (Criteria development for alternatives assessment).
Ontario Building Code	Municipality of Marmora and Lake	Building permit	New	Required	Required for construction of buildings and other structures.	Municipal planning.

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2.4 Activities, Infrastructure, Structures and Physical Works

2.4.1 Proposed Project Facilities and Infrastructure

The Project proposes a 400-MW pumped storage hydropower facility consisting of a closed-loop scheme with two reservoirs, and an approximate 90-ha, 30-MW ground-mount solar facility (Figure 1-2).

Descriptions of the Project components are presented in the following sections. It should be noted that these components are subject to change as designs becomes more defined and could be influenced by the environmental scopes of work.

To-date, multiple underground access alternatives have been explored. An initial consideration involved construction of an access tunnel at 80 metres above sea level (masl) through the northern end of the Open Pit wall (as shown in Figure 2-1). More recently proposed concepts explore alternatives to avoid construction of the primary access tunnel within the Open Pit, such as a surface access tunnel arrangement. This approach would manage unknown or uncertain Open Pit geotechnical conditions and avoid the need to dewater during the planning phase, as well as other unknowns. This is further described in Section 2.4.2.3.1.

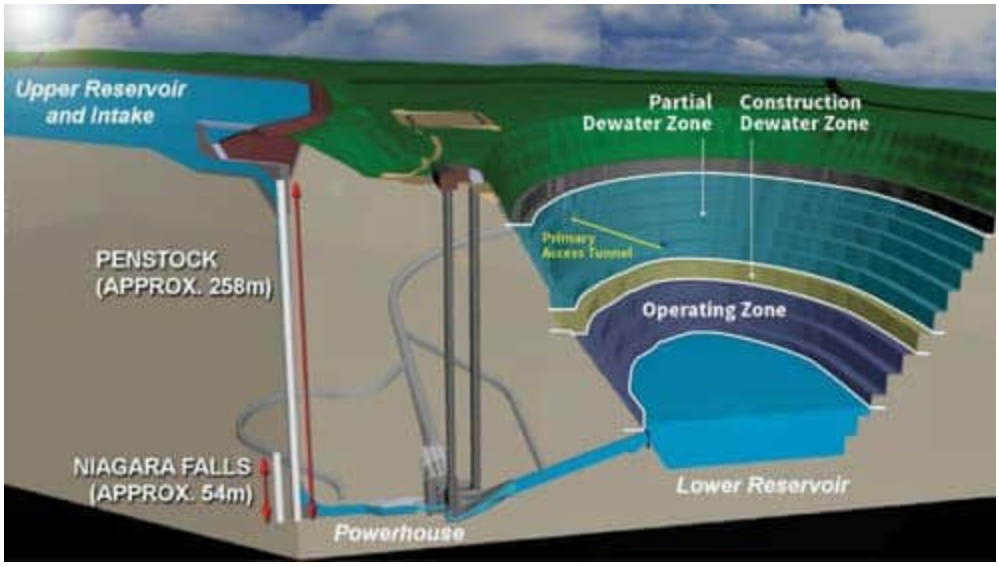

Figure 2-1: Main Components of the Pumped Storage Facility (Open Pit Primary Access Tunnel Configuration)

2.4.1.1 Lower Reservoir

The Open Pit will be utilized to create the Lower Reservoir. Current concepts indicate that the water level within the Open Pit will require lowering to a live storage capacity of 4.42 million m^3, adequate for 5 hours of daily peaking, yielding 2 GWh per day of peak period generation. The Lower Reservoir will contain a draft tube tunnel outlet of the power station and draft tube closure gates and guides. The Lower Reservoir will have a low supply level

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(LSL) of 7 masl and a full supply level (FSL) of 72.96 masl, with a full storage capacity of 4.48 million m^3 (SNC Lavalin, 2018).

2.4.1.2 *Upper Reservoir*

The Upper Reservoir is proposed to be constructed on the northeast portion of the existing non-reclaimed broken rock pile to function as a headrace pond. Construction of an upper containment dam with an impervious liner will be required, with the on-site materials being utilized to the extent possible. Several considerations will contribute to the selected layout of the Upper Reservoir, including but not limited to reservoir location and shape, natural sloping and drainage characteristics, rock properties and bedrock profile, and permeability and liner requirements (SNC Lavalin, 2018). These items will be further discussed in the alternatives assessment.

Currently, a 20-m deep reservoir with a length of 840 m and bottom elevation of 225 masl in the northern part of the rock pile is envisioned (BBA, 2022). A summary of the operational reservoir data is provided in Table 2-2. (SNC Lavalin, 2018).

Table 2-2: Summary of the Operational Reservoirs Data

Parameter	Upper Reservoir (masl)	Lower Reservoir (masl)
Full Supply Level (FSL) (masl)	245.00	72.96
Low Supply Level (LSL) (masl)	226.73	7.00
Bottom of Reservoir (masl)	225.00	-6.00
Gross Storage at FSL (million m^3)	4.76	4.48
Gross Storage at LSL (million m^3)	0.34	0.06
Live Storage (million m^3)	4.42	4.42

2.4.1.3 *Powerhouse and Power Intake*

At this concept stage, the powerhouse has been proposed to be located below ground surface between the Upper and Lower Reservoirs with the transformers and control room located above surface directly over the powerhouse. The powerhouse will house two variable speed reversible pump-turbines to both (a) produce energy during peak demand hours (turbine mode) and (b) fill up the reservoir during hours of low demand (pumping mode). Currently, the pump-turbine units are designed with a rated capacity of 200 MW for a total combined installed capacity of 400 MW (SNC Lavalin, 2018).

The powerhouse is proposed to have two forms of personnel access:

- tunnel (±1222 m long) from the surface to the powerhouse, sufficient to allow vehicle access
- vertical shaft (6 m diameter and ±210 m deep) connecting the control room to the powerhouse.

An additional vertical busbar shaft that is 7 m in diameter and 242 m deep is proposed to connect the generators in the powerhouse to the transformers on the surface. The initial concept design also included a powerhouse intake in the Upper Reservoir made of reinforced

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concrete to minimize hydraulic loss. This intake has been proposed to function as a conventional horizontal scheme constructed from reinforced concrete with proper entrance shapes (SNC Lavalin, 2018).

2.4.1.4 Water Conveyance System

During peak hours, the headgates will open and the water within the Upper Reservoir will travel down the penstock into the powerhouse. The penstock connecting the Upper Reservoir to the powerhouse is currently designed to comprise of a short horizontal cut and cover section made of reinforced concrete followed by a vertical shaft approximately 210 m high and a horizontal tunnel approximately 104 m long. The tailrace tunnel between the Lower Reservoir and the powerhouse will undergo further design determined during the engineering optimization exercise within Phase 2 (SNC Lavalin, 2018).

2.4.1.5 Surface Buildings, Auxiliary Surface Structures and Access Roads

Based on previous design reports, the following surface structures are anticipated to be needed for Project implementation:

- control/operations buildings
- transformer station
- maintenance building
- equipment laydown areas
- new access roads.

2.4.1.6 230-kV Transmission Line

The Project's preliminary preferred transmission corridor is comprised of two 230-kV, 3-phase circuits connecting the pumped storage/solar facility transformer station to a switching station located near Quinn Road. The preliminary preferred transmission line would travel aboveground from the on-site Marmora transformer station to Marmora Mine Road. The line would go underground at Marmora Mine Road and continue north on Marmora Mine Road to Highway 7, where it would then cross and continue north on Goat Hill Road and Centre Line Road, until it reaches Beaver Creek Road (refer to Figure 1-2). Upon reaching Beaver Creek Road, the line may travel westward until Quinn Road, turning north on Quinn Road for approximately 250 m before reaching the first of four parallel existing transmission lines. The above-noted switching station is to be located near the four transmission lines with the most northern line being approximately 520 m north of Beaver Creek Road.

There are various alternatives being considered for the electric transmission line interconnection. The underground 230-kV transmission circuits would enter the Hydro One compound, which will be an indoor gas-insulated switchgear (GIS) or an outdoor air insulated switchgear (AIS). This element of the Project would be designed and delivered by Hydro One; however, it will be assessed by the Project environmental process. Switching station details and siting study is currently under review by Hydro One.

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Based on the preliminary preferred route, the total length of the transmission line from the Project transformers to the Hydro One switching station near Quinn Road is approximately 10 km and, beginning at Marmora Mine Road, is anticipated to be located entirely underground within the municipal road allowance. It is noted that the route of the proposed transmission line is subject to change based on a technical evaluation and environmental findings of the transmission routes.

2.4.1.7 Ground-Mounted Solar Facility

The Project intends to include an approximately 90-ha solar facility with approximately 30 MW of ground-mounted solar infrastructure to partially offset the off-peak pumping of the pumped storage facility. The proposed locations of the solar infrastructure within the Project Location are former mine, non-reclaimed lands, as shown in Figure 1-2. East of Hastings Trail is a deposit of fine-processed rock/area of non-reclaimed abandoned mine lands consisting of compacted rock providing an ideal, cost-effective “spear” foundation for approximately 20 MW of ground-mount solar. The additional proposed solar location is located south of the proposed upper reservoir. This area provides an opportunity for rock to be tiered/layered/graded to support approximately 10 MW of ground-mounted solar.

2.4.2 Project Phases

The following sections outline the activities, infrastructure, permanent or temporary structures and physical works and activities are anticipated to be included in at least one of the: study phases (ongoing investigation/data collection), advanced works, construction, and operation phases of the Project.

2.4.2.1 Preliminary Environmental Investigations

Table 2-3 provides a summary of the preliminary environmental investigations completed or scheduled as part of the ongoing investigations phase of the Project.

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Table 2-3: Summary of Preliminary Environmental Investigations

Discipline	Completed Desktop Review	Baseline Investigation	Rationale	Status
Geology, Hydrogeology and Hydrology	Previous Studies including - *Marmora Pumped Storage Development Conceptual Study (Hatch, 2011), and* - *Open Pit wall bedrock quality, and waste rock and tailings quality from "Preliminary Environmental Site Investigation" (Hatch, 2009).* Site topographical information including the Soil Survey for Ontario, Bedrock Geology Mapping from OGS Earth and Aerial Photos. MECP Well Water Information System (WWIS) for lithological, material and hydrogeological information. Provincial Groundwater Monitoring Network (PGMN) data on ambient (baseline) groundwater level and chemistry conditions.	Undertake a geotechnical study. Undertake a hydrology study (monitored during dewatering). Undertake a hydrogeological study (monitored during dewatering).	To reduce the uncertainty of potential Project risks that remain following the desktop study. To inform Open Pit water discharge criteria/plan and support dewatering permit application submission. To support monitoring of potential effects of dewatering.	Studies commenced in Q4 2022 and are ongoing. Longer term monitoring expected to continue through construction and operational phase.
Water Quality	Previous Studies including - *Trent Conservation Coalition Source Protection Assessment Report* - The "*Marmora Open Pit Water Quality Study*" (Morrison Beatty, 1987), and - Water quality analysis of Marmora Open Pit water quality in "*Preliminary Environmental Site Investigation*" (Hatch, 2009), among others. Provincial Water Quality Monitoring Data Water Survey of Canada Hydrometric Station River Flow Data at stations located at the Moira River near Deloro and Crowe River at Marmora. Quinte Watershed Report, Source Water Reports and Related Studies for baseline water quality, quantity and earth science information. Source Protection Information Atlas provides data on aquifer vulnerability and climate and surficial water body quality.	Water quality profile assessment of the Marmora Open Pit including low level mercury analysis. Surface water quality samples collected from potential receiving waters identified within the dewatering options analysis. Collect water samples from Marmora Open Pit and potential receiving waters for eDNA analysis. Sediment sampling from potential receiving waters.	To support dewatering permit application submission. To assess Project impacts to surface water. To characterize the site and to inform Open Pit water discharge criteria/plan. To assess if fish are present within the Open Pit and if the water quality is suitable to support fish year-round.	Water quality programs conducted August and November 2022, March/April 2023; currently scheduled for Q2 2023. Longer term monitoring expected to continue through construction and operational phase.

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Discipline	Completed Desktop Review	Baseline Investigation	Rationale	Status
Natural Heritage (Aquatic, Terrestrial, SAR)	Make a Map: Natural Heritage Areas and Natural Heritage Information Centre (NHIC) Data/Land Information Ontario (LIO) database in order to identify features such as Provincial Parks, conservation reserves, ANSIs, wetlands, woodlands, designated natural heritage systems (e.g., Niagara Escarpment, Oak Ridges Moraine, and Greenbelt Plans) and NHIC data (i.e., rare species and SAR, plant communities, wildlife concentration areas, and natural areas). iNaturalist in order to review records of species sightings within the Study Area (includes species observations previously recorded in the Ontario Reptile and Amphibian Atlas and Ontario Butterfly Atlas). Northern Development, Mines, Natural Resources and Forestry (NDMNRF) Fish On-Line Tool to identify aquatic species records within the Study Area. DFO SAR Mapping Tool to identify federally listed species within the Study Area. Atlas of Ontario Mammals in order to identify mammals that have the potential to occur within the Study Area, specifically SAR. Ontario Breeding Bird Atlas (OBBA) in order to identify breeding bird records within a 10-km square that overlaps the Study Area. Relevant Assessment Reports and Recovery Strategies to identify potential SAR and Endangered Species habitat types with potential to occur on site. Quinte Conservation Mapping Tool to determine regulation limits and identify any other mapped significant features. Hastings County Official Plan ‘Schedule B’ to identify any municipally mapped significant environmental features. Preparation of a letter of Inquiry to Quinte Conservation to request background data from the area including any significant natural features. Preparation of a Property Inquiry form for Crowe River Conservation Authority in order to obtain regulation boundary datasets and to request background data from the area including any significant natural features. Preparation of a letter of Inquiry to the MECP to request background data from the area including any known occurrences of SAR. Other regional environmental studies, land-use data.	Conduct an Ecological Land Classification (ELC) Assessment. Conduct a vegetation inventory. Conduct a Significant Wildlife Habitat screening assessment. Complete baseline aquatic habitat mapping activities. Conduct SAR surveys (Butternut searches, SAR Bat habitat suitability assessment and maternity roost surveys, Ogden’s Pondweed searches, Gray Fox habitat suitability assessment and den searches).	To characterize the existing features/habitat within the Study Area and to support future regulatory requirements and allow for assessment of potential impacts. To document both SAR individuals and their habitat.	Natural Heritage works commenced in Q3 2022, scheduled to continue throughout 2023. Longer term monitoring expected to continue through construction and operational phase.

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Discipline	Completed Desktop Review	Baseline Investigation	Rationale	Status
Archaeology	Review all project documentation, including obtaining previously completed reports within or adjacent to the study area, PIF and site database information from the MTCS and mapping where required. Review of pertinent provincial and federal government files (Ontario Archaeological Sites Database). Review and compile the results of a literature search (published and unpublished).	Conduct Stage 1 Archaeological Assessments (AA).	To evaluate potential for archaeological resources within or adjacent to the study area.	Stage 1 AA to be completed Q4 2022.
Built Heritage and Cultural Heritage Landscape	Brief review of available primary and secondary source material to produce a contextual overview of the study area, including a general description of Euro-Canadian settlement and land use, and the development of transportation infrastructure. Available historic mapping, existing condition mapping, Project mapping, and aerial photographs will be reviewed, if available, and relevant agencies and authorities will be contacted as necessary, in order to make a preliminary identification of existing built heritage features and cultural heritage landscapes within the study area. As part of this task, municipal heritage inventories are reviewed to identify properties and resources that have been previously identified as being of potential cultural heritage value, or which have been designated under the *Ontario Heritage Act*. Background historical research will be undertaken to determine the historical development of the area to be impacted. Relevant background studies will be reviewed to collect preliminary information about previous identified cultural heritage resources and sensitivities on the subject lands. Following, land registry offices, local archives, and the provincial archives will be consulted to collect information relevant to the historical significance of potentially impacted cultural heritage resources. Agency contacts and stakeholders will be consulted for investigation as appropriate.	Conduct Cultural Heritage (CH) Assessment.	To determine potential for cultural heritage value or interest.	Desktop CH Assessment to be completed Q4 2022.
Air, Noise and Vibration	Compile a list of key noise sensitive receptors associated with both the construction and operations of the proposed facilities and transmission corridor. The list will include receptor information (e.g., address, area noise classification) and distances of receptors from the project. The list will be based on the latest available aerial imagery of the project site and the surrounding area. The list will also include any foreseeable future receptors, in accordance with the *Tailored Impact Statement Guidelines Template for Designated Projects Subject to the Impact Assessment Act*.	Conduct air and noise baseline monitoring.	To determine ambient levels and input for noise modelling to evaluate potential Project effects.	To be completed in 2023.

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2.4.2.2 Detailed Design

The following activities are anticipated during detailed design:

- Land acquisition/agreements.
- Initiation and completion of engineering studies.
- Development of environmental protection and monitoring plans.
- Receipt of environmental permits and approvals.
- Hiring and procurement.

2.4.2.3 Construction

The following activities are anticipated to occur during construction:

- Site earthworks (e.g., clearing, grubbing, grading services and utilities).
- Open Pit dewatering (volumes to be determined, see Section 2.4.2.1).
- Foundation development (seismically designed piles and foundations).
- Drilling, blasting and excavation (earth moving, rock excavation, tunnel boring machine).
- Construction of permanent water intake and discharge structure(s) and water crossings.
- Construction of provisional settling ponds/diversions, dewatering as needed.
- Use of existing local roads during construction.
- Upgrades to existing local roads (as needed).
- Construction and use of new access roads (as needed).
- Construction and inundation of upper reservoir.
- Installation/upgrades of water, potable water and sewage services (from point of connection with existing facility to on- site).
- Installation of electrical transmission lines (from point of connection with existing facility to on site; and from on-site to off-site switching station).
- Construction of off-site switchyard and electrical power systems (transformers, emergency power).
- Installation/upgrades of ancillary facilities on site (offices, control room, transformer station, maintenance building).
- Horizontal and/or vertical tunneling for powerhouse shafts, access tunnels and penstock.
- Installation of fencing and security systems.
- Construction and use of temporary laydown area(s), including for stockpiles as needed.

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- On-site storage of equipment, material, components and supplies.
- Construction equipment operation.

2.4.2.3.1 Construction Open Pit Dewatering

Concepts indicate that in order to adequately utilize the Open Pit for the pumped storage facility, the water level will require lowering to bring the LSL and the FSL to an elevation of 7.0 and 72.96 masl, respectively. Early considerations explored tunnel access through the Open Pit, requiring partial dewatering to 80 masl during preliminary investigations planning phase, followed by additional dewatering to lower the water in the Open Pit to the operational 72.96 masl during the construction phase (see Figure 2-1). However, utilizing the surface-access tunnel alternative, it is likely the Partial Dewater Zone would be combined with the Construction Dewater Zone, therefore dewatering would occur following the Decision Statement Phase of the IA/EA. Completing a Partial Dewater during the planning phase of the Project presents both advantages and disadvantages from both an environmental and overall construction perspective. Through consultation with the public, Indigenous communities and agencies, potential groundwater impacts are an identified concern. Therefore, currently the preliminary preferred alternative is to dewater the Open Pit during the construction phase following the Minister's decision and any subsequent potential permits and approvals (e.g., MECP PTTW, Conservation Authority Approvals, etc.).

2.4.2.4 Operation

The following activities are anticipated to occur during operation:

- Turbine operation (start-up, operation and shutdown).
- Electrical power systems (transformers, emergency power).
- Ventilation.
- Personnel/administration offices.
- Use of existing/new local access roads during operation.
- Safety and security systems.
- Waste and hazardous materials management (conventional waste and recycling; secondary containment).
- Equipment servicing workshop.
- Emissions and effluent monitoring.
- Operational maintenance.
- Landscaping/vegetation maintenance.
- Discharge of surplus water accumulated through seepage and precipitation.

2.4.2.5 Decommissioning

Waterpower projects are designed for long life spans, typically in excess of 100 years with ongoing maintenance, repair and upgrade programs. As such, decommissioning of the facility is highly unlikely to happen in less than 100 years. Once the facility has reached the

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end of its service life, additional redevelopment, rather than decommissioning, would be an option that should be considered again to further extend the life of the facility.

It is anticipated that the solar facility will have a useful lifetime of at least 25 years, which can be extended with proper maintenance, component replacement and repowering. Upon decommissioning, the following activities would be anticipated during decommissioning of the solar facility:

- Equipment dismantling and removal.
- Waste (conventional waste and recycling) and hazardous materials management.
- Site restoration.

2.5 Capacity Estimate

The Project's maximum production capacity is anticipated to be 500 MW. The pumped storage facility's capacity is anticipated to be 400 MW (estimated 5 hours of daily peaking at an output of 400 MW, yielding approximately 2 GWh per day of peak period storage-based power). The potential for solar generation is approximately 30 MW. Currently, there is consideration for an additional 70 MW of potential additional power to be included in the Project's production capacity – either as storage or generation.

2.6 Preliminary Schedule

The following table summarizes the general Project schedule and associated deliverables.

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Table 2-4: Preliminary Project Schedule – Coordinated Provincial/Federal Impact Assessment Process

Phase	Date					Milestone	Responsibility
Planning Phase	Q4 2022	*Additional Baseline Investigations (e.g., Cultural Heritage, Natural Heritage, Archaeological Assessment)*	*Indigenous Engagement*	*Engagement with the Public and Other Interested Parties*	*Regulatory/Agency Engagement*	Draft Initial Project Description submission to IAAC and MECP	Proponent
	Q2 2023					Initial Project Description submission to IAAC	Proponent
	Q2 2023					MECP issues Notice of Commencement	MECP
	Q2 2023					Draft Terms of Reference submission to MECP, Public and Indigenous Communities/Nations	Proponent
	Q2 2023					IAAC provides Summary of Issues	IAAC
	Q3 2023					Detailed Project Description submission to IAAC	Proponent
	Q3 2023					IAAC issues Notice of Commencement	IAAC
Impact Statement Phase	Q3 2023					Final Terms of Reference submission to MECP	Proponent
	Q3 2023					Impact Assessment/Environmental Assessment Determination	IAAC
	Q3 2023					Draft Environmental Assessment /Environmental Impact Statement (EA/EIS) package submission to IAAC and MECP	Proponent
	Q2 2024					Final EA/EIS package submission to IAAC and MECP	Proponent
Impact Assessment Phase	Q2 2024– Q2 2025					IAAC posts Notice of Determination and Impact Assessment period of up to 300 days begins*	IAAC
Decision Statement	Q2 2025 – Q3 2025					Decision Statement and Conditions by Minister	MECP
Post-IA/EA	Q3 2025 – Q4 2025					Permits and Approvals Secured	Appropriate authorities (federal, provincial, municipal)
	2025 – 2029					Construction Phase (inclusive of Open Pit dewatering)	Proponent
	2029					Operation Phase Commences	
	2054					Decommissioning/Re-contracting (solar facility)	

* If required.

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2.7 Potential Alternatives

An essential component of the IA/EA process is the evaluation of alternatives to ensure that the most appropriate approach of addressing a problem or opportunity is selected. This process of evaluating alternatives creates an opportunity to identify potential environmental impacts as well as advantages and disadvantages between multiple options when planning the Project. Criteria will be developed to assess alternatives to the Project and alternative methods of implementing the Project, based on feedback from engagement with Indigenous communities/Nations, the public, regulators, and information collected during baseline studies.

2.7.1 Alternatives to the Proposed Undertaking

Alternatives to a proposed undertaking are functionally different ways of approaching and dealing with a problem or opportunity. As discussed in Section 2.1, the Project's purpose is described as meeting the need for clean energy production to achieve net zero emission goals by 2050. The sections below describe alternatives to the Project that will be considered.

2.7.1.1 Energy Storage versus Energy Generation

Pumped storage hydropower differs from undertakings that offer purely generation of power, such as wind or solar, or traditional hydro. The Project proposes stored energy – offering the operating flexibility that the province's grid currently needs – therefore it is not comparable to other forms of renewable energy generation. Further, the Project's pumped storage facility would be a closed-loop system, differentiating it from traditional pumped storage hydropower that uses a continuously flowing watercourse. The table below provides a comparison of solar and wind power, traditional reservoir hydropower, and the Project.

Table 2-5: Comparison of Marmora Pumped Storage to Traditional Reservoir Hydropower and to Other Renewable Energy Sources

Topic	Energy Generation		Energy Storage
	Other Renewable Energy (i.e., wind, solar)	Traditional Hydropower (Reservoir)	Marmora Pumped Storage Hydropower
Concept	Sends newly generated energy to the electricity transmission grid.	Sends newly generated energy to the electricity transmission grid.	Previously generated electricity from the grid is converted to potential energy when pumped and stored in the form of water in the upper reservoir. The stored energy is converted back to electricity when it flows to the lower reservoir.
Operational Flexibility	No ability to respond to changes in demand.	No ability to respond to changes in demand.	Yes – has the ability to respond to changes in demand.

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Topic	Energy Generation		Energy Storage
	Other Renewable Energy (i.e., wind, solar)	Traditional Hydropower (Reservoir)	Marmora Pumped Storage Hydropower
Energy Production/ Demand Management	Intermittent and reliant on the weather and season.	Constant, consistent, day in day out power generation; however, also seasonally dependent (higher in spring vs. summer, and subject to limitations of water availability during droughts).	Control of stored energy and addresses energy congestion on the grid. Water is pumped from lower reservoir to upper reservoir when energy needs are low in the province and/or to absorb surplus power. Water is used to transfer or redistribute energy from the upper reservoir back to the grid when energy needs require.
Water Resource Impact	Minor	Open environment. Connected to waterbodies and fish habitat.	Closed-loop system (water is re-circulated). Offline from waterbodies and fish habitat.
Land Use	Wind generation is unpredictable (generation is not a function of # of turbines). For solar, to generate 400 MW: 7.5 acres per MW / 0.85 (panel efficiency) / 0.75 (summer daytime sunlight availability) = 4,705 acres required.	Land is typically flooded to create new or larger reservoir.	Addresses mine closure plan: lower reservoir is existing Open Pit; upper reservoir proposed to be constructed within unrehabilitated inactive mining lands.
Environmental Contamination Considerations	N/A	Vegetation is typically submerged and can create emissions/ discharge of contaminants during decomposition.	No vegetation is submerged to create potential contamination during decomposition.
Decommissioning	Site can be repurposed for other uses, such as agriculture.	Few opportunities exist if new reservoir is created.	Opportunities exist to incorporate alternative land uses.

2.7.1.2 Energy Storage: Alternatives

There are many different methods of storing energy to respond to fluctuations in demand and increasing the responsiveness of the grid. Alternative ways of storing clean energy could include:

- compressed air energy storage (CAES)

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- thermal
- battery energy storage systems (BESS)
- hydrogen.

The effectiveness of an energy storage facility is determined by how quickly it can react to changes in demand, the rate of energy lost in the storage process, overall storage capacity and how quickly it can recharge. The below table provides a description of each method and a comparison of the advantages and disadvantages of the various energy storage solutions.

Table 2-6: Energy Storage Alternatives

Energy Storage Method	Description	Advantages	Disadvantages
Pumped Storage Hydropower	Hydroelectric energy storage configured with water reservoirs at different elevations.	High storage capacity.	High capital cost. Specific geographic requirements. Safety concerns.
Compressed Air Energy Storage (CAES)	During off-peak hours, air is pumped into an underground hole. When energy is needed, the air is released into a facility where it is heated and expands to turn an electricity generator.	High storage capacity. Quick response time.	Use of natural gas. Lower efficiency compared to pumped storage.
Thermal	Rocks, salts, water, or other materials are heated and kept in insulated environments. Energy is generated by pumping cold water onto the material to generate steam.	Cost-effective. Location flexibility. Low environmental impact.	Significant water input requirement. Low overall efficiency. High maintenance requirement/cost.
Battery Energy Storage Systems (BESS)	Lithium-ion, lead-acid, flow, solid state, flywheels.	High efficiency.	High capital cost. High maintenance requirement/cost. Raw material cost/extraction.
Hydrogen	Fuel cells generate electricity by combining hydrogen and oxygen.	High efficiency. Low environmental impact.	High capital cost. Specific infrastructure requirements. Safety concerns.

2.7.1.3 Pumped Storage Hydropower: Alternatives

There are alternatives within the application of pumped storage hydropower specifically that can also be considered.

- Marmora Clean Energy Hub

  Proceeding with the undertaking would involve developing the proposed pumped storage facility and ground-mounted solar, as well as associated infrastructure. A detailed description of the proposed undertaking is outlined in Section 2.4.

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Proceeding with the Project would have economic, energy creation and tourism benefits in addition to potentially impacting the biological and physical environment. These advantages and disadvantages are discussed in detail within the following sections.

- Pumped Storage Facility in Foymount, Ontario

  There is a site with favourable topography for a pumped storage facility that would serve the same markets as the proposed Project. In Foymount, Ontario, Opeongo Hills (Madawaska Highlands) and Lake Clear have a head differential of 250 m, similar to the proposed upper reservoir and Open Pit in Marmora. The specific locations of the elements of this facility will not be included in the evaluation of the alternatives. This level of detail will be included in the evaluation of alternative methods should this facility be identified as the preferred alternative.

- Do Nothing

  The “do nothing” approach would include allowing the Site and surrounding environment to remain as they currently exist. The potential benefits and effects of other alternatives will be compared to the status quo.

2.7.2 Alternatives To: Criteria

The criteria proposed for the evaluation of alternatives to the undertaking will include but not be limited to those presented in Table 2-7. Additional criteria or modifications to existing criteria will be considered based on feedback received from the public, Indigenous communities/Nations, and government agencies.

Table 2-7: Alternatives To: Proposed Evaluation Criteria

Criterion	Description
Compliance with Government Regulations, Policies, Initiatives and Planning	Considers the ability of the alternative to meet applicable regulations and policies, provincial planning (e.g., mine closure), initiatives (i.e., green energy commitment)
Proven Technical Capability and Feasibility	Considers whether the alternative consists of proven technologies, and/or has been proven through approval of similar facilities and years of successful operating experience in Ontario and other jurisdictions.
Effectiveness	Considers the alternative’s storage capacity, its efficiency, recharge time, and ability to respond to grid fluctuations.
Environmental Acceptability	Considers the potential to affect sensitive environmental features.
Financial and Economic Practicality	Considers the cost/return of the alternative.
Ability to Implement	Considers whether NPI/OPG have the ability to implement the alternative.
Land Use	Considers whether the alternative is the best use of available property.

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2.7.3 Alternative Methods of Implementing the Undertaking

Should the Project be determined the preferred alternative to, alternative means or methods of completing the Project that are technically and economically feasible will be considered during future studies and regulatory documentation. A preliminary list of design considerations has been provided below, which will be subject to the results of ongoing engagement, regulatory advice, and engineering studies:

- underground access
- transmission corridor route
- rock, overburden and organics/topsoil segregation and storage (re-use as construction and reclamation material, various stockpile locations, based on geotechnical and geochemical properties)
- dewatering conveyance and discharge locations (various watercourses)
- watercourse crossing, realignments and structures (as needed)
- biotic offsetting and compensation measures (to be determined through engagement activities and regulatory advice)
- solid waste management
- aggregate supply source (develop a dedicated aggregate resource on or near the site, re-use mine rock or purchase aggregate from suppliers)
- access road locations
- ground-mount solar locations, and
- site closure methods.

2.7.4 Alternative Methods: Criteria

The criteria proposed for the evaluation of the alternative methods will include but not be limited to those presented in Table 2-8 below.

Table 2-8: Preliminary Alternative Methods Criteria

Project Component	Preliminary Alternative Methods	Preliminary Criteria
Underground Access	A) Main Access Tunnel Portal B) Secondary Egress Tunnel	Construction feasibility (cost and schedule) Safety considerations
Electric Transmission Line Approach	A) Above ground transmission line B) Below ground transmission line	Construction feasibility (cost and schedule) Cost/schedule Property availability Visual effects

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Project Component	Preliminary Alternative Methods	Preliminary Criteria
Electric Transmission Line Route	A) Follows existing rights-of-way along Marmora Mine Road north, crossing Highway 7 and proceeding north on Goat Hill Road and Centre Line Road until it reaches Beaver Creek Road. Upon reaching Beaver Creek Road the line will travel westward to Quinn Road, turning north on Quinn Road to the HONI transmission corridor. B) Follows Mary Road east from Hastings Heritage Trail and heading north towards the existing HONI right-of-way traversing across Moira River Conservation Authority (MRCA) land to interconnect with the HONI transmission corridor. C) Exits the site along Mary Street running west along the Project Development Area boundary to RR 14 (Stirling Marmora Road), turning north along RR 14, continuing north along Cordova Road to the existing HONI transmission corridor.	Route length Natural environment interactions Socio-economic interactions (number of residences and businesses) Cultural heritage and archaeological potential Property availability
Temporary Work Areas	Specific alternatives for temporary work areas will be detailed as Project design and engineering progresses. The proposed construction laydown/facilities area and proposed operations infrastructure area are shown in Figure 1-2.	Distance from natural features
Location of Upper Reservoir	A) On top of existing waste rock pile B) At the southern edge of the Open Pit at grade	Height of penstock IESO power requirements Size of reservoir Distance from natural features Safety considerations
Dewatering Conveyance and Discharge Locations (Construction)	A) Dewatering location from the Open Pit. B) Conveyance route and ultimate discharge to the watershed (Moira River). C) Conveyance route and ultimate discharge to the watershed (Crowe River). D) Conveyance route and ultimate discharge to Beaver Creek. E) Conveyance route and ultimate discharge to Hoards Creek. F) Conveyance route and ultimate discharge to Mud Lake. G) Discharge into “holding Pond” on site and release into Moira Watershed.	Distance Construction feasibility (cost and schedule) Ability of receiving waters to accommodate quantity Likelihood of temperature variation Ability to control discharge quantity Fish and fish habitat, SAR and SAR habitat

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Project Component	Preliminary Alternative Methods	Preliminary Criteria
Operational Water Level Management	A) Upper reservoir – discharge westerly towards the Crowe Valley watershed into adjacent wetland and watercourse heading toward the Crowe River. B) Upper reservoir – discharge easterly towards the Moira River watershed. C) Lower, at-grade reservoir – discharge into Mud Lake. D) Lower, at-grade reservoir – discharge into "holding pond".	Distance Construction feasibility (cost and schedule) Ability of receiving waters to accommodate quantity Likelihood of temperature variation Ability to control discharge quantity Fish and fish habitat, SAR and SAR habitat
Aggregates	A) Develop a dedicated aggregate resource on or near the Project Development Area. B) Re-use mine rock. C) Purchase aggregate from suppliers.	Quantity requirements Traffic Site works (level of complexity)
Access Road Locations	A) Existing emergency access along Stirling Marmora Road, Regional Road 14. B) Existing access south from Highway 7 along Marmora Mine Road (public viewing area and existing aggregates plant). C) Open Hastings Heritage Trail from Highway 7 to the site.	Traffic Socio-economic considerations, recreation Municipal requirements (design considerations, upgrades, etc.) Natural environment interactions
Ground-Mount Solar Locations	A) Include renewable energy on site. B) Future recreational and green tourism opportunities. C) Do nothing.	Economic considerations Tourism Natural environment interactions

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3. Location Information and Context

3.1 Site History

Development of the Marmoraton mine began in 1952 with the initial blasting and removal of approximately 40 m of limestone before reaching the high-grade ore, with ore production starting in 1955. The mine was owned and operated by Bethlehem Steel Mills of New York.

Excavation of the high-grade iron ore was accomplished by electrically operated shovels and removed by dump trucks. The ore containing magnetite was then crushed, ground, and magnetically separated to produce a 65% iron concentrate which was then converted into hematite pellets by roasting at 1315°C in vertical shaft furnaces. At its peak, the mine produced 520,000 tons of ore pellets and generated 3,500,000 tons of waste rock annually. In total, approximately 70,000,000 tons of waste rock was removed from the Open Pit. During operations, the mine void was actively pumped of groundwater seepage to allow for mining excavation. The Open Pit covers an area of approximately 33 ha, measuring approximately 740 m by 450 m wide and 220 m deep.

The size of the mine site property is reportedly over 1,500 acres. As noted, aggregate crushing and processing activities previously occurred at the site and there are several haul roads, non-reclaimed broken rock piles and processed rock piles on site. Several settling ponds were located in the south-central portion of the site.

The mine ceased production and closed in 1978. The site was sold to Aecon (formerly Armbro Construction), who currently operate an aggregate crushing site on the property immediately north of the former mine site.

Since the mine ceased production in 1978, the Open Pit has continued to infill with groundwater and precipitation, currently containing approximately 24.24 million m^3 of water (BBA, 2022). Based on 2022 groundwater elevation monitoring, the current Open Pit elevation is expected to rise an additional 1 m prior to reaching the elevation of the surrounding surface waters, at which time the Open Pit would be expected stop rising. (Hatch, 2022). Photos of the infilling of the Open Pit over time is shown in Appendix A.

In total, the Open Pit has taken 43 years to fully recharge back to the upper-most aquifer groundwater level (Hatch, 2022). The following provides a brief summary of the change in Open Pit water levels over time:

- 1979 (Mine operations cease): Open Pit bottom -6 masl
- 1987: approximately 88 masl
- 1993: approximately 120 masl
- 2012: 164 masl
- 2017: 171.67 masl
- 2022: 179.37 masl.

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According to the Abandoned Mine Inventory of Ontario, the Marmoraton mine currently has a status of abandoned (Identifier 04220, site classification A). The file does not list a mine closure plan or rehabilitation plan. On the western side of the Open Pit, there is an approximately 35-m thick non-reclaimed broken rock pile, consisting of unused/waste rock from the historical mining operation. At this time, it is unknown who would be responsible for the proper closure/remediation of the abandoned mine/site. Regardless of who this lies with, the repurposing of the Open Pit/site back to a productive/useful area for the citizens of Ontario should be emphasized. Furthermore, it is very possible the responsibility of the closure/remediation of the Open Pit/site lies with MNRF's reclamation branch (formally part of ENDM).

3.2 Project History

The following studies have been completed and are considered as part of the Project's general development:

1) Golder Associates Ltd., "Phase I Environmental Assessment Update," March 2007.
2) Hatch, "Assessment of Former Marmoraton Mine Site, Preliminary Environmental Site Investigation," March 2009.
3) Hatch, "Conceptual Definition of Marmora Pumped Storage Development," July 2011.
4) Hatch, "Environmental Summary, Gap Analysis and Roadmap – Draft," September 2022.
5) Morrison Beatty, "Marmora Open Pit Mine Water Quality Study," January 1987.
6) MTE, "Marmora Mine Preliminary Dewatering Impact Assessment," January 2013.
7) SNC Lavalin, "Inception Report, Marmora Pump Storage Development Project," April 2018.
8) BBA, "Pit Dewatering Strategy – Environmental Permitting Review," August 2022.

These reports have provided historical Project development information, a general understanding of the Project region and a basis for many of the sections within this document. A summary of relevant information from the previous reports is provided in Table 3-1.

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Table 3-1: Summary of Relevant Information from Previous Studies

Report	Summary of Relevant Information	Comments
Marmora Open Pit Water Quality Study Prepared for Armbro Construction by Morrison Beatty Ltd. (MBL), 1987	Morrison Beatty Ltd. (MBL) assessed the water quality of the Open Pit for the purpose of establishing a salmon aquaculture facility. The Open Pit was estimated to be 561 m long, 235 m wide and 118 m deep. In November 1986, stratified samples were collected at three locations. Samples were collected at 1.5-m interval depths for the first 10 m, and 3-m intervals to the maximum sample depth of 30 m. General chemistry parameters were measured in the field (temperature, pH, dissolved oxygen (DO), and electric conductivity (EC). Further analyses were completed for alkalinity, total dissolved solids, and concentrations of iron and sulphate. It was estimated that 3 L/s to 10 L/s of inflow is derived from direct precipitation; 9 L/s can be attributed to groundwater sources; and 23 L/s is attributed to surface runoff. The total inflow to the Open Pit was estimated to be 35 L/s. The results showed the water had elevated sulphate (410-720 mg/L) and DO (10-12 mg/L) concentrations, as well as elevated conductivity (900 uS/cm). The elevated DO was attributed to inflowing water being aerated as it cascaded down the sides of the Open Pit. The thermocline was detected between 18 and 21 m below the surface. Average pH was 6.2. MBL determined alkalinity between 120-137 mg/L, total dissolved solids (TDS) between 500-700 mg/L and concentrations of iron and sulphate to be less than 0.1 mg/L and 410-720 mg/L, respectively. With the exception of sulphate and temperature, no trends (increasing or decreasing concentrations with depth) were apparent. Concentrations of some metals parameters exceeded the Provincial Water Quality Guidelines (PWQO), mostly at depths greater than 75 m. The results were determined to be appropriate for salmon aquaculture. Generally, groundwater is interpreted to flow south and eastward. During the active life of the mine, the Open Pit was dewatered; much of the water pumped from the mine was surface runoff. This created a depression in the local water table.	Information drawn from this report will be used to inform the long-term water quality trends moving forward. In addition, this report will help validate/set assumptions on groundwater inflow rates for the dewatering as well as potential local and regional groundwater impacts. Socially, this information may become important to show local well impacts during the Open Pit dewatering for upfront geotechnical investigation (if needed) as well as during construction and operational phases.

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Report	Summary of Relevant Information	Comments
Phase I Environmental Site Assessment Update Prepared for Aecon Group Inc. by Golder Associates Ltd., 2007	Crushing and washing of waste rock occurred on site since 1992. The water used in the washing plant was obtained via a pump from Mud Lake located on the south portion of the Site. Wastewater was directed to the settling ponds located in the south-central portion of the Site. The series of six settling ponds eventually drained into the wetland at the point where water was extracted for the washing plant. The on-site wetland flowed northward into the Moira River watershed, as well as occasionally to Crowe River, located west of the Site due to beaver dams. Regional groundwater was expected to flow southwesterly towards Lake Ontario; however, the direction of local groundwater flow was influenced by the presence of underground structures and deep excavations such as the Open Pit. According to the 1990 Preliminary Hydrogeological Review and Landfill Development Feasibility Report, there were four water wells located in the vicinity of the Open Pit. Two of the wells were drilled in 1984; one was used for domestic water supply. One of the wells was drilled in 1951 to a depth of 22.9 m. Water bearing zones were reportedly encountered at depths of 4.9 and 9.4 metres below ground surface (m bgs) with static water level recorded at 3.4 m bgs. The Site had one Permit to Take Water (97-P-4053), dated May 30, 1997, which authorized the taking of water from one sump pond located on Lots 2 and 3, Concession 5, and Lots 3 and 4, Concession 6, Marmora Township, for aggregate wash water. The permit was valid indefinitely, or until such a time where are changes in the rate, amount or method of water taking. The Site was registered as a high level (>1,000 ppm) polychlorinated biphenyls (PCB) storage site in 1998, 1999 and 2000. A Canadian National Railway line and Canadian Pacific Railway line were formerly located on site. The lines have been decommissioned, removed and converted into a heritage trail. Three partially buried underground storage tanks (USTs) were observed and reported to have previously contained fuel: beside the former pumphouse at the edge of Mud Lake; and two 67,500-L USTs near the southwest edge of the Open Pit. Three aboveground storage tanks (ASTs) containing diesel and waste oil were also observed.	Information drawn from this report will be used to inform the soils conditions and potential contamination land use moving forward.

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Report	Summary of Relevant Information	Comments
Preliminary Environmental Site Investigation Prepared for Northland Power Inc. by Hatch, 2009	The Open Pit mine covered an area of approximately 30 ha, measuring 520 m by 370 m and 183 m deep. On December 11, 2008, Hatch collected six water samples from the Open Pit (0.5 m, 25 m, 50 m, 75 m, 100 m, and 125 m). In-situ measurements were carried out for pH, conductivity, DO, and temperature to a depth of 60 m. Two bedrock samples from the Open Pit sidewalls near the existing water level in the Open Pit were collected for bulk and leachate testing. Two rock samples from the existing waste rock area and two rock/soil samples from the existing tailings area were collected. Rock samples were analyzed for inorganic parameters (pH, metals and sulphates). There was a consistent relationship between pH, conductivity, temperature and DO in the upper water column. A thermocline was determined to be near 40 m deep. Results of the water sampling indicated the following: - Concentration of boron exceeded the PWQO. - Concentration of cobalt and iron exceeded the PWQO by approximately three times. - Petroleum hydrocarbons (PHCs), volatile organic compounds (VOCs) and PCBs were not detected in the water samples. Results of the waste rock and tailings sampling indicated the following: - All of the tested metals parameters in the bedrock samples met the MECP O. Reg. 153/04 Table 1, Table 2 and Table 3 Standards with the exception of boron. - All of the tested metals parameters in the waste rock and tailings samples met the Table 1, Table 2 and Table 3 Standards with the exception of arsenic, boron, cobalt and copper. - The test results for leachable inorganics showed that barium, boron and fluoride were leached in detectable concentrations; however, all of the samples were below the leachate quality criteria in Schedule 4 of Ontario Regulation (O. Reg.) 558.	Information drawn from this report will be used to inform the long-term water quality trends moving forward as well as provide a bases for rock quality and geochemistry.

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Report	Summary of Relevant Information	Comments
	- It was unlikely that the tested rock materials would be acid-generating. Metal leaching was also not likely to be an issue since most metals are not soluble under alkaline conditions. Hatch conducted an environmental effects screening. It was assessed that: - Utilization of the Marmoraton mine site was expected to result in low to moderate overall potential for significant environmental impact due to recognition that the former Open Pit and adjacent lands have been previously disturbed and were in private ownership. This was considered to reduce the potential for natural and social environmental impacts. - Moderate environmental effects to existing surface drainage conditions and groundwater regimes were anticipated. Large variations in water levels could be expected to negatively affect existing natural features and habitats, and ecological functions within the area.	
Marmora Pumped Storage Development Conceptual Study Prepared for Northland Power Inc. by Hatch, 2011	The Open Pit was approximately 210 m deep. The former mine Open Pit was identified by the MNRF as a provincially significant Earth Science ANSI. The Marmoraton Mine ANSI is 32 ha in area and contained Precambrian, Neohelikian bedrock overlain by Lake Cambrian-Early Ordovician Shadow Lake shales and Middle Ordovician Gull River Formation and Bobcaygeon Formation limestones. Within the mine site property was the Marmora Wetlands, a provincially significant wetland complex (MNRF) approximately 199 ha in area. The wetland was located south and east of the Open Pit, surrounding Mud Lake. The total annual volume of mean annual precipitation was ~15.8 L/s. The rate of groundwater infiltration was ~20.6 L/s. Outflow water volume was ~10 L/s. Net inflow was ~10.6 L/s. Preliminary water quality testing undertaken in 2008 indicated that the quality of the water in the Open Pit was adequate for release into natural waterbodies.	This report provides context on the history of the Project and demonstrates that a consistent messaging has been delivered to the stakeholders. Inflow estimates completed in 2011 will help validate/set assumptions on groundwater inflow rates under different Open Pit water level scenarios informing the dewatering strategy as well was water management during construction and operations.
Marmora Mine Preliminary Dewatering Impact Assessment	Aecon completed a perimeter survey around the Open Pit on May 25, 2012 and measured it to be approximately 25.5 ha in size. During a site visit by MTE on December 7, 2012, the Open Pit was measured to be 163 m deep. The total volume of the Open Pit was calculated to be 18,046,754 m^3.	Similar to previous reports this will help inform the long-term water quality trends, infill rates and begins to explore the receiving environment's

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Report	Summary of Relevant Information	Comments
Prepared for Aecon Construction and Materials Ltd. by More Than Engineering (MTE), 2013	The purpose of the investigation was to assess the suitability of using the Marmora Mines Wetland, including Mud Lake, as an overflow receiver. Water levels within the Open Pit were estimated to be 88 m in November 1986, 120 m in 1993 and 164 m in 2012, estimating that the water level rose approximately 3 m per year, on average. On August 30, 2012, MTE inspected the Open Pit, Mud Lake, Marmora Mines Wetland, and Naylor's Common Marsh. A staff gauge had been installed within the Open Pit to track the rate the Open Pit fills with water. The Crowe River was considered a primary receiver for the discharge from the proposed Upper Reservoir via the Naylor's Common Marsh Creek. However, consultation with the Crowe Valley Conservation Authority indicated that a large, discharged volume of water would be unwelcome due to the presence of dams in both the Crowe River and the Trent River. As a result, the Crowe River was considered as a potential secondary receiver only. The Marmora Mines wetland was considered the best option for receiving excess water due to its large capacity, positive drainage away from the Site to the north, proximity to the Open Pit, and favourable discussions with the Quinte Conservation Authority. The capacity of the Marmora Mines Wetland channel culvert had increased to allow for positive drainage to the north, so the wetland would not flood and the habitats will not be negatively impacted by the addition of water. On August 30, 2012, MTE collected four water samples from the Open Pit (surface, 15 m, 30 m, 60 m), and one surface sample from Mud Lake. MTE collected surface samples from the Open Pit and Mud Lake on October 1 and November 2, 2012. On December 7, 2012, MTE collected three samples from the Open Pit (90 m, 120 m, 150 m). MTE noted there was very little change to the chemistry of the water due to depth. MTE believed the Open Pit water had an epilimnion (upper layer) greater than 60 m when sampled in August. MTE concluded, the sampling in December confirmed that turnover had occurred, and mixing of the water in the Open Pit occurs on an annual basis.	ability to take or provide waters during dewatering, construction and operations. MTE summarized previous agency consultation efforts that can be documented to show consistency and maturity of the Project. Advancements in remote real-time monitoring gauges can help alleviate agency concerns by allowing Northland and the agencies access to the flow/pump gauges during sensitive periods. Preliminary ELC and wildlife habitat designation completed in 2013, will be used to demonstrate potential changes of the environment since 2013 (i.e., introduction of invasives) or conversely provide an indication of environmental stability should 2022/2023 finding find similar habitats remain. SAR and wildlife observations or notes will be used to inform baseline investigations in 2022/2023 to reduce potential for species being added later, reducing schedule risk. As noted before, this adds to the maturity of the Project narrative (i.e., the project has been studied for over a decade). Combining the results of MTE 2013 and Hatch 2009, and assuming the 2022/2023 water quality results are similar, will add a greater confidence in the overall findings (i.e., multiple consultants, methods, timeframes and labs coming to same conclusions). As noted above, this also shows Project maturity. Lastly, this report will help inform the need and requirements/scope for additional field investigations.

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Report	Summary of Relevant Information	Comments
	Further concluding the water quality is similar throughout the entire depth of the Open Pit. MTE completed preliminary baseline habitat observations of the Site Wetland. MTE confirmed, significant natural areas identified during records review, remained present within the boundaries of the Site: provincially significant wetland complex, and Earth Science ANSI. Land-use management of ANSIs is the responsibility of the local municipality. The Official Plan for the County of Hastings identified the Marmoraton Mine as Environmentally Sensitive. According to the Official Plan, the municipal Council may allow development of these lands following the preparation and approval of an Environmental Impact Statement. Preliminary Ecological Land Classification (ELC) was completed for the Marmora Mines Wetland. Of the wildlife SAR identified within the Natural Heritage Information Centre (NHIC) database, Eastern Ribbonsnake and Channel Darter were stated to have the highest potential to exist in the Marmora Mines Wetland. Four avian SAR were identified as having high potential for occurrence on the site (in wetland habitat): short-eared Owl, Olive-sided Flycatcher, Least Bittern, and King Rail. Three River Otters were observed within the northern extent of Mud Lake during the site visit on December 14, 2012. The Marmora Mines Wetland was presumed to provide suitable habitat to a variety of freshwater fish species. Aecon's consultation with the Quinte Conservation Authority indicated that dewatering to the Moira River would generally be welcomed in the drier months to keep volume flow constant. However, volumes added during the spring melt would need to consider Moira River flooding concerns, specifically near the mouth in Belleville. The water quality results for the Open Pit were as follows:	

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Report	Summary of Relevant Information	Comments
	- Concentrations of TDS exceeded the aesthetic guideline for the Ontario Drinking Water Standards (ODWS). Concentrations of TDS would not be toxic to aquatic organisms. - Concentrations of aluminum and calcium exceeded the PWQO and ODWS. These metals were considered background concentrations die to the alkaline nature of the rock. They were not present in concentrations that were toxic to aquatic organisms. - Concentrations of boron exceeded the PWQO. Boron was naturally occurring in the Marmora area due to concentrations in the bedrock. The concentration for boron is within the Canadian Environmental Quality Guidelines (CEQG) and would not impact water quality. - Concentrations of iron exceeded the PWQO. Iron levels were naturally occurring due to surrounding geology. It was not occurring in concentrations that would be deemed toxic to aquatic organisms. MTE concluded, the water quality of the Open Pit water and that of Mud Lake were similar, and the dewatering of the Open Pit to the Marmora Mines Wetland should not negatively impact the water quality of the Site Wetland.	
Marmora Pump Storage Development Project Prepared for Northland Power Inc. by SNC Lavalin, 2018	SNC summarized the potential SAR and/or SAR habitat that may be in the vicinity of the Marmora Mine. The following SAR or associated SAR habitats were identified as potentially present in the study area: Whip-poor-will, Black Tern, Common Nighthawk, Olive-sided Flycatcher, Cerulean Warbler, Least Bittern, King Rail, Canada Warbler, Hooded Warbler, Little Brown Myotis, Eastern Small-footed Myotis, Northern Long-eared Myotis, Tri-Coloured Bat, Eastern Ribbonsnake, Milksnake, Common Five-lined Skink, Blanding's Turtle and Butternut. Surveys would address seasonality and potential for presence of SAR. A bathymetric survey of the Open Pit was conducted in May 2017, showing that the Open Pit is 24 m less deep than initially considered (-6.0 masl). The water level during the survey was estimated at 171.67 m which is about 1.3 m above the water level measured on October 25, 2016 (170.37 m). The average net inflows into the Open Pit were estimated to be ~12 L/s. Impact of water discharges to the adjacent Marmora Mines Wetland would require additional study. This would include an assessment of erosion	This inception report was primarily focused on the design aspects of the Project, with no new environmental inclusive studies completed. That noted, several studies that were completed to advance the design have/will help advance the environmental component. Furthermore, SNC provided a more complete/robust listing the potential SAR and survey recommendations that is more consistent with the level of effort needed to properly evaluate the effects of the Project and ultimately lead to the environmental approval. Bathymetry completed by ASI in 2017 adds a much-needed certainty to the Open Pit geometry and depths not previously available. This report notes a LiDAR survey was completed for the upper reservoir; however, Hatch is unsure if this survey also captured the Open Pit perimeter. If so, LiDAR information should be merged with the bathymetry.

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Report	Summary of Relevant Information	Comments
	potential and impact of increased flows on wetland function. It may be necessary to evaluate different dewatering scenarios. Field investigations would also need to be conducted on the different routing alternatives considered for the transmission line corridor. Basic climatic data was presented in Table 3-5.	Combining the two data sets will allow modelling of the entire Open Pit for better volume calculations, informing the dewatering strategy/permits as well as IA/EA. This report estimated the average inflow of the Open Pit to be approximately 12 L/s which provides a secondary assessment that supports previous estimate of 10.6 L/s by Hatch in 2011, speaks to the maturity of the Project and confidence of predictions. Basic climatic data presented in Table 3-5 was tabulated using data from 1981 to 2010 (30-yr duration) an additional 10 to 11 years of data exists and should be added/considered. Hatch has noted hydraulic differences in various parts of the provinces over the past 20 years that significantly differs from the historical records.

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3.3 Geographic Coordinates

The Project is located in Municipality of Marmora and Lake, between the towns of Madoc and Havelock in Hastings County, Ontario, Canada. The Open Pit is located approximately 1.5 km southeast of the village of Marmora, roughly bounded by Highway 7 to the north, Regional Road 14 (Forsyth Street) to the west and south, and a trail that was formerly a Canadian National Railway and Canadian Pacific Railway lines to the east (SNC Lavalin, 2018). See Figure 1-1 and Figure 1-2.

The geographic coordinates (latitude/longitude) of the Project components are provided below:

- The Open Pit (proposed lower reservoir): 44.478 N ; 77.657 W
- Non-reclaimed broken rock pile (proposed upper reservoir): 44.475 N ; 77.664 W
- Transformer station: 44.475 N ; 77.659 W
- Switching station: 44.539 N ; 77.685 W
- Ground-mount solar: 44.479 N ; 77.645 W,
  44.469 N ; 77.646 W,
  44.471 N ; 77.656 W.

The electric transmission corridor study area currently includes the consideration of various alternative methods, routes, and interconnection approaches, and consists of an area approximately 40 km^2. The study area surrounds the Open Pit and fans out towards the existing HONI transmission line, located approximately 7 km north of the Open Pit. The study area extends approximately 150 m south of the Open Pit, east of the Open Pit to Hastings Heritage Trail, fanning northeast to the end of Lajoie Road, and continuing to the transmission line. The study area extends west of the Open Pit to Forsyth Street, and northwest along the Crowe River to Cordova Road before reaching the transmission line.

3.4 Land Ownership

The Project Location is proposed on privately held lands. NPI/OPG currently have a purchase option agreement in place with Aecon pending progression of the Project. The relevant Property Information Numbers (PINs), and respective geographic coordinates (Parcel center point latitude/longitude) are as follows:

- PIN 40320-0053: 44.453 N ; 77.652 W
- PIN 40177-0327: 44.474 N ; 77.646 W
- PIN 40177-0341: 44.472 N ; 77.665 W
- PIN 40179-0096: 44.489 N ; 77.646 W
- PIN 40176-0132: 44.484 N ; 77.665 W
- PIN 40177-0361: 44.474 N ; 77.673 W
- PIN 40177-0289: 44.470 N ; 77.675 W

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- PIN 40177-0263: 44.458 N ; 77.663 W
- PIN 40177-0324: 44.456 N ; 77.671 W
- PIN 40340-0268: 44.450 N ; 77.667 W

No Provincial or Federal Crown lands are located within the Project Location nor the immediate vicinity of the Project.

3.5 Proximity to Residences and Communities

There is one property along Stirling-Marmora Road and one property along Mary Street with permanent residences which are adjacent to the lands owned by Aecon described in Section 3.4. As shown in Table 3-2, permanent residences part of the Municipality of Marmora and Lake are located as close as 25 m northwest of the proposed Project Location.

There are also permanent residential properties adjacent to the proposed water conveyance infrastructure routes for dewatering (approximately 5 towards Moira River, and 3 towards Crowe River), and along the preliminary preferred transmission corridor route (approximately 7 adjacent to Goat Hill Road, approximately 12 adjacent to Centre Line Road, and approximately 10 adjacent to Beaver Creek Road).

There are no known seasonal or temporary residences within the proposed Project Location. The table below shows the distances from the proposed Project Location to communities and recreational areas.

Table 3-2: Distance to Communities and Recreational Areas

Community	Distance from Proposed Project Location
Municipality of Marmora and Lake	25 m northwest
Heritage Trails Campground	1 km east
Booster Park Beach	3 km northeast
Township of Madoc	12.5 km east
Moira Lake Beach	13.5 km east

3.6 Proximity to Indigenous Lands

The Project is proposed within two historical First Nation treaties; the northern portion lies in Treaty 27/Treaty 27¼, and the southern portion lies in the Crawford Purchase. Both treaties and the Crawford Purchase, are the traditional and treaty territory of AFN and territory covered by the Williams Treaties settlement agreement.

NPI and OPG are in regular discussions with AFN and WTFN to support meaningful engagement throughout the development of the proposed Project including to determine the Project's proximity to land used for traditional purposes.

The Open Pit does not provide opportunity to be used for traditional purposes. The Open Pit is a man-made, former mine that is located on private property. The Open Pit is also not defined as fish habitat, as described in Section 3.8.5.1.

The Project's proximity to First Nation reserve lands is presented in Figure 1-1.

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The Project is not proposed to be located on land in a reserve as defined in subsection 2(1) of the *Indian Act*; First Nation land as defined in subsection 2(1) of the *First Nations Land Management Act;* land that is subject to a comprehensive land claim agreement or a self-government agreement; nor any other land set aside for the use and benefit of Indigenous peoples of Canada. Distances to reserve lands from the Project Location are presented in Table 3-3 below.

Table 3-3: Distance to Reserve Lands

First Nations Reserve	Distance from Project
Tyendinaga Mohawk Territory	43 km
Alderville First Nation	44 km
Hiawatha First Nation 36	52 km
Curve Lake First Nation 35	55 km
Mississaugas of Scugog Lake	101 km

3.7 Proximity to Federal Lands

No federal land is located within the proposed Project Location. Nor are federal lands proposed to be used for the purpose of carrying out the Project. Distances to federal lands from the Project Location are presented in Table 3-4 below.

Table 3-4: Distance to Federal Lands

Federal Lands	Distance from Project
Trent-Severn Waterway	14 km
Canadian Forces Base (CFB) - Trenton	39 km

3.8 Physical and Biological Environment Setting

The physical and biological features in the vicinity of the Project Location are described in the sections below. Key environmental features, including wetlands, watercourses and waterbodies, wildlife areas, natural heritage areas, etc, are shown in Figure 3-1.

3.8.1 Climate, Air Quality, Noise and Light

Climate data from the Peterborough Station (ID 6166418) was reported within the 2017 Inception Report (SNC Lavalin, 2018) as presented below in Table 3-5. This data represents 1981 to 2010 Canadian climate normal and provides a summary of daily minimum and maximum temperatures as well as average precipitation per month. In order to evaluate potential effects from the Project on climate change, baseline data in Table 3-5 should be updated to the extent possible, to compare to future scenarios. This update is specifically important as recent hydrological updates on various hydroelectric facilities across Ontario have noted a significant change in flow conditions over the past 20 years when compared to the long-term flow records.

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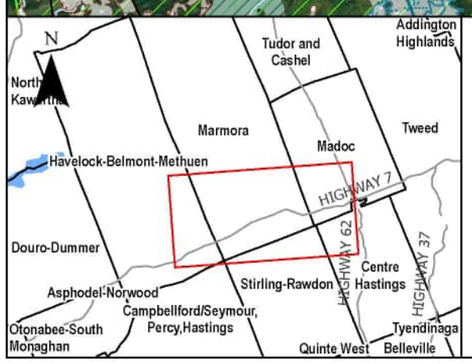

Legend

- Proposed Project Location
- Road
- Waterbody
- Watercourse
- Quinte Conservation Authority Regulation Limit
- Unevaluated Wetland
- Evaluated - Not Provincially Significant
- Evaluated-Provincially Signficant Wetland
- White-tailed Deer Wintering Area (Stratum 2)
- White-tailed Deer Yard (Stratum 1)
- DFO - Critical Habitat
- Potential HONI Connection Zone
- Natural Heritage System - Growth Plan for the Greater Golden Horseshoe

Notes
1. Produced by hatch, contains information under the Open Government License - Ontario
2. Spatial referencing: NAD 83 UTM Zone 18N
3. Quinte Region Conservation Authority Regulated Limit obtained from ArcGIS Online (2022)

0 0.75 1.5 3 Kilometers

1:67,500

PROJECT: Marmora Pumped Storage Project Environmental Assessment				
FIGURE TITLE: Key Environmental Features				
CLIENT: NORTHLAND POWER / ONTARIO POWER GENERATION				
DWG BY: J. VILLELLA	CHK BY: C. COUGHLIN	FIG NO.: 3-1	REV NO.: 3	PROJECT No.: H-369550
DATE: 23/04/03	PAGE: 1 of 1			HATCH

Table 3-5: Climate Data – Peterborough Station

Month	Daily Minimum Temperature (°C)	Daily Maximum Temperature (°C)	Average Precipitation (mm)
January	-13.7	-3.2	57.4
February	-12.5	-1.4	51.4
March	-7.3	3.7	56.1
April	0.1	11.7	68.6
May	5.6	18.6	81.5
June	10.4	23.6	79.9
July	12.8	26.4	70.6
August	11.4	25.2	77.0
September	7.2	20.6	85.3
October	1.5	13.4	76.9
November	-2.6	6.4	86.4
December	-8.9	0.2	64.2

Short-term moderate effects on localized air quality are expected, due to surface excavation and rock disposal activities are anticipated. Fugitive dust and vehicle emissions during construction activities are also expected. In accordance with the Tailored Impact Statement Guidelines (TISG) Template for Designated Projects Subject, the list of sensitive receptors associated with both the construction and operation of the Project will be compiled.

The operation of the Project is not anticipated to be a significant source of air emissions and can be positioned as contributing to the overall reductions of emissions in Ontario. However, air quality has been a focal interest for many stakeholder groups that oppose project development, and therefore, a technically sound review of potential air emissions from the Project is recommended to address potential social concerns. Furthermore, this assessment would support any future environmental compliance approvals (ECAs) required for the Project.

A Noise and Vibration Assessment is recommended as part of preliminary environmental investigations. Short-term, localized effects are anticipated to be associated with ambient noise and vibration levels during tunnel and reservoir construction, construction vehicles and activities related to surface excavation, haulage and disposal of rock. A list of key noise sensitive receptors associated with both the construction and operation of the facility and transmission components will be compiled.

3.8.2 Physiography and Geology

Bedrock geology within the majority of the proposed Project Location has been described as characteristic of the Upper Ordovician Period, comprised of limestone, dolostone, shale, arkose and sandstone. Within the northern portion of the Project Development Area, and a small area surrounding the Open Pit, bedrock is consistent with the Precambrian (Neo- to Mesoproterozoic) Period and consists of carbonate metasedimentary rocks such as marble, calc-silicate rocks, skarn and tectonic breccias found within the Grenville group. Previous

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geotechnical investigations found that the overburden thickness within the areas surrounding the proposed locations of the shafts and the powerhouse is approximately 4 m, underlain by a 44-m thick horizontally bedded sedimentary formation (SNC Lavalin, 2018) followed by Precambrian rock. Permeability within the Precambrian rock is considered to be low, whereas the sedimentary formation is noted to have low to medium permeability, with the contact between the two having higher permeability.

The surficial geology within the area is relatively diverse; however, a large percentage of the proposed Project Location is comprised of Paleozoic bedrock and a bedrock-drift complex in Precambrian terrain. Immediately surrounding the Open Pit are man-made deposits consisting of excavated rock material and crushed gravel used to make access roads. Previous geotechnical investigations in 2017 found that the granular waste rock material within this area was comprised of a mix of gravel and sand, with some silt (SNC Lavalin, 2018) with a variable quantity of cobble and boulders throughout. The waste rock matrix is typically brown to grey in colour (SNC Lavalin, 2018), with some areas observed to be reddish brown-grey in colour consistent with iron oxides. Permeability is expected to be high within the waste rock. Several areas surrounding the Provincially Significant Wetland (PSW) complexes are mapped as organic deposits containing peat, muck and marl, consistent with the soil sampling results found in the Wetland Evaluation Reports obtained from the MNRF. Some areas within the proposed Project Location also are consistent with till, particularly stony, sandy silt to silty sand textured till on Paleozoic Terrain. Lastly, an esker overlaps the area of the proposed switching station near Quinn Road and is comprised of soils consistent with ice-contact stratified deposits such as sand and gravel, minor silt, clay and till.

Areas surrounding the Open Pit are mostly within Limestone Plains, within the Dummer Moraines physiographic region. The northern portions of the proposed Project Location along the preliminary preferred transmission route are consistent with various landforms including kame moraines, peat and muck, eskers, till moraines, and shallow till and rock ridges, and also overlap with the Georgian Bay Fringe physiographic region.

The Ontario Geological Survey (2008) as shown in the Hastings County Official Plan (2018) also notes the presence of karst environments formed from the dissolution of limestone bedrock within a large percentage of the proposed Project Location, consistent with observations made by Hatch staff during the September 1, 2022 site investigation.

3.8.3 Surface Water and Groundwater

3.8.3.1 Surface Water

Various historic surface water sampling events have occurred within the proposed Project Location. Water quality sampling at various depths within the Open Pit was conducted by Hatch in 2008 (Hatch, 2009) and by MTE in 2012 (MTE, 2013). In August 2022, November 2022, and March/April 2023, water quality sampling at various depths within the Open Pit was conducted to compare to previous studies to capture potential chemical changes throughout the depth of the Open Pit since the previous water quality investigations.

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The Marmora Open Pit is located along the watershed divide of the Moira and Crowe Rivers. Baseline studies and consultation activities are being conducted in support of the dewatering alternatives assessment. The potential discharge locations and potential water conveyance infrastructure being considered for dewatering are shown in Figure 1-2.

As part of the provincial (stream) water quality monitoring network, baseline water quality sampling routinely occurs within the Moira and Crowe rivers near the proposed potential discharge locations identified within Figure 1-2. To supplement this ongoing sampling, the surrounding watercourses/waterbodies have been sampled in August 2022, November 2022 and March/April 2023 at various locations, additional sampling is planned for late spring 2023 to provide four seasons of water quality data. All water quality parameters will be compared to the Ontario Provincial Water Quality Objectives (PWQO) and the Canadian Environmental Quality Guidelines (CEQGs) for the Protection of Aquatic Life.

3.8.3.1.1 Marmora Open Pit

The Open Pit is located to the east of the downtown core of Marmora and is approximately 33 ha in size and 220 m deep. The Open Pit has continued to infill with water following the closure of the Marmoraton Mine in 1978. Water within the Open Pit is composed of precipitation, surface runoff and groundwater infiltration. The Open Pit exists offline from all other surface water sources including the nearby tributaries of the Moira River, originating from the wetlands southeast of the Open Pit, and the Crowe River and its tributaries to the north and west.

A thermocline is present in the Open Pit between 7.5 to 10 m in depth. Further full depth stratification sampling activities to take place in late spring 2023 will provide a complete seasonal record of water quality within the Open Pit and selected surrounding waterbodies. Ultimately, the completed/recommended surveys will confirm the following:

1) determine if the Open Pit experiences turnover in the late fall/spring
2) capture water quality during a turnover event (if present), and
3) capture water quality during the inverse thermocline expected to occur during winter/frozen conditions.

Understanding the stratification cycle of the Open Pit will help educate dewatering strategies and ultimately minimize effects on receiving waters.

Overall, past reports and recent water sampling events indicate that water quality within the Open Pit generally meets objectives of the PWQO, with most in Open Pit quality exceedances being consistent with regional water quality (i.e., naturally occurring). Recent in-situ measurements are relatively consistent with results of previous water quality investigations.

3.8.3.1.2 Crowe River/Crowe River Swamp Provincially Significant Wetland

Crowe River originates in Paudash Lake approximately 60 km north of the proposed Project Location and traverses south through several other lakes (Cordova Lake and Belmost Lake) prior to draining into Crowe Lake, located approximately 3.5 km west of the former Marmora

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Mine. The river outflows from Crowe Lake on the eastern side, where it takes on flows from Beaver Creek and its tributaries, before reaching the Marmora Dam located slightly north of Highway 7. The river continues to flow southward through the Crowe River Swamp Provincially Significant Wetland (PSW), approximately 1.5 km west of the Open Pit near the potential discharge locations shown in Figure 1-2. Approximately one km downstream of the most southern potential discharge location, the Crowe River flows over Callaghan's Rapids which consist of two approximately 1-m high limestone falls that are approximately 40 m to 60 m long respectively. The falls themselves are expected to be upstream barriers to fish movement; however, a side channel located to the east may provide passage around the rapids/falls. Immediately downstream of Callaghan's Rapids, the Crowe River discharges into Rylstone Lake. Rylstone Lake is the result of water impounded by the Allan Mills Dam, located immediately downstream of Rylstone Road Bridge (Figure 2-1). Allan Mills Dam consists of an approximately 2-m high overflow weir approximately 60 m long and approximately 20 m of operable dam. Both the weir and operating portions of the dam are expected to be upstream barrier to fish and other aquatic organisms. Approximately 4 km downstream of Allan Mills Dam, the Crowe River flows beneath the Crowe Bridge prior to flowing over the Crowe Lake weir (Figure 2-1) which is an approximately 1-m high, 60-m long weir. Immediately downstream of the weir, the river cascades over a series of limestone falls ranging in height from 0.3 to 1 m, before entering Crowe Bay and the Trent River. The Crowe Lake weir, in association with the cascading falls, is a navigation barrier for any boat traffic on the Trent-Severn waterway. Furthermore, is expected to be an upstream barrier to fish passage under most (if not all) flows, effectively separating the Trent system from the Crowe River. All water control structures described above are under CVCA control and offer potential opportunities to minimize potential impacts to the Crowe should it be chosen for Open Pit water discharge.

The Crowe River Swamp PSW is located along and immediately adjacent of the Crowe River, approximately 1.3 km directly west of the Open Pit and downstream of Highway 7. Based on the wetland evaluation report (MNRF, 2013), the complex comprises three separate wetlands, culminating to 124.8 ha. Within the river itself, the PSW is mainly comprised of marsh habitats that line the sides of the channel. Vegetation communities within these areas are diverse, with emergent vegetation consisting of cattails, rushes and sedges, waterlilies, floating pondweeds and duckweed and submergent vegetation consisting of Canada Waterweed (*Elodea canadensis*) and various tape-grasses and pondweeds. The inland portions of the PSW are considered a swamp community, dominated by Silver Maple (*Acer saccharinum*) with both Black Ash (*Fraxinus nigra*) and American Elm (*Ulmus americana*) also present in abundance. The catchment area of the PSW is 194,340 ha as it crosses the Crowe River; however, the total size of the upstream detention areas within the catchment is approximately 38,125 ha. Some groundwater seeps (<3) were also noted within the wetland (MNRF, 2013).

3.8.3.1.3 Crowe Lake

Crowe Lake is located approximately 4 km west of the Open Pit and drains several watercourses, most notably the Crowe River prior to the watercourse exiting the lake and

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continuing to the east. The lake is relatively uniform in shape; however, some small islands and peninsulas can be seen along the shorelines throughout the western portion of the lake. The maximum depth of the lake is reported to be 15.8 m located in the center of the northeastern body of the lake. The average depth of the lake is 5.6 m accounting for the western areas of the lake which generally are much shallower. The surface area of the lake is approximately 1064 ha (FishOnline, 2022). Additionally, several unevaluated and evaluated wetlands are present along the shores of Crowe Lake, including Crowe Lake Wetland along the north shore and Crowe Lake Wetland No. 2 found along the southern shore.

3.8.3.1.4 Moira River

Moira River originates within the Municipality of Tudor and Cashel approximately 50 km northeast of the former Marmora Mine prior to flowing south through several lakes, most notably Wolf Lake located east of Highway 62 in Millbridge, Ontario. A small headwater branch of the Moira River begins from the Marmora Mine Wetland/Mud Lake complex. This channel drains northeast along Highway 7 where it eventually confluences with the Main Branch of the Moira River southeast of the proposed Project Location. The river then flows to the east and outlets into Moira Lake, Stoco Lake and eventually the Bay of Quinte on the north shore of Lake Ontario.

3.8.3.1.5 Beaver Creek Main Branch

Beaver Creek's headwaters are located within several wetlands and creeks that feed Limerick Lake approximately 45 km north of the proposed Project Location. The watercourse then flows over the St. Ola Dam prior to draining into Muskrat Lake and eventually reaching Marmora Township approximately 25 km downstream. Flows within the watercourse appear to vary greatly with some areas experiencing slow moving flows and wide cross sections; however, some areas also contain areas with fast moving flows over open water rapids. Within the proposed Project Location, bankfull width appears to range from 40 m to 140 m in most sections; however, channel width widens significantly within the Beaver Creek Swamp Area located directly west of the former Marmora Mine.

3.8.3.1.6 Beaver Creek Tributaries/Beaver Creek Provincially Significant Wetland

Several tributaries of Beaver Creek extend towards and into the proposed Project Location from the west with water crossings along Center Line Road, Quinn Road and Goat Hill Road within the area of the preliminary preferred transmission corridor and switching station. In total, nine water crossings are expected to exist within the footprint of the preliminary preferred transmission line route, several of which were documented during preliminary site investigation. The tributaries primarily flow through woodland and wetland environments before reaching the proposed Project Location; however, some areas do appear to have anthropogenic influence from agricultural and municipal operations along Center Line Road.

The Beaver Creek PSW is located 3.6 km north of the former Marmora Mine immediately west of Center Line Road and includes several tributaries of Beaver Creek. The PSW complex is comprised of one wetland, approximately 203 ha in size with an additional 10.34 ha of riverine/upland areas situated within the complex. The PSW consists of two wetland types (marsh and swamp). Swamp communities make up a majority of the complex,

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dominated by Black Ash, Balsam Fir (*Abies balsamea*), White Cedar (*Thuja occidentalis*), Tamarack (*Larix laricina*), American Elm and Silver Maple. Open water marsh communities are comprised of Canada Waterweed, pondweeds, Spiked Water-milfoil (*Myriophyllum spicatum*) and other floating and submergent vegetation, whereas meadow marsh communities are dominated by sedges, Canada Blue Joint (*Calamagrostis canadensis*), Joe-pye-weed (*Eutrochium purpureum*) and touch-me-nots (Brownell, 1989).

3.8.3.1.7 Marmora Mines Wetland/Mud Lake/Conveyance Channel

The Marmora Mines PSW is located to the east of the Open Pit and consists of a several vegetation communities that surround the Moira River in proximity to the proposed Project Location. The PSW is bordered by Highway 7 to the north and continues down the Moira River approximately 3 km to the southwest before ending at an unnamed trail off of Morrison Drive. The wetland complex is comprised of two individual wetlands, composed of two wetland types (67% swamp; 33% marsh) both of which are situated on organic soils and also contains the open water area known locally as Mud Lake. Marsh communities within the complex consists of emergent vegetation such as cattails, grasses, willows, and some dead coniferous trees with various species of submergent vegetation including Coontail (*Ceratophyllum demersum*), Spiked Water-milfoil, Sago pondweed (*Stuckenia pectinate*), and Chara spp. Swamp communities are dominated by coniferous species in the northern sections of the complex, primarily Tamarack with an abundance of other dead conifer species. Swamp communities towards the southern half of the complex include an abundance of dead coniferous trees with deciduous tree species such as willows, alders, poplars, Silver Maple and Black Ash also found within the wetland. The catchment area of the PSW is approximately 1430 ha; no detention areas upstream were noted within the 1987 evaluation report; however, six detention areas including Moira Lake were noted, totaling 1571 ha (MNRF, 2013; L'Arrivee and Brown, 1987).

Mud Lake to the southern extent of the wetland is approximately 181,000 m^2 with an estimated volume of 1,086,000 m^3 (MTE, 2013). It has been previously noted that Mud Lake experiences size fluctuations resulting in the swelling of the waterbody under Hastings Road 14 in spring conditions. Currently, a 500-mm diameter corrugated steel culvert exists under Hastings Road 14 conveys flows; however, previous investigations noted that the culvert was blocked, restricting flows to the southern portions of the wetland (MTE, 2013). Water quality sampling was conducted at Mud Lake (as described in Section 3.2) by MTE in 2012. On the north side of Mud Lake, a long channel transects the mine property/site. Currently, a single access road connects the east and west portions of the mine site with a partially blocked culvert conveying flows northward. Hatch noted an abundance of invasive species within the wetland, Mud Lake associated channel with areas of thicket homogenous phragmites.

3.8.3.1.8 Unevaluated Wetlands

Numerous unevaluated wetlands are mapped within the proposed Project Location. Upon preliminary site investigations, the wetlands within the proposed Project Location appear to be a mix of both marsh and swamp environments and will be further characterized and

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delineated during future detailed vegetation community mapping exercises and site investigations.

3.8.3.2 Groundwater

Groundwater in the Marmora area resides mainly in the underlying limestone bedrock and is anticipated to flow in the southwest direction towards Lake Ontario, although local groundwater flow is likely to be influenced by the presence of subsurface features such as the Open Pit and local streams, rivers and wetlands (Morrison Beatty, 1987).

In 1987, groundwater inputs into the Open Pit were estimated to be 9 L/s, with the remaining contributions from surface water and precipitation to be a combined 26 L/m. Estimations on groundwater inflow were done by Hatch in 2011 by taking the monthly pumping rate during active mining operations (28.8 L/s) and subtracting the total contributions from precipitation, resulting in an estimation of 20.6 L/s of groundwater inflows, over two times higher than 1987 estimations. Conversely, calculations completed in 2018 by SNC Lavalin note that that average inflow rates from all combined sources was estimated to be 12 L/s. Accordingly, due to the high discrepancy of inflow calculations from the past 30+ years, a more detailed analysis of the water balance of the Open Pit will be required in order to properly assess impacts and to determine an appropriate rate of pumping for dewatering and operational activities.

Geotechnical characterization of the waste rock pile surrounding the Open Pit was completed in 2017 and found that no water infiltrated the test pits during site investigations (SNC Lavalin, 2018), indicating that the groundwater table was lower than 1 m below surface elevation, consistent with findings from the 1987 Water Quality Study completed by Morrison Beatty that groundwater occurs mainly in the limestone bedrock.

As per the Ontario Source Water Protection Atlas, several Significant Groundwater Recharge Areas exist within the area around Crowe River/Crowe Lake, with several smaller areas also visible within the area of the proposed switching station near Quinn Road, immediately north of the Beaver Creek PSW. Accordingly, most of the proposed Project Location is also located within a Highly Vulnerable Aquifer.

A search of the Ontario Water Well Records database resulted in the identification of several active and decommissioned wells within the vicinity of the Project Location, detailed below in Table 3-6. In summary, of the 12 wells surrounding the site, depth to water ranged from 7 m to 127 m below ground surface and was typically found within the limestone bedrock.

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Table 3-6: Water Well Records in Proximity of the Open Pit

Well ID	Well Depth (m)	Type	Depth to Water (m)	Completion Year	Overburden Material	Bedrock Material
7241027	285.0	Decommissioned	N/A	2015	N/A	N/A
7039898	27.4	Domestic Water Supply	7.0	2006	Clay/Sand	Limestone
2901340	28.5	Domestic Water Supply	25.9	1965	Clay	Limestone
2901491	32.3	Domestic Water Supply	30.5	1965	Sandy Clay	Limestone
7164769	N/A	Decommissioned	N/A	2011	N/A	N/A
2901490	22.9	General Supply for	4.9	Est. 1952	Till	Limestone, Dolomite
7164768	N/A	Decommissioned	N/A	2011	N/A	N/A
2910711	48.5	Domestic and Industrial Water Supply	38.7	1984	Fill	Limestone, Red Shale
2920461	52.0	Decommissioned	Dry	2004	Clay	Limestone, Sandstone, Green and Black Granite
2906125	11.2	Domestic Water Supply	7.3	1973	Clay + Shale	Limestone
2901492	13.7	Service Station	9.1	1953	Clay	Limestone
2909600	17.7	Domestic Water Supply	N/A	1977	Till	Limestone

A detailed geotechnical groundwater modelling exercise is underway to accurately assess any potential groundwater recharge/discharge effects, effects to nearby aquifers and to a lesser extent groundwater quality. Potential issues would include a lowering of the local aquifer to a level within the operating range of the lower reservoir. It should be noted that this would presumably be higher than the aquifer levels while the mine was in operation that would presumably draw the groundwater to below the elevation of the Open Pit bottom (-6 masl) while the mine was continuously dewatered.

3.8.4 Terrestrial Environment

3.8.4.1 Vegetation Communities

The areas along the preliminary preferred transmission line corridor are primarily dominated by forest/woodland communities as well as active agricultural fields typically consisting of hay and corn. A number of tributaries of Beaver Creek also cross the preliminary preferred transmission line corridor, several of which are also associated with adjacent wetland environments such as swamps, meadow marshes and open water marshes.

Few established vegetation communities are present within the area surrounding the Open Pit itself, with a majority of the adjacent lands consisting of deposited rock and fill from historic mining operations. The groundcover within these areas is sparse, vegetation common to culturally influenced sites such as thistles, clover and other weedy species. Areas north of the Open Pit are considered a deciduous forest dominated by hardwood maple species; however, some coniferous forest patches are also scattered throughout the community; future Ecological Land Classification (ELC) investigations will serve to confirm whether these areas meet the criteria to be considered their own ecosites. The Marmora Mines PSW is located to

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the east of the Open Pit and consists of a several vegetation communities including open water marshes and shallow cattail marshes that surround the nearby reaches and tributaries of the Moira River. Areas of deposited rock similar to those areas surrounding the Open Pit are also present within close proximity to the edge of the PSW, with areas of previous infill likely with current flow patterns impacted from those infills. Forest and woodland communities are also found to the southwest of the mine beyond the areas of rock deposits, with some agricultural fields also visible on aerial imagery. The Open Pit itself is considered an open water environment, with vertical cliffs around the perimeter. The cliffs should be further examined and screened against the Significant Wildlife Habitat Guide for 6E and 5E to determine its applicability to qualify as a Rare Vegetation Community (Cliffs and Talus Slopes).

ELC will be completed for the purposes of refining boundaries and determine species composition and soil characteristics. In total, preliminary characterization of the site resulted in 82 different community compartments identified, consisting of 18 different general habitat types. A summary of the number of compartments per type is provided below in Table 3-7.

Table 3-7: Preliminary Summary Vegetation Communities Surrounding the Open Pit and Proposed Transmission Line

General Community Type	Number of Compartments
Mixed Forest	9
Deciduous Forest	9
Coniferous Forest	3
Coniferous Woodland	2
Conifer Swamp	1
Other Woodland	3
Thicket Swamp	2
Meadow Marsh	2
Open Water Marsh	1
Shallow Marsh	1
Thicket	1
Agriculture	26
Anthropogenic	11
Fallow	6
Fills and Deposits	1
Hedgerow	2
Vertical Cliffs	1
Open Water	1

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3.8.4.2 Wildlife Habitat

3.8.4.2.1 Birds

Approximately 159 bird species, were found to have the potential to utilize the proposed Project Location and surrounding areas, according to the Ontario Breeding Bird Atlas (OBBA) and iNaturalist databases. OBBA data is presented in 10-km x 10-km grids, in total four grids overlap with the Project area (18TQ83, 18TQ82, 18TQ92, 18TQ93). Of the 159 species, 19 are considered SAR and are discussed in detail in Section 3.8.6.

The following environments have the potential to provide bird habitat within the area:

- An abundance of hydrologic features and wetland environments are present within the area, including cattail marshes that have a high potential to provide nesting, foraging and breeding habitat for various waterfowl species. In particular, the following Significant Wildlife Habitats as defined within the Criteria Schedules for Ecoregion 6E have the potential to exist within wetted environments and will be confirmed during future studies:
  - Colonially Nesting Bird Breeding Habitat (Trees/Shrubs)
  - Colonially Nesting Bird Breeding Habitat (Ground)
  - Waterfowl Nesting Area
  - Bald Eagle and Osprey Nesting, Foraging and Perching Habitat
  - Marsh Breeding Bird Habitat
  - Waterfowl Stopover and Staging Areas (Aquatic)
  - Shorebird Migratory Stopover Area.
- Woodlands are present throughout several areas surrounding the mine site and along the preliminary preferred transmission route, in particular along Goat Hill Road adjacent to the proposed location of the transmission line. Woodlands within the area are relatively small and fragmented, indicating that species that prefer open or edge environments likely utilize these woodlands to a higher degree than interior forest species would. The following Significant Wildlife Habitats as defined within the Criteria Schedules for Ecoregion 6E have the potential to exist within woodland environments and will be confirmed during future studies:
  - Raptor Wintering Areas
  - Woodland Raptor Nesting Habitat
  - Woodland Area-sensitive Bird Breeding Habitat
- Several field/meadow environments are present within the area; therefore, grassland species (e.g., Savannah sparrow, Bobolink, Eastern Meadowlark, etc) likely utilize these areas for various life processes including nesting, foraging and breeding. The following Significant Wildlife Habitats as defined within the Criteria Schedules for Ecoregion 6E

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have the potential to exist within grassland/field environments and will be confirmed during future studies:

- Open Country Bird Breeding Habitat
- Shrub/Early Successional Bird Breeding Habitat
- Waterfowl Stopover and Staging Areas (Terrestrial).

- The Open Pit itself has the potential for various swallow species to utilize the cliffs for various life process such as breeding, nesting and foraging. The following Significant Wildlife Habitats as defined within the Criteria Schedules for Ecoregion 6E have the potential to exist within the Open Pit and will be confirmed during future studies:
  - Colonially Nesting Bird Breeding Habitat (Bank and Cliff)
- Several structures associated with the mine have the potential to provide nesting and perching habitat for species well adapted to anthropogenic environments (i.e., House Sparrow, Rock Pigeon, Mourning Dove, etc). Additionally, wooden hydro poles within the area north of Mud Lake have previously provided habitat for Osprey, as noted within the 2013 MTE Report and through consultation with MNRF in 2022.

3.8.4.2.2 Amphibians

A total of seven amphibian species were recorded between both the NHIC database and iNaturalist that have the potential to occur within the area. Of the seven species, only Western Chorus Frog (*Pseudacris triseriata*) is considered SAR and is further discussed in Section 3.8.6.

The following environments have the potential to provide amphibian habitat within area:

- An abundance of hydrologic features and wetland environments are present within the area, including cattail marshes that have a high potential to provide both breeding and general habitat for various species. The following Significant Wildlife Habitats as defined within the Criteria Schedules for Ecoregion 6E have the potential to exist within wetted environments and will be confirmed during future studies:
  - Amphibian Breeding Habitat (Wetland)
  - Amphibian Movement Corridors
- Woodlands are present throughout several areas of the area, in particular along Goat Hill Road adjacent to the proposed location of the transmission line. Woodlands within the area have the potential to contain vernal pools used for amphibian woodland breeding. Should vernal pools be found within these woodlands, the results of amphibian breeding surveys would indicate whether the areas would be considered the following Significant Wildlife Habitat under the Criteria Schedules for Ecoregion 6E:
  - Amphibian Breeding (Woodland)

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3.8.4.2.3 Reptiles

A total of five reptile species were recorded between both the NHIC database and iNaturalist that have the potential to occur within the area. Of the five species, four are considered SAR and are further discussed in Section 3.8.6 The potential presence for Eastern Ribbonsnake (*Thamnophis sauritus*) has been indicated in past studies; however, to date the reasoning for their inclusion is unknown. Given the habitat suitability in the area, Eastern Ribbonsnake has been included as a potential species for the time being.

The following environments have the potential to provide reptile habitat within the area:

- An abundance of hydrologic features and wetland environments are present within the area, including cattail marshes that have a high potential to provide nesting, foraging and overwintering habitat for turtle species. Additionally, the Open Pit itself provides open water habitat that is suitable for turtle nesting. The following Significant Wildlife Habitats as defined within the Criteria Schedules for Ecoregion 6E have the potential to exist within both wetland environments and within the Open Pit and will be confirmed during future studies:
  - Turtle Wintering Areas
  - Turtle Nesting Areas
- Woodland edges, rock outcrops and field environments located within the area have the potential to be utilized by various snake species, including Eastern Milksnake (Lampropeltis Triangulum) for various life processes including foraging and breeding. Present, older structures with exposed foundations, old barns and waste rock piles within the area, have the potential to function as hibernacula for snake species. The following Significant Wildlife Habitats as defined within the Criteria Schedules for Ecoregion 6E have the potential to exist within area and will be confirmed during future studies:
  - Reptile Hibernaculum
- Gravel areas have the potential to function as nesting habitat for various turtle species; however, these areas would not be considered Turtle Nesting Habitat under the Significant Wildlife Habitat Criteria Schedules.

3.8.4.2.4 Mammals

A total of four mammal species were recorded between both the NHIC database and iNaturalist that have the potential to occur within the area. Of the four species, only Gray Fox (*Urocyon cinereoargenteus*) is considered SAR and is further discussed in Section 3.8.6. Generally, in Hatch's experience the mammal observations within the databases are not considered fulsome and Hatch expects many more mammals to be present, specifically four SAR bat species which are further discussed in Section 3.8.6.

The following environments have the potential to provide mammal habitat within the area:

- An abundance of hydrologic features and wetland environments are present within the area, including cattail marshes that have a high potential to provide both foraging and

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breeding habitat for aquatic mammals including river otters, muskrats and beavers. Three River Otters were observed by MTE in 2012 within the northern extent of Mud Lake (MTE, 2013).

- Woodlands are present throughout several areas, in particular along Goat Hill Road adjacent to the proposed location of the transmission line. Woodlands within the area likely support an abundance of small mammal habitat for various species (i.e., Groundhog, Eastern Chipmunk, squirrels, etc). Woodlands also likely provide roosting habitat for several SAR bat and non-SAR bat species. Bat species also have the potential to utilize any caves or crevices within the Open Pit itself. The following Significant Wildlife Habitats as defined within the Criteria Schedules for Ecoregion 6E have the potential to exist and will be confirmed during future studies:
  - Bat Hibernacula
  - Bat Maternity Colonies

Project Construction and Operation have the potential to result in the following impacts to the terrestrial environments:

- Construction activities are expected to disturb several vegetation communities noted in Section 3.8.4.1, resulting a loss of natural areas. However, Hatch understands the Proponent intends to minimize terrestrial footprints by utilizing existing disturbed areas, roadways and corridors. Furthermore, Hatch understands the Proponent intends to reclaim various existing mine rock areas, which has the potential to be a net positive for the terrestrial environment.
- Invasive plant species have colonized throughout the existing mine site, as they are especially prolific on disturbed land. Management of this potential will require consideration; however, similar to the above, the site offers an opportunity to reduce existing invasive species and promote native species for a potential net benefit.
- Vegetation removal presents the potential for habitat fragmentation and the alteration of current forest edge boundaries, which may alter wildlife movement and behavior.
- Destruction of bird nests and other wildlife habitat during tree clearing and site preparation activities (outside of Bird Migratory window).
- Injury or loss of life to wildlife due to vehicle strikes and other incidental incidents.

3.8.5 Aquatic Environment

3.8.5.1 Open Pit

The Open Pit is artificially created and is offline (not connected) from adjacent waterbodies. Anecdotal reports suggested it may support some species of fish placed there by locals, with 2022 eDNA sampling suggesting presence as well. Regardless, the quarry should not be considered fish habitat under the Fisheries Act. This is supported by the publicly available guidance created by the DFO which outlines quarries, aggregate pits, stormwater management ponds or tailings impoundment areas that do not require review if they are not

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connected to fish-bearing watercourses. Based on site observations and available bathymetry information, the main section of the Open Pit follows a standard terraced structure with elevation drops at regular intervals between Open Pit top and bottom. Minimal in water structure exists within the main body of the Open Pit. A small area of shallow water exists on the south and southeast edge of the Open Pit supporting some riparian vegetation previously used to access the Open Pit prior to it becoming flooded. Substrate in this area is consistent with a loose gravel road and provides very little in water structure to support fish species. No records review information is available for the Open Pit; however, some anecdotal reports have suggested that fish may exist seasonally in the lake. Hatch completed an eDNA investigation to confirm whether fish DNA existed within the Open Pit waters. Results suggest that fish DNA does exist within the surface waters of the Open Pit; however, the source or species of the DNA is still unconfirmed. Very little to no fish DNA was detected at 100 m in depth or the Open Pit bottom depth.

3.8.5.2 Crowe River

Based on the currently available information, it is assumed this reach of the Crowe River contains barriers to upstream fish passage at the Marmora Dam and at Callaghan's Rapids. Additional barriers to fish passage are assumed to exist at Allan Mills Dam and Crowe Bridge located approximately 5 km and 10 km downstream of Callaghan's Rapids, respectively. Based on the isolated nature of the reaches, the fish community is expected to be somewhat limited as well with reduced numbers of upstream migration during spawning periods. Furthermore, SAR known to reside in downstream Trent River are not expected to have access to the river in close proximity to the proposed Project Location. Spring fishing restrictions currently exist below Marmora Dam and it is assumed this area is currently utilized for Walleye (*Sander vitreus*) and sucker species spawning. Information requests have been sent to the MNRF to confirm potential spawning habitats; however, at the time of this draft, no response has been received. Furthermore, consultation will occur as the Project and decision-making advances. Similarly, Callaghan's Rapids are expected to be utilized for spring spawning by Walleye and various Sucker species. In addition to the flowing water spawning habitat likely occurring at the above-mentioned locations, the PSW along the riverbanks would also be expected to provide spawning, nursery and foraging habitat for various species (e.g., Northern Pike (*Esox Lucius*) and Largemouth Bass (*Micropterus salmoide*)). A detailed and thorough understanding of the aquatic habitat and fish community within this reach of the Crowe River is likely required to inform dewatering strategies and the overall IA/EA. Aquatic habitat surveys were conducted in the fall of 2022 and will continue into 2023 to supplement information to collected to date and information provided by the regulators.

Site observations of the Crowe River downstream of the Marmora Dam confirmed the potential for spawning habitat below the Marmora Dam discharge structure, specifically on the western edge of Crowe River. Table 3-8 outlines species that may be present in the Crowe Lake and River based on desktop review activities. A notable recreational and Indigenous important fish species not currently known to exist within Crowe River is Lake Whitefish (*Coregonus clupeaformis*); this should be confirmed with the agencies. If present,

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this species would likely spawn below Marmora Dam, Callaghan's Rapids and Allan Mills Dam during the fall period potentially influencing water management activities.

Table 3-8: Records Review of Fish Species Potentially Present Within Crowe Lake, Crowe River and Rylstone Lake

Species	Scientific Name	Source	Habitat Preference
Banded Killifish	*Fundulus diaphanus*	LIO	Margins of lakes, ponds and sluggish streams in areas with sand and gravel substrates.
Black Crappie	*Pomoxis negromaculatus*	LIO	Low current, clear vegetated lakes ponds and rivers. Access to deep water in winter and summer.
Blackchin Shiner	*Notropis heterodon*	LIO	Clear vegetated lakes and quiet pools and slow runs in creeks and small rivers.
Blacknose Shiner	*Notropis heterolepis*	LIO	Clear vegetated lakes and pools of creeks and small rivers.
Bluegill	*Lepomus macrochirus*	FishOnline, LIO	Warmer lakes and ponds, slow moving streams with weed growth.
Bluntnose Minnow	*Pimephales notatus*	LIO	Sandy and gravely shallows of lakes, creeks and rivers.
Brook Stickleback	*Culaea inconstans*	LIO	Boggy headwaters streams, shallow lakes and ponds. Slow moving water.
Brook Silverside	*Labidesthes sicculus*	LIO	Shallow open waters of lakes and pools of rivers.
Burbot	*Lota*	LIO	Cool deep lakes and rivers.
Brown Bullhead	*Ameiurus nebulosis*	FishOnline, LIO	Warm slower waters, abundant week growth and soft substrates.
Central Mudminnow	*Umbra limi*	LIO	Heavily vegetated ponds and slow-moving creeks and rivers. Organic substrates.
Cisco	*Coregonus artedii*	LIO	Cold deep well oxygenated lakes and rivers.
Common Shiner	*Luxilus cornutus*	LIO	Creeks, small to medium rivers and nearshore habitats in lakes.
Fallfish	*Semotilus corporalis*	LIO	Gravel and cobble bottom rivers and lake margins.
Golden Shiner	*Notemigonus crysoleucas*	LIO	Clear waters with muddy substrate, lots of vegetation.
Greater Redhorse	*Moxostoma valenciennesi*	LIO	Clear fast-moving waters in rivers and shallow and deep water lakes.
Iowa Darter	*Etheostoma exile*	LIO	Slow moving lakes and pools. Sandy substrates.
Largemouth Bass	*Micropterus salmoides*	FishOnline	Warm water with lots of vegetation and deep water areas.
Logperch	*Percina caprodes*	LIO	Sandy-rocky substrates in lakes or rivers outside of high currents.
Mooneye	*Hiodon tergisus*	FishOnline	Clear rivers and shallow lake waters.
Muskellunge	*Esox masquinongy*	FishOnline	Vegetated shallows in rivers, rocky offshore shoals in lakes. Deep water in summer.
Northern Pike	*Esox lucius*	FishOnline	Vegetated shallows in rivers, rocky offshore shoals in lakes. Deep water in summer.
Pumpkinseed	*Lepomis gibbosus*	FishOnline	Quiet, slower moving streams, in the waters of small lakes or ponds.

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Species	Scientific Name	Source	Habitat Preference
Sauger	*Sander canadensis*	LIO	Cover in lakes and deeper rivers.
Rock Bass	*Ambloplites rupestris*	FishOnline	Rocky substrates of lakes rivers and creeks.
Smallmouth Bass	*Micropterus dolomieu*	FishOnline	Clear rocky lakes and rivers. Deep water and shoals in summer.
Spottail Shiner	*Notropis hudsonius*	LIO	Lakes, rivers and streams with a wide range of substrates.
Trout-Perch	*Percopsis omiscomaycus*	LIO	Deeper waters of lakes and deep flowing pools in rivers.
Walleye	*Sander vitreus*	FishOnline	Cover in lakes and deeper rivers.
Yellow Bullhead	*Ameiurus natalis*	LIO	Slow moving deeper waters with muddy and vegetated bottoms.
Yellow Perch	*Perca flavescens*	FishOnline	Open water with moderate vegetation.

Notes:
LIO – Aquatic Resource Area Polygon and Line segments as published by Land Information Ontario as of September 9, 2022.
FishOnline - Fish ON-Line (gov.on.ca). As of September 9, 2022.

3.8.5.3 Beaver Creek and Tributaries

Beaver Creek drains into Crowe River immediately downstream of Crowe Lake and above the Marmora Dam Complex. Tributaries of Beaver Creek extend through Beaver Creek wetland PSW and cross centerline road and Quinn Road at four locations. In all cases, these tributaries have potential to be seasonally dried out depending on annual precipitation and beaver activity. Further field observation of these watercourses is required to confirm watercourse presence and condition at all potential water crossings of the preliminary preferred transmission line footprint. Beaver Creek and by extension its tributaries have potential to support the following fish species outlined in Table 3-9.

Table 3-9: Records Review of Fish Species Potentially Present Within Beaver Creek Tributaries

Species	Scientific Name	Source	Habitat Preference
Blackchin Shiner	*Notropis heterodon*	LIO	Clear vegetated lakes and quiet pools and slow runs in creeks and small rivers.
Blacknose Shiner	*Notropis heterolepis*	LIO	Clear vegetated lakes and pools of creeks and small rivers.
Brook Stickleback	*Culaea inconstans*	LIO	Boggy headwaters streams, shallow lakes and ponds. Slow moving water.
Common Shiner	*Luxilus cornutus*	LIO	Creeks, small to medium rivers and nearshore habitats in lakes.
Logperch	*Percina caprodes*	LIO	Sandy-rocky substrates in lakes or rivers outside of high currents.
Pumpkinseed	*Lepomis gibbosus*	LIO	Quiet, slower moving streams, in the waters of small lakes or ponds.
Rock Bass	*Ambloplites rupestris*	LIO	Rocky substrates of lakes rivers and creeks.
Yellow Perch	*Perca flavescens*	LIO	Open water with moderate vegetation.

Notes:
LIO – Aquatic Resource Area Polygon and Line segments as published by Land Information Ontario as of September 9, 2022.
FishOnline - Fish ON-Line (gov.on.ca). As of September 9, 2022.

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3.8.5.4 Site Wetland/Mud Lake/Conveyance Channel

Water from the area surrounding the Open Pit drains into a low gradient area within the adjacent easterly PSW which also contains Mud Lake and an anthropogenic watercourse channel that conveys water from Mud Lake through the mine site northward to the natural Moira River tributaries located immediately south of Highway 7 (see Section 3.8.5.5). The western portion of Mud Lake and the conveyance channel is shallow with interspersed islands of hummocky marsh wetland. This wetted surface area of the western portion of Mud Lake may change annually depending on precipitation levels in the catchment area. The eastern half of Mud Lake contains a much more defined shoreline caused by a steeper drop in elevation than is seen in the adjacent areas which support robust emergent vegetation, predominantly cattails. The northern shorelines of Mud Lake consist of gravel/cobble substrates likely introduced as a means to stabilize the area for past mining infrastructure, specifically a pumphouse that remains. Mud Lake may serve as an overwintering area for fish species that are present in the PSW and conveyance channel that are likely more prone to freezing fully during winter months.

Site observations from the Heritage Trail south of Hastings Road 14 indicate that the wetland has potential to support some bait fish species during the spring and summer season from the downstream Mud Lake; however, the majority of the wetland south of Mud Lake likely freezes through to the ground leaving little potential to support overwintering fish. Narrow channels exist through the thick cattail marsh that may allow fish to move throughout the wetland; however, it is expected that large portions of the wetland are too dense and shallow to support abundant numbers or species of fish. Anecdotal information indicates Mud Lake is a semi-popular Largemouth Bass fishery with Northern Pike, Yellow Perch (*Perca flavescens*) and low numbers of Walleye reported to exist. It is expected the lake could support these species, but would note limited Walleye spawning habitat exists and would caution including that species as confirmed unless proven to exist through on-site studies. All other species would be expected to find suitable spawning and nursery habitat within Mud Lake or adjacent PSW. Table 3-10 represents the current documented species within Mud Lake and conveyance channel.

Table 3-10: Records Review of Fish Species Potentially Present Within the Site Wetland and Mud Lake

Species	Scientific Name	Source	Habitat Preference
Blackchin Shiner	*Notropis heterodon*	LIO	Clear vegetated lakes and quiet pools and slow runs in creeks and small rivers.
Blacknose Shiner	*Notropis heterolepis*	LIO	Clear vegetated lakes and pools of creeks and small rivers.
Brook Stickleback	*Culaea inconstans*	LIO	Boggy headwaters streams, shallow lakes and ponds. Slow moving water.
Common Shiner	*Luxilus cornutus*	LIO	Creeks, small to medium rivers and nearshore habitats in lakes.
Logperch	*Percina caprodes*	LIO	Sandy-rocky substrates in lakes or rivers outside of high currents.

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Species	Scientific Name	Source	Habitat Preference
Pumpkinseed	*Lepomis gibbosus*	LIO	Quiet, slower moving streams, in the waters of small lakes or ponds.
Rock Bass	*Ambloplites rupestris*	LIO	Rocky substrates of lakes rivers and creeks.
Yellow Perch	*Perca flavescens*	FishOnline	Open water with moderate vegetation.

Notes:
LIO – Aquatic Resource Area Polygon and Line segments as published by Land Information Ontario as of September 9, 2022.
FishOnline - Fish ON-Line (gov.on.ca). As of September 9, 2022.

3.8.5.5 Moira River Tributary

The existing natural Moira River tributaries in proximity to the Marmora Mine originates from two separate locations. Immediately east of the mine in the Marmora Mines PSW (connection with conveyance channel) and Mud Lake and a small tributary derived from wetlands, small ponds and overland drainage north of Marmora Station. These two waterbodies merge north of Highway 7 immediately northeast of Marmora Mine. Site observations from this location characterize the watercourse as lacking a defined channel within a large marsh feature (flows seep through wetland). Flow was observed to be limited at this location possibly due to downstream beaver activity. A wetted width between 7 and 10 m was observed. Robust emergent vegetation such as cattail and phragmites species dominated the shoreline community and were occasionally present within the channel. Floating vegetation was also present within the watercourse providing approximately 30% cover, primarily along the shoreline and shallower areas of the watercourse. Sediment appeared to be inundated by a thick layer of organics and fine material. Water depth varied between 60 to 150 cm.

A review of historical imagery downstream of the Highway 7 culvert was completed to further characterize the watercourse. This tributary of the Moira becomes more channelized but is still characterized by the surrounding marsh wetland shoreline. Restrictions and faster moving water exists; however, the locations defined by beaver dams making them intermittent in nature. As the branch continues south back across Highway 7, further signs of anthropogenic uses/crossing exist from the adjacent trails through agricultural and residential properties.

Table 3-11 outlines species documented to be between of the Moira River and the mine site based on desktop review activities.

Table 3-11: Records Review of Fish Species Potentially Present Within the Tributary Branch of the Moira River Adjacent to Marmora Mine

Species	Scientific Name	Source	Habitat Preference
Banded Killifish	*Fundulus diaphanus*	LIO	Margins of lakes, ponds and sluggish streams in areas with sand and gravel substrates.
Blacknose Shiner	*Notropis heterolepis*	LIO	Clear vegetated lakes and pools of creeks and small rivers.
Bluntnose Minnow	*Pimephales notatus*	LIO	Sandy and gravely shallows of lakes, creeks and rivers.
Central Mudminnow	*Umbra limi*	LIO	Heavily vegetated ponds and slow-moving creeks and rivers. Organic substrates.
Common Shiner	*Luxilus cornutus*	LIO	Creeks, small to medium rivers and nearshore habitats in lakes.

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Species	Scientific Name	Source	Habitat Preference
Creek Chub	*Semotilus atromaculatus*	LIO	Small quick moving streams and rivers.
Rock Bass	*Ambloplites rupestris*	LIO	Rocky substrates of lakes rivers and creeks.

Notes:
LIO – Aquatic Resource Area Polygon and Line segments as published by Land Information Ontario as of September 9, 2022.
FishOnline - Fish ON-Line (gov.on.ca). As of September 9, 2022.

3.8.5.6 Moira River Main Branch

The main branch of the Moira River is a much faster flowing river, with a defined shoreline and substrates of bedrock, rock and cobble. Shoreline vegetation communities range from deciduous and mixed forest to tall grasses and phragmites. Shoreline habitats observed from the Old Marmora Bridge include bedrock outcrops, overhanging trees and woody debris and narrow leaved emergent vegetation. The riffle pool sequence is more naturally defined by the river substrates and morphology when compared to the tributaries previously described, with visible rapids and shallow waters observable across multiple years of aerial imagery in localized clusters. It should be noted that SAR mapping made available by the DFO lists the main channel of the Moira River as Critical Habitat for Channel Darter (*Percina copelandi*) which is listed on Schedule 1 of the Species at Risk Act as an Endangered Species.

The main branch of the Moira River takes on the flow of the Moira tributary approximately 2 km downstream of the Old Marmora Bridge. Observations from an area upstream of the Storms Road bridge, approximately 3.5 km downstream of the Moira tributary and main branch confluence, noted the river was slower moving than upstream of the confluence. River substrate in this area was dominated by bedrock with large boulders observable within the waterbody. Sand deposits were observed in some slower deeper portions of the water body overlaying bedrock. The riverbank was well defined and dominated by deciduous trees and shrubs in the area. From reviewing aerial imagery, some areas of lesser defined shorelines in this reach, where the shoreline is influenced by adjacent wetlands similar to the tributary branch of the Moira previously described. The majority of the reach from the confluence to Bend Bay downstream appears to oscillate between well-defined riverbanks and lesser defined marsh and swamp habitats. This reach reflects both habitat types that characterize the main branch and tributary reaches upstream of their confluence. The wide variety of habitat types available throughout the main branch of the Moira River may provide several species spawning habitat opportunity. Fast-moving, heavily oxygenated rapid areas may serve as spawning habitat for Walleye, White Sucker (*Catostomus commersonii*) and other sucker species. Areas with less defined marsh shorelines found on the tributary of the Moira and areas closer to Bend Bay likely support spawning Northern Pike and Muskellunge. Quiet bays or backwater areas with rocky-cobble substrate may provide spawning opportunities for bass species reportedly present. As previously noted, the main branch of the Moira River is mapped by the DFO of Channel Darter critical habitat. This suggest that portions of the river likely support spawning Channel Darter or other critical life stages of the species. Channel Darters migrate to spawning grounds in the spring and early summer. Spawning areas typically exhibit fast currents with smooth rock, gravel or rubble substrates.

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Table 3-12 outlines species documented to exist within the Moira River near the proposed Project Location.

Table 3-12: Records Review of Fish Species Potentially Present Within the Main Branch of the Moira River

Species	Scientific Name	Source	Habitat Preference
Banded Killifish	*Fundulus diaphanus*	LIO	Margins of lakes, ponds and sluggish streams in areas with sand and gravel substrates.
Blacknose Dace	*Rhinichthys obtusus*	LIO	Riffles and runs of streams.
Blacknose Shiner	*Notropis heterolepis*	LIO	Clear vegetated lakes and pools of creeks and small rivers.
Bluegill	*Lepomus macrochirus*	FishOnline	Warmer lakes and ponds, slow moving streams with weed growth.
Bluntnose Minnow	*Pimephales notatus*	LIO	Sandy and gravely shallows of lakes, creeks and rivers.
Brassy Minnow	*Hybognathus hankinsoni*	LIO	Small moving clear creeks and small rivers with soft substates.
Brook Stickleback	*Culaea inconstans*	LIO	Boggy headwaters streams, shallow lakes and ponds. Slow moving water.
Brown Bullhead	*Ameiurus nebulosis*	FishOnline, LIO	Warm slower waters, abundant week growth and soft substrates.
Burbot	*Lota*	FishOnline	Cool deep lakes and rivers.
Central Mudminnow	*Umbra limi*	LIO	Heavily vegetated ponds and slow-moving creeks and rivers. Organic substrates.
Channel Darter	*Percina copelandi*	SARA mapping	Clean streams and lakes with sandy or gravel bottoms. During the breeding season in late spring, it prefers riffle areas with fairly fast-moving water but spends the winter in deeper, calmer water. It eats mostly aquatic insect larvae from the bottom of the stream.
Common Shiner	*Luxilus cornutus*	LIO	Creeks, small to medium rivers and nearshore habitats in lakes.
Creek Chub	*Semotilus atromaculatus*	LIO	Small quick moving streams and rivers.
Fallfish	*Semotilus corporalis*	LIO	Gravel and cobble bottom rivers and lake margins.
Fathead Minnow	*Pimephales promelas*	LIO	Slow moving waters in ponds lakes and creeks.
Finescale Dace	*Chrosomus neogaeus*	LIO	Small cool boggy lakes and streams.
Iowa Darter	*Etheostoma exile*	LIO	Slow moving lakes and pools. Sandy substrates.
Johnny Darter x Tesselated Darter	*Etheostoma nigrum*	LIO	Rock to sand substrates in pools of creeks and small rivers.
Largemouth Bass	*Micropterus salmoides*	FishOnline, LIO	Warm water with lots of vegetation and deep water areas.
Logperch	*Percina caprodes*	LIO	Sandy-rocky substrates in lakes or rivers outside of high currents.
Longnose Dace	*Rhinichthys cataractae*	LIO	Cobble to gravel riffers of clean fast-moving waterbodies.
Muskellunge	*Esox masquinongy*	FishOnline	Vegetated shallows in rivers, rocky offshore shoals in lakes. Deep water in summer.

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Species	Scientific Name	Source	Habitat Preference
Northern Pearl Dace	*Northern Pearl Dace*	LIO	Cool clearwater headwater streams and bogs.
Northern Pike	*Esox lucius*	FishOnline	Vegetated shallows in rivers, rocky offshore shoals in lakes. Deep water in summer.
Northern Redbelly Dace	*Chrosomus eos*	LIO	Lakes, ponds and pools of creeks with organic substrates.
Pumpkinseed	*Lepomis gibbosus*	LIO	Quiet, slower moving streams, in the waters of small lakes or ponds.
Rock Bass	*Ambloplites rupestris*	FishOnline, LIO	Rocky substrates of lakes rivers and creeks.
Rosyface Shiner	*Notropis rubellus*	LIO	Clear, flowing pools and runs of small to medium rivers with sand and gravel substrate.
Smallmouth Bass	*Micropterus dolomieu*	FishOnline, LIO	Clear rocky lakes and rivers. Deep water and shoals in summer.
Walleye	*Sander vitreus*	FishOnline	Cover in lakes and deeper rivers.
White Sucker	*Catostomus commersonii*	FishOnline, LIO	Shallow waters in lakes and rivers.
Yellow Bullhead	*Ameiurus natalis*	Fish Online	Slow moving deeper waters with muddy and vegetated bottoms.
Yellow Perch	*Perca flavescens*	FishOnline, LIO	Open water with moderate vegetation.

Notes:
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FishOnline - Fish ON-Line (gov.on.ca). As of September 9, 2022.

3.8.6 Species of Concern

Of the species identified within the desktop review, 28 were identified as provincially or federally listed SAR and are summarized below in Table 3-13. In addition to the 28 SAR recorded during the desktop review, an additional four bat species were included in Table 3-13 due to the high likelihood of bat habitat within the surrounding woodlands and talus environments.

Given the very specific nature of SAR, general potential issues have not been included; however, the general habitat description have been included in Table 3-13. Generally any activity that would disrupt the identified habitat would be considered a potential effect. Furthermore, the likelihood for the species to be present and a likelihood the Project will interact with the species has been provided, to be identified as an issue for consideration in the IA/EA. Furthermore, identification of potential net benefits for many SAR (with proper planning) has provided a likelihood that a long-term net benefit could be achieved for each species. As noted above, both the likelihood for the species to be present, a preliminary issue and the potential for long-term benefits to be achieved has been derived. The high (>50% chance), moderate (≥25% ≤50% chance) and low (<25% chance) rankings are provided in the table below.

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Table 3-13: Species at Risk Records Review Results

Common Name	Scientific Name	Source	SRank	SARO Status	COSEWIC Status	SARA Status	Habitat Description	Potential to Utilize Project Site	Preliminary Issue Likelihood (if present)	Potential for Long-Term Benefits to the Species
Birds										
Bank Swallow	*Riparia*	OBBA	SB4	THR	THR	THR	Nests in a wide variety of naturally and anthropogenically created vertical banks, which often erode and change over time including aggregate pits and the shores of large lakes and rivers.	**Moderate** – Foraging habitat was observed throughout the area over fields and watercourses. Open Pit and stockpile vertical banks potentially could be utilized as potential habitat.	Moderate	Low
Barn Swallow	*Hirundo rustica*	OBBA	SB4	THR	SC	THR	Commonly associated with human structures such as buildings, open barns, bridges and culverts where their mud nest-cups can be built.	**High** – Several old barns and structures were observed within the area. Culverts along the proposed transmission line also have the potential to function as nesting habitat depending on the size of the structure.	Low	Low
Black Tern	*Chlidonias niger*	NHIC / OBBA	S3B	SC	NAR	NAR	Build floating nests in loose colonies in shallow marshes, especially in cattails.	**Moderate** – Suitable habitat for the species exists within the Marmora Mines Wetland Complex to the east of the Open Pit. Cattail marshes, pools, and channels of the Moira River were observed during site investigations. Breeding Bird Surveys will serve to confirm presence/absence.	Low	Low
Bobolink	*Dolichonyx oryzivorus*	NHIC / OBBA	S4B	THR	SC	THR	Commonly found in areas with medium to tall grass – meadows or tall grass prairies.	**Moderate** – Agricultural hay fields have been identified within the area; however, it is uncertain whether crop rotation and ecosite size limit the ability for the species to utilize the area. Breeding Bird Surveys will serve to confirm presence/absence.	High	High

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Common Name	Scientific Name	Source	SRank	SARO Status	COSEWIC Status	SARA Status	Habitat Description	Potential to Utilize Project Site	Preliminary Issue Likelihood (if present)	Potential for Long-Term Benefits to the Species
Canada Warbler	*Cardellina canadensis*	OBBA	S4B	SC	SC	THR	Deciduous and coniferous, usually wet forest types, all with a well-developed dense shrub layer.	**Moderate** – Several deciduous and conifer forests and swamps have been identified within the area. Breeding Bird Surveys will serve to confirm presence/absence.	Low	Moderate
Cerulean Warbler	*Setophaga cerulea*	OBBA	S3B	THR	END	END	Breed in mature, deciduous forests with tall trees and an open understory.	**Moderate** – Several deciduous forests have been identified within the area. Breeding Bird Surveys will serve to confirm presence/absence.	Low	Moderate
Chimney Swift	*Chaetura pelagica*	OBBA	S4B S4N	THR	THR	THR	Historically found in deciduous and coniferous, usually wet forest types, all with a well-developed, dense shrub layer; now most are found in urban areas in large, uncapped chimneys.	**Moderate** – Several active and inactive structures have been identified on the property that have the potential to function as chimney swift habitat. Breeding Bird Surveys will serve to confirm presence/absence.	Low	Low
Common Nighthawk	*Chordeiles minor*	OBBA	S4B	SC	SC	THR	Traditionally associated with open areas with little to no ground vegetation but have been known to be found along gravel roads and railways, in urban parks, nesting in cultivated fields, orchards and mine tailings.	**High** – A significant portion of the area consists of open, patchy treed environments within areas of exposed rock deposit, providing suitable habitat for nightjar species.	High	Low
Eastern Meadowlark	*Sturnella magna*	NHIC / OBBA	S4B	THR	THR	THR	Primarily in moderately tall grasslands, such as pastures and hayfields – can also be found in alfalfa fields, weedy borders of croplands, roadsides, orchards, overgrown fields and other open areas.	**Moderate** – Agricultural hay fields have been identified within the area; however, it is uncertain whether crop rotation and ecosite size limit the ability for the species to utilize the area. Breeding Bird Surveys will serve to confirm presence/absence.	High	High

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Common Name	Scientific Name	Source	SRank	SARO Status	COSEWIC Status	SARA Status	Habitat Description	Potential to Utilize Project Site	Preliminary Issue Likelihood (if present)	Potential for Long-Term Benefits to the Species
Eastern Wood-Pewee	*Contopus virens*	OBBA	S4B	SC	SC	SC	Commonly found in the mid-canopy layer of forest clearings and edges of deciduous and mixed forests. Mostly found within intermediate-age mature forest stands with very little understory.	**High** – Several deciduous and mixed-wood forests have been identified within the area. Breeding Bird Surveys will serve to confirm presence/absence.	Low	High
Evening Grosbeak	*Coccothraustes vespertinus*	OBBA	S4B	SC	SC	SC	Open, mature mixed-wood forests dominated by fir species; abundance linked to prey.	**High** – Several mature mixed-wood forests have been identified within the area. Breeding Bird Surveys will serve to confirm presence/absence.	Low	Low
Golden-Winged Warbler	*Vermivora chrysoptera*	OBBA	S4B	SC	THR	THR	Tends to nest in shrubby areas that are surrounded by mature forests – typically in locations of recent disturbance which include, fields, hydro and utility corridors and logged areas.	**Moderate** – Several shrubby areas in agricultural fallows located in areas adjacent to mature forests/woodlands have been identified within the area. Breeding Bird Surveys will serve to confirm presence/absence.	Moderate	High
Grasshopper Sparrow	*Ammodramus savannarum*	OBBA	S4B	SC	SC	SC	Open grasslands, hay or pasture, with well-drained, sandy soil.	**Moderate** – Several hay fields were observed within the area along the route of the proposed transmission line. Breeding Bird Surveys will serve to confirm presence/absence.	Moderate	High
King Rail	*Rallus elegans*	Inception Report (SNC Lavalin, 2018)		END	END	END	Densely vegetated freshwater marshes with open shallow water adjacent to shrubby areas.	**Low** – Suitable habitat exists within wetlands environments within the area. Marsh Monitoring Surveys will serve to confirm presence/absence.	Low	Low

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Common Name	Scientific Name	Source	SRank	SARO Status	COSEWIC Status	SARA Status	Habitat Description	Potential to Utilize Project Site	Preliminary Issue Likelihood (if present)	Potential for Long-Term Benefits to the Species
Least Bittern	*Ixobrychus exilis*	NHIC / OBBA	S4B	THR	THR	THR	Found in a variety of wetland habitats, usually prefers cattail marshes with a mix of open pools and channels. Nests are found above the marsh in stands of dense vegetation near open water.	**High** – Suitable habitat for the species exists within the Marmora Mines Wetland Complex to the east of the Open Pit. Cattail marshes, pools, and channels of the Moira River were observed during site investigations. Marsh Monitoring Surveys will serve to confirm presence/absence.	Moderate	Moderate
Loggerhead Shrike	*Lanius ludovicianus*	OBBA	S2B	END	END	END	Grasslands with scattered low trees and shrubs; nests in small trees or shrubs.	**Moderate** – Suitable habitat within fallows and field habitats within area.	Moderate	High
Olive-sided Flycatcher	*Contopus cooperi*	OBBA	S4B	SC	SC	THR	Nests in conifer or mixed forest regions adjacent to rivers or wetlands.	**Moderate** – Several coniferous forests in proximity to watercourses have been identified within the area. Breeding Bird Surveys will serve to confirm presence/absence.	Low	High
Red-headed Woodpecker	*Melanerpes erythrocephalus*	OBBA	S4B	END	END	END	Associated with open woodland and woodland edges; areas typically have many dead trees used for nesting and perching.	**Moderate** – Several woodlands with open areas in proximity to watercourses have been identified within the area. Breeding Bird Surveys will serve to confirm presence/absence.	Low	Low
Whip-poor-will	*Caprimulgus vociferus*	OBBA	S4B	THR	THR	THR	Usually found in areas with a mix of open and forested areas, such as savannahs, open woodlands or where there are openings in mature deciduous, coniferous and mixed forests.	**Moderate** – A significant portion of the area consists of open, patchy treed environments within areas of exposed rock deposit, providing suitable habitat for nightjar species. Crepuscular surveys will serve to confirm presence/absence.	Moderate	Low
Wood Thrush	*Hylocichla mustelina*	NHIC / OBBA	S4B	SC	THR	THR	Nests mainly in second-growth and mature deciduous and mixed forests, with saplings and well-developed understory layers. Prefers large forest mosaics, but may also nest in small forest fragments.	**Moderate** – Several mature deciduous and mixed-wood forests have been identified within the area. Breeding Bird Surveys will serve to confirm presence/absence.	Low	Low

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Common Name	Scientific Name	Source	SRank	SARO Status	COSEWIC Status	SARA Status	Habitat Description	Potential to Utilize Project Site	Preliminary Issue Likelihood (if present)	Potential for Long-Term Benefits to the Species
Amphibians										
Western Chorus Frog - Great Lakes - St. Lawrence - Canadian Shield population	*Pseudacris maculata pop. 1*	NHIC		NAR	THR	THR	Inhabits moist open or lightly wooded areas in southwestern Ontario.	**High** – Suitable habitat for the species exists within wetland/woodland environments throughout the area.	Moderate	Moderate
Reptiles										
Eastern Milksnake	*Lampropeltis triangulum*	NHIC	S4	NAR	SC	SC	Typically inhabits rock outcrops, fields and forest edges. Human-made structures may provide suitable habitat for hibernation during the winter.	**Moderate** – Suitable habitat including rock and rock outcrops, fields, forest edges and anthropogenic structures have been identified within the area.	Moderate	High
Eastern Ribbonsnake	*Thamnophis sauritus*	Inception Report (SNC Lavalin, 2018)		SC	SC	SC	Typically inhabits marshes and areas close to water. Hibernation occurs in underground burrows and rock crevices.	**Moderate** – Suitable habitat within wetland environments has been identified within the area.	Moderate	High
Five-lined Skink	*Plestiodon fasciatus*	Inception Report (SNC Lavalin, 2018)		SC	SC	SC	Found underneath rocks on open bedrock within forested habitats. Hibernation occurs rock crevices or buried in the soil.	**Moderate** – Suitable habitat likely present within forests with exposed bedrock and rock outcrops.	Low	Moderate
Midland Painted Turtle	*Chrysemys picta marginata*	NHIC	S4	NAR	SC	SC	Waterbodies such as ponds, marshes, lakes and slow-moving creeks with a soft bottom; including abundant basking sites and aquatic vegetation.	**High** – Several marshes and slow-moving creeks (Moira River) are present within the area.	High	High
Snapping Turtle	*Chelydra serpentina*	NHIC	S3	SC	SC	SC	Typically can be found in shallow waters with soft mud and access leaf litter. During nesting season, females travel over land to gravel and sandy areas near streams to nest.	**High** – Several marshes, ponded areas and other wetland environments with shallow waters are present within the area. Areas adjacent to the Open Pit consist of gravelly areas suitable for nesting.	High	High

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Common Name	Scientific Name	Source	SRank	SARO Status	COSEWIC Status	SARA Status	Habitat Description	Potential to Utilize Project Site	Preliminary Issue Likelihood (if present)	Potential for Long-Term Benefits to the Species
Blanding's Turtle	*Emydoidea blandingii*	NHIC	S3	THR	END	END	Typically inhabit shallow lakes, ponds, and wetlands with clean water and mucky bottoms. Prefer large bodies of water and areas with fallen trees and other debris for basking.	**Low-Moderate** – Several marshes and wetland environments are present within the area; however, water quality within areas adjacent to the Open Pit may limit usage. Other wetland environments to the north of the Open Pit and along Crowe River have a higher potential to support the species.	Moderate	High
Mammals										
Tri-colored Bat	*Pipistrellus subflavus*	Added by Hatch	S3?	END	END	END	This species is found in a variety of forested habitats. It forms day roosts in maternity colonies in old-growth forest and occasionally man-made structures. They overwinter/hibernate in caves or underground location like many other species of bats.	**Moderate** – Suitable habitat within deciduous, mixed and coniferous forests have been identified within the area.	Low	High
Little Brown Myotis	*Myotis lucifugus*	Added by Hatch	S3	END	END	END	The Little brown myotis roosts in treed environments and select attics, abandoned buildings and barns in colony format to raise their young. They hibernate from October/November to March/April, most often in caves or abandoned mines that are humid and remain above freezing.	**Moderate** – Suitable habitat within deciduous, mixed and coniferous forests have been identified within the area.	Low	High

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Common Name	Scientific Name	Source	SRank	SARO Status	COSEWIC Status	SARA Status	Habitat Description	Potential to Utilize Project Site	Preliminary Issue Likelihood (if present)	Potential for Long-Term Benefits to the Species
Northern Myotis	*Myotis septentrionalis*	Added by Hatch	S3	END	END	END	These bats are associated with forest environments, choosing to roost under loose bark and in the cavities of trees. They hibernate from October/ November to March/April like many other bat species; can be in caves or abandoned mines.	**Moderate** – Suitable habitat within deciduous, mixed and coniferous forests have been identified within the area.	Low	High
Eastern Small-footed Myotis	*Myotis leibii*	Added by Hatch	S2S3	END		NAR	Roosting occurs in rocks, rock outcrops, buildings, under bridges, caves, mines and hollow trees. Hibernation occurs within caves and abandoned mines.	**High** – The areas surrounding the Open Pit have the potential to support roosting habitat for the species within the various rock deposits within area. The walls of the Open Pit also have the potential to function as hibernacula should caves be found within the walls of the Open Pit and should be investigated during future site investigations.	High	Low
Gray Fox	*Urocyon cinereoargenteus*	NHIC	S1	THR	THR	THR	Lives in deciduous forests and marshes. Dens are typically found in dense shrubs close to a water source; however, will also use rocky areas, hollow trees, and underground burrows dug by other animals.	**Moderate** – The Gray Fox Recovery Strategy indicates that Critical Habitat has only been identified on Pelee Island to date, and that the occurrence adjacent to the Marmora mine appear to be an isolated observation. Suitable ELC codes for the species listed in the recovery strategy are found within the area including deciduous, coniferous and mixed wood forest, treed swamps and cultural woodlands.	Low	Moderate

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Common Name	Scientific Name	Source	SRank	SARO Status	COSEWIC Status	SARA Status	Habitat Description	Potential to Utilize Project Site	Preliminary Issue Likelihood (if present)	Potential for Long-Term Benefits to the Species
Fish										
Channel Darter	*Percina copelandi*	NHIC / DFO SARA Mapping	S2	SC	END	END	Found in clean streams and lakes with sandy or gravel bottoms. Preferred spawning habitat in riffle areas with fast moving water.	**Moderate** – Select areas of the Moira River adjacent to the Project have records of Channel Darter presence. The species is also potentially present in other watercourses (Beaver Creek, Crowe River). Watercourses in the vicinity of the Project contribute waters to downstream critical SAR Habitat in either the main branch of the Moira or Trent rivers.	Moderate	High
Plants										
Butternut	*Juglans cinerea*	NHIC	S2?	END	END	END	Butternut are found within deciduous forests in moist, well-drained soil and is often found along streams. Also found near forest edges and on well-drained gravel sites.	**Moderate** – Several deciduous forests in proximity to watercourses have been identified within the area.	Low	High
Ogden's Pondweed (Potamogeton hillii X Potamogeton zosteriformis)	*Potamogeton ogdenii*	NHIC	SNA	END	END	END	Typically found in clear, slow-moving streams, beaver ponds and lakes.	**Low** – Suitable habitat within wetlands, waterbodies and watercourses; however, observation record is old and species is not anticipated to be found within the area.	Low	Low
Insects										
Mottled Duskywing	*Erynnis martialis*	Ontario.ca	S2	END	END	END	Tends to live in dry habitats with sparse vegetation. These include open barrens, sandy patches among woodlands, and alvars. In Ontario, the Mottled Duskywing deposit their eggs on New Jersey tea and prairie redroot vegetation.	**Moderate** – Suitable habitat likely present within semi open forests with exposed limestone bedrock and rock outcrops. Sparsely vegetated waste rock piles may provide artificial habitat for the species, currently unknown if required vegetation is present or not	High	Moderate

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3.9 Social, Economic and Health Contexts

3.9.1 Social Context

The Municipality of Marmora and Lake, in which the Project is located, covers an area of 557 km^2 with a total population of 4,267 and density of 7.1 people per square kilometre as per the 2021 Census (Statistics Canada, 2021). This is a slight increase (7.9%) from 3,953 recorded in the 2016 count. According to the Census, the median age of the township was of 56 with 58% of the population between the ages of 15 to 64, and 32% of the population over age 65. The total population was almost evenly split between males and females with 50% identifying as male and 50% identifying as female, of those between the ages of 15 and 64, 58.8% identified as male and 57.5% as female. The marital status of the municipality is divided as 61% being married or living in common law, 20% separated/divorced/widowed and 19% reported never being married. Correspondingly, the average household size was of 2.2 people per household. Lastly, it was noted the language spoken is predominantly English (98%) with a minority of people speaking French (0.1%) and other non-official languages at home (1.2%).

The Marmora and Lake Strategic Plan 2020 outlines some demographics of those surveyed, such as residential occupancy outlining 78% of the town occupants identifying as residents, and 16% as cottagers. This data also serves to highlight the areas of residence as being predominantly rural (35%), followed by waterfront (32%), urban (28%) and farm (5%) (Municipality of Marmora and Lake, 2020). Data per the 2021 Census illustrates an aging trend in the population, with a distribution of 13% of the population between 0 to 14 years old, 26% between 15 to 44 years old, 32% between 45 to 64 years old, and 30% 65 years of age and over.

The Municipality of Marmora and Lake is one of 14 municipalities within Hastings County. The County is predominantly rural in nature with several urban communities and hamlets serving as market service centers for residents. This County is subdivided into two distinct regional market areas, North and South Hastings. Marmora and Lake receives the designation of “urban” and is part of the South Hastings Market Area which is characterized by its agricultural lands, larger settlement areas and rural non-farm residential developments (Hastings County Planning Department, 2017).

3.9.2 Economic Context

The 2016 census outlined the total labour force population in Marmora and Lake, defined as population aged 15 years and over, is composed of 53% male and 48% are females, from a 25% sample data (Statistics Canada, 2016). According to the 2021 Census, the median income of an individual in the labour force was $32,000 while the median income of an economic family was $78,000 (average family size of economic families is 2.8).

The low labour force participation rate aligns with the notion of Marmora and Lake being regarded as a quiet rural area with a large retiree demographic. Overall, the employment rate in Marmora and Lake is declining at a 0.33% rate over as calculated for the years 2001 to 2016. This aligns with the declining participation rates, people employed or looking for employment, of 3.6% over the same time period. A decreased participation rate means the

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proportion of the working population in Marmora and Lake is lower than in the past (Townfolio, 2017).

When characterizing the work force, a lens of labour force per sector and per occupation can be applied. Firstly, the labour force by industry is predominantly made up of construction and retail (28%), healthcare and social assistance (9%), accommodation and food services (9%), and manufacturing (9%); refer to Figure 3-2. Secondly, the labour force of the town represented by occupation is made up primarily by trades and transport (29%), sales and service (22%), followed by manufacturing and utilities, health, education, law and government making up 6% each; refer to Figure 3-3.

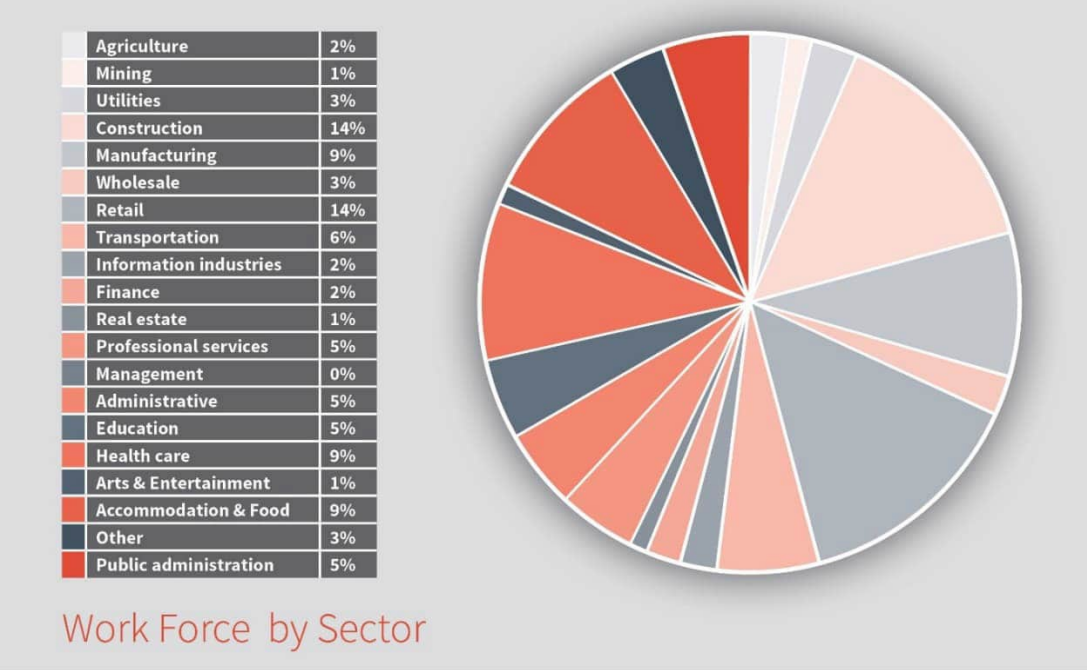

Figure 3-2: Marmora and Lake Work Force by Sector

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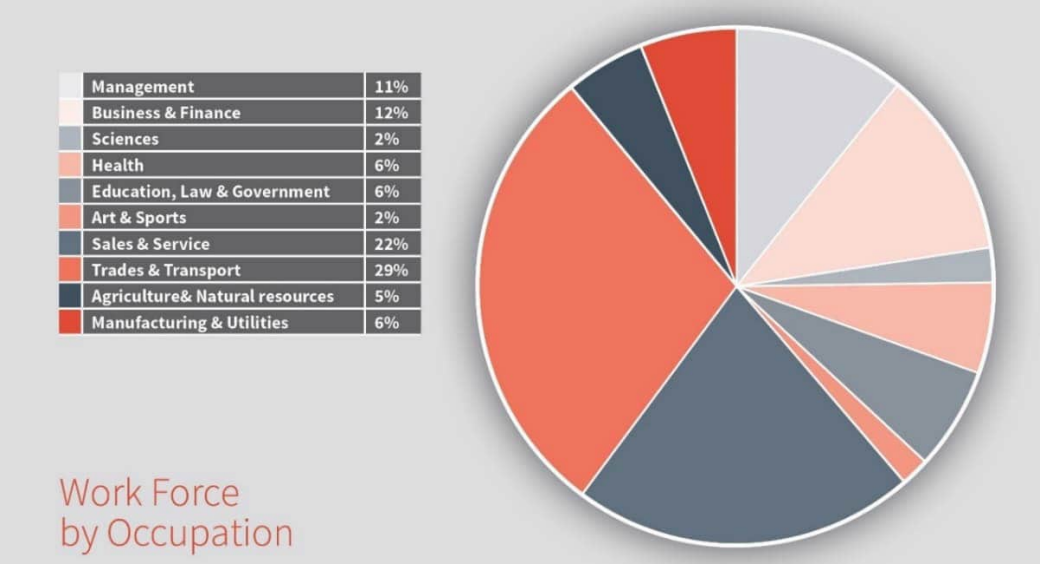

Figure 3-3: Marmora and Lake Work Force by Occupation

Marmora and Lake's labour force commuting statistics show 61% of working people commute to work within the region and 39% commute to a work destination outside of it. There is a roughly even distribution regarding work travel time, with roughly 48% of commuters spending less than 30 minutes to arrive to work, and 52% of commuters spending 30 minutes or longer to reach their destination as represented by Figure 3-4.

Figure 3-4: Commuting Destination and Duration for Marmora and Lake's Work Force

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With respect to living quarters and according to the 2021 Census, Marmora and Lake has a total of 2,578 private dwellings of which 1,885 are occupied by “usual residents” which permanently reside them. Approximately 82% of the homes are owned, while 18% are rented; note there are currently no dwellings in Marmora and Lake provided by the local government, First Nations or Indian Band (Statistics Canada, 2021). The 81% of the dwellings in Marmora and Lake were constructed prior to 2000, with a consistent declining trend of new builds as time moves forward (see Figure 3-5).

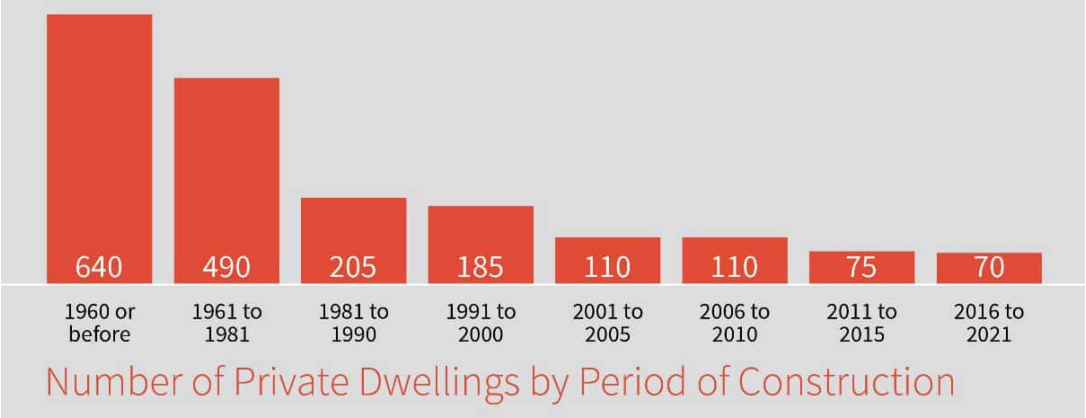

Figure 3-5: Number of Private Dwellings by Period of Construction in Marmora and Lake

3.9.3 Health Context

Marmora and Lake has a medical center that focuses on family and community health with a team of doctors, nurses, nurse practitioners, dietitian and social worker. The small center provides services such as nutritional, mental and sexual health, addictions counseling and treatment, preventative care, heart, stroke hypertensions and diabetes management, wound care and other non-emergent services.

Hospitals are located in the proximal town of Campbellford (30 km), city of Belleville (50 km), and city of Peterborough (55 km). Marmora and Lake has a centrally located fire hall within the municipality, equipped with six fire units, of which one is intended as a first response vehicle. Similarly, centrally located is the Marmora and Lake By-law Enforcement building; however, police departments are not within the municipality. The nearest police centers are the Ontario Provincial Police Centre Hastings located in Madoc (16 km), the Stirling Police Department in Stirling (24 km) and the Ontario Provincial Police - Campbellford building in Campbellford (31 km).

The Central Hastings County, which includes Marmora and Lake, has a Community Safety and Well-Being (CSWB) Plan to direct local efforts into social development, prevention and risk mitigation within the community. The Plan’s outlined goal is “a sustainable community, where everyone is safer, has a sense of belonging and opportunity to participate, and where they can meet their needs for education, health, food, housing, income, and social and cultural expression”. The Plan is considered a living document and is evolving as outlined; the

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next steps revolve in engagement and retaining specialist teams to better inform the document regarding objectives, deliverable and evaluation/performance criteria.

Through a desktop review, it was found that Marmora and Lake's total crime rates are 38% lower than the national average with an estimate of 2,606 total crime/violations per 100,000 people. Information regarding community safety and well-being or social determinants of health was not publicly available at the time of the desktop review.

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4. Federal, Provincial, Territorial, Indigenous and Municipal Involvement and Effects

4.1 Federal Funding

There is no anticipated federal funding for the Project.

4.2 Federal Lands Needed

No federal lands will be used for the purpose of carrying out the Project.

4.3 Federal, Provincial, and Municipal Environmental Approvals

Section 2.3 provides a preliminary listing of the federal, provincial and municipal environmental approvals that are expected to be required to construct, operate and decommission the Project based on the preliminary design.

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5. Potential Effects of the Project

5.1 Changes to Fish and Fish Habitat, Aquatic Plants and Migratory Birds

The following table provides a summary of the potential changes, and governing federal legislation, that may occur as a result of various Project phases.

It should be noted that the options for dewatering can manage quantity and quality of discharge from the site in a manner not to negatively affect fish and fish habitat downstream. Currently the preliminary preferred receiving waters are the Crowe River. Working through the alternatives assessment process, Crowe River is preferred due to a larger 7Q20 flow, being controlled/regulated by upstream and downstream dams, no known SAR fish, favourable land ownership, and use of existing trails/easements.

Table 5-1: Preliminary List of Changes to the Environment Under Federal Jurisdiction

Environmental Component	Project Phase	Source of Potential Effect	Potential Change to Environment	Area of Influence
Fish and fish habitat, as defined in subsection 2(1) of the *Fisheries Act*	Construction	Dewatering Installation of temporary and permanent infrastructure (e.g., pumps)	Change to the natural surface water flow pattern Surface water quality alteration (suspended solids, water temperature) Alteration, disruption and destruction of fish and benthic fauna habitat Erosion and sedimentation	Discharge location(s) and criteria Characteristics of discharged water (e.g., temperature, velocity)
	Construction	Site preparation Installation of temporary and permanent infrastructure Transport and traffic Use and maintenance of equipment Waste rock management	Change to the natural surface water flow pattern Surface water quality alteration (suspended solids, accidental spills, water temperature) Alteration, disruption and destruction of fish and benthic fauna habitat Erosion and sedimentation	Project footprint
	Operation	Transport and traffic	N/A	N/A
	Decommissioning	Dismantling of equipment and infrastructure Transport and traffic	Surface water quality alteration (suspended solids, accidental spills)	Project footprint

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Environmental Component	Project Phase	Source of Potential Effect	Potential Change to Environment	Area of Influence
Aquatic SAR, as defined in subsection 2(1) of the *Species at Risk Act*	Construction	Dewatering	Change to Ogden's Pondweed habitat Change to flow regime in Channel Darter Habitat (Moira River)	Discharge location(s) and criteria
Migratory birds, as defined in subsection 2(1) of the *Migratory Birds Convention Act, 1994*	Construction	Dewatering	Disturbance (noise, light, vibration) Change to hydrology impacting wetlands and waterway nests	Project footprint
	Construction	Tree clearing Installation of temporary and permanent infrastructure	Habitat loss Disturbance (noise, light, vibration) Increased risk of collision or mortality	Project footprint
	Operation	Facility operation Additional vehicle traffic	Disturbance (noise, vibration)	Project footprint
	Decommissioning	Dismantling of equipment and infrastructure	Disturbance (noise, vibration)	Project footprint

5.2 Potential Changes to the Environment on Federal Lands or Lands Outside of Ontario

The Project is not expected to result in changes to federal lands. There are no federal lands near the Project site and no development is planned to occur on federal lands.

The Project is not expected to result in changes to lands outside of Ontario.

5.3 Potential Effects to Indigenous Peoples

NPI/OPG are engaging with Indigenous Nations with respect to all Project phases, including the determination of potential effects to Indigenous peoples. Consideration for the potential effects to Indigenous peoples is based on engagement that has occurred to date. This information will continue to be updated throughout the IA/EA process as engagement continues and if/when further information is shared.

5.3.1 Current Use of Lands and Resources for Traditional Purposes

As described in Section 1.3.2, NPI/OPG consultation with Indigenous peoples is ongoing. During this engagement, topics of interest raised by community members has included (but were not limited to) considerations for dewatering regarding quantity and quality of downstream water, and Wild Rice harvesting on Crowe River, as well as fishing opportunities within the Open Pit.

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Any minimal changes in water level and water quality from dewatering activities will abide by MECP discharge criteria, with traditional use and values being considered during the various evaluations required through the IA/EA and subsequent approvals (e.g., PTTW). As a result, no anticipated effects to traditional use or values are anticipated as result of the Open Pit dewatering. A water sampling program is ongoing to determine the quality of the Open Pit water stratums as well as the potential receiving waters. Preliminary results indicate a direct discharge is likely possible (using floating intake pumps), however, further sampling and evaluation is needed to confirm. As noted above, Crowe River is currently the preliminary preferred receiving water for Open Pit dewatering. Currently, there are no plans for dewatering to occur during the spring restrictive fish window. Proposed measures including appropriate scheduling, discharge quality requirements and discharge flow control will mitigate potential impacts to aquatic life, users and/or navigation. Similarly, a 2013 MNRF wetland evaluation mapped Wild Rice between the two most upper potential discharge locations on the Crowe River (the proximity of which is ~100 m from the proposed Project Location). These Wild Rice locations, as well as any new discharge location considerations along Crowe River, will be confirmed during 2023 baseline investigations. Presumably, any discharge location located downstream of the Wild Rice would have an advantage over those further upstream; however, a fulsome analysis is required. Further discussion is provided in Table 1-4 and Section 5.6. Traditional land use will continue to be considered as the IA/EA progresses. NPI and OPG will maintain an open relationship with the communities that identify as using these resources to address access and scheduling considerations around harvesting.

As baseline investigations continue to collect data, this information will be shared with relevant/interested Indigenous communities for review, feedback and insertion into the alternatives assessment and overall IA/EA process.

5.3.2 Cultural Heritage and Archaeology

5.3.2.1 Marmoraton Mine

Cultural heritage and archaeological assessments were performed by Archaeological Services Inc (ASI) at the Marmoraton Mine site. The results of this study concluded that a direct impact to the former Marmoraton Mine property is expected due to the proposed Project. A Cultural Heritage Evaluation Report was prepared, and the results determined that the property has cultural heritage value in addition to historical and contextual value. ASI recommended that the report is submitted for review and feedback to the planning staff at the Municipality of Marmora and Lake, the MCM and other interested stakeholders. A Heritage Impact Assessment (HIA) will be completed for the Marmoraton Mine Site early within the detailed design phase of the Project. The HIA will identify impacts and provide mitigation and monitoring commitments that will avoid or minimize the impacts on the cultural heritage value of the site.

No previously registered archaeological sites were identified within the studied area during the archaeological assessment. However, areas that have not been previously disturbed by

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Marmoraton Mine activities, exhibit archaeological potential and will require a Stage 2 archeological assessment via test pit survey where appropriate.

5.3.2.2 Preliminary Preferred Transmission Line Route

The preliminary preferred transmission corridor is planned to be located within the municipal right-of-way to the extent possible; therefore, effects are expected to be minimal. Cultural heritage and archaeological assessments were performed by ASI on the area of the preliminary preferred transmission line route. The results indicated that 5 built heritage resources (B.H.R.s) and 8 cultural heritage landscapes (C.H.L.s) were identified within the Project development study area. These findings will be used to inform the criteria used in the alternatives assessment as the IA/EA progresses.

The results of archaeological assessment indicated that the Centre Line Cemetery located at 663-673 Centre Line Road and the Hamilton-Irwin Family Plot Cemetery located at 4 Quinn Road will require Stage 3 Cemetery Investigations as areas of the properties exhibit archaeological potential. Other areas identified along the potential transmission line route will require a Stage 2 archaeological assessment via test pit and pedestrian surveys where appropriate, which will be conducted as the IA/EA progresses.

5.3.3 Social, Economic and Health Contexts

As described in Section 1.3.2, NPI/OPG consulted with WTFN on February 27, 2023. During this engagement, topics of interest raised by community members included (but were not limited to) interest in economic opportunities. Economic opportunities for Indigenous stakeholders will continue to be considered as the IA/EA progresses. NPI/OPG are committed to providing beneficial economic opportunities (which could include training, apprenticeships, procurement, etc.) as an extension of engagement agreements to date. Overall, from the discussions with Indigenous communities to date, there have been no concerns raised related to social, economic or health effects as a result of the Project.

Negative impacts to health are not anticipated as a result of the Project. As described above, the quantity and quality of downstream water should not be affected, and harvesting activities on Crowe River and nearby lands can continue uninterrupted through proper planning, mitigations, communication, and scheduling considerations. As noted in Table 1-4, NPI and OPG are open to discussing land agreements that could potentially see an increase in available lands for harvesting, fishing, and collection of traditional plants. Furthermore, also noted in Table 1-4, NPI and OPG are very much cognizant of the opportunities a Project of this nature can provide to Indigenous peoples through participation in the environmental planning phase as well as the opportunities during the construction and operational phases.

5.4 Greenhouse Gas Emissions

The Project is expected to reduce greenhouse gas (GHG) emissions from the Ontario electricity system by 70,000 to 140,000 tonnes of carbon dioxide equivalent (tCO_2e) per year.

However, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and other GHG will also be released to the atmosphere during all phases of the Project. An initial estimate of GHG emissions associated with the Project has been developed and is presented in the sections

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below. The GHG emissions estimates below are based on construction costs and US EPA supply chain emission factors for construction activities.

GHG quantification studies will continue as the Project progresses.

5.4.1 Construction

During construction, the main source of GHG emissions will be from the combustion of diesel fuel in heavy equipment on site and for transportation activities, including the use vehicles, equipment, and machinery.

Under the assumption that construction will start in Q1 2025 after dewatering has occurred, and be complete by Q4 2029, direct and indirect GHG emissions for construction have been estimated at 39,871 tCO_2e per year for 5 years, totaling 199,357 tCO_2e.

5.4.2 Operations

Operational Project GHG emissions are expected to be negligible, limited to emissions from site vehicles and a backup generator to be used for emergency on-site power.

5.5 Wastes and Emissions

5.5.1 Waste

The Project is committed to carrying out activities in a way which minimizes the generation of waste and prioritizes environmental protection throughout all stages. As such, a waste and hazardous materials management plan will be developed and submitted in the Environmental Protection Plan. The plan will provide preventative measures to avoid the release of waste and hazardous materials into the environment as well as reporting and clean-up protocol. Waste or hazardous materials are to be recycled, disposed of, or transported to an authorized disposal site in accordance with applicable legislation and standards.

The Project is expected to generate non-hazardous and hazardous waste, although the hazardous waste contained on site will be minimal.

Non-hazardous solid waste is the debris and trash materials resulting from activities during the construction stage of the project. This non-hazardous waste includes, but is not limited to,

- aggregate/quarry materials
- soils
- timber
- grubbing materials
- kitchen waste
- used welding rods/electrodes
- abrasive sanding products
- plastic materials
- wood

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- wires and cables
- survey stakes and ribbons
- geotextile materials
- metal strapping and cut-off materials
- tapes and pipe coatings

Hazardous waste is waste which may contain a certain amount of hazardous substances in the form of residues. Hazardous waste may be generated or used mainly during construction; however, some can also be expected to occur to a lesser extent when the transmission line is in operation. Hazardous waste and materials likely to be used over the course of the Project include, but are not limited to,

- fuels (e.g., propane, gasoline, diesel, etc)
- lubricants (e.g., motor oil, transmission oil, gear oil, lubricating grease, engine oil, etc)
- cooling fluids (ethylene glycol, ethylene glycol monomethyl)
- paints and solvents
- adhesives (including epoxy and urethane-based products) and cements
- cleaning products
- used batteries (from vehicles and equipment)
- empty grease cartridges
- soil, vegetation and contaminated absorbent materials that may contain hydraulic fluids, diesel, gasoline or lubricating oil.

Minimal quantities of oil, lubricants and chemical are expected to be used on the site. Appropriate oil containment mechanisms will be implemented and regularly maintained. Additionally, in accordance with O. Reg. 224/07 under the Environmental Protection Act, a Spill Prevention Protocol and Countermeasures Plan will be issued to provide guidance and requirements for spill prevention and contingency plans. Spill control equipment should be provided and maintenance for all oil storage areas on site, including but not limited to absorbent pads, oil-specific absorbent booms, universal absorbent booms, rope for boom installation in the tailrace, sampling bottles, disposal bags and ties, safety glasses and rubber gloves.

5.5.2 Emissions

For more information regarding GHG emissions, refer to Section 5.4.

Emissions during the construction stage may include, but are not limited to:

- atmospheric emissions (SO_2, NO_x and CO_2) resulting from the simultaneous operation of vehicles, equipment and machinery with internal combustion engines

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- temporary dust generation and GHG emissions from rock blasting works
- noise emissions from operation of trucks, excavators, bulldozers, generators and drilling machines.
- Emissions during the operations stage may include, but are not limited to:
- noise emissions from compressor stations, motors and electrical switching stations.

No emissions to water or soil are expected. Standard construction site best management practices to minimize emissions due to exhaust and dust will be applied. Refueling and maintenance best practices will be following throughout the duration of construction.

5.6 Overview of Potential Environmental Effects

A summary of the Project's potential environmental effects is provided in the following table.

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Table 5-2: Preliminary Summary of Potential Environmental Effects

Environmental Component	Potential Effect	Preliminary Proposed Mitigation (to Address Potentially Adverse Effects[1])
Air Quality	Generation of dust or emission products of petroleum hydrocarbon combustion. **<u>Project Benefit:</u> Potential for reduced long-term dust generation through the mine lands repurposing/reclamation.**	• Regulatory air quality requirements will be met at property boundary. • Hard surfacing of roads or other high traffic working areas. • Water will be sprayed on haul roads and construction areas to control dust emissions; best management practices will be followed for dust control during operations. • Implement slow speed limits for construction vehicles on site to minimize dust emission potential on access roads. • Phase construction, where possible, to limit the amount of time soils (minimal soils on site) are exposed. • Waste rock reshaping works not to be conducted during excessively windy weather. • Dust curtains to be used on loaded dump trucks, delivering materials from off site. • Stockpiles and other disturbed areas to be stabilized as necessary (e.g., tarped, mulched, graded, revegetated or watered to create a hard surface crust) to reduce/prevent erosion and escape of fugitive dust. • All equipment will be well maintained and fitted with appropriate exhaust systems.
Noise and Vibration	Noise and vibration emissions may disturb adjacent landowners or other area users.	• Regulatory requirements for noise will be met at nearest sensitive receptor. • Measures will be used to reduce sound emissions, such as developing a compact site, maintaining tree screens around work areas, reducing the overall height of stockpiles. • Equipment will be maintained in good working order and utilize efficient mufflers. • Construction will be undertaken in accordance with municipal noise bylaws which may limit construction activities to avoid disturbance during sensitive nighttime periods. • Hydro One switching stations to be enclosed. • Transmission line to be underground.

1 Mitigation measures are not required, nor proposed to address positive environmental effects.

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Environmental Component	Potential Effect	Preliminary Proposed Mitigation (to Address Potentially Adverse Effects[1])
Light	Localized light glow may be visible off site.	• Lights will be properly aimed to minimize off-site light disturbance. • Light color, brightness, and shrouds to follow federal/provincial guidance to minimize effects on people and the environment.
Soils and Sediment Quality	Erosion and sedimentation due to construction and/or dewatering activities. Soil and sediment quality could be adversely affected by excavation and removal, accidental spills, compaction, or loss due to fugitive dust or erosion. **<u>Project Benefit:</u> Implementation of setbacks, buffers, vegetated areas and other measures to reduce off-site transport of sediment.**	• A sediment and erosion control plan will be developed to minimize the potential for off-site soil transport. • Best management practices will be implemented for erosion and sedimentation control, dust management and prevention/containment of accidental spills. • Erosion and sediment control measures to be implemented prior to start of site construction and maintained until site restoration measures (e.g., revegetation, grading, stabilization) are sufficient to prevent any further erosion and sedimentation due to disturbance from the construction period. • Any new cleared or disturbed areas (minimal planned) will be minimized to the extent possible. • Phase construction will be proposed to minimize the time that soils are exposed and stabilize, repurpose, or reclaim existing area in progression. • Aggregate piles/areas currently in close proximity or encroaching on natural environment (e.g., wetlands) will be repurposed early in the construction phase to reduce/improve current conditions. • Existing vegetation cover will be maintained to the extent possible and grubbing will only be conducted where required. • An adequate supply of erosion control devices (e.g., geotextiles, revegetation materials) and sediment control devices will be provided on site to control erosion and sediment transport and respond to unexpected events. • Permanent and temporary access road runoff will be diverted in a diffused manner through vegetated areas or into properly designed and constructed sediment traps or a drainage collection system to ensure that exposed soils are not eroded. Runoff velocities in ditches or other drainage routes, or along slopes, will be kept low to minimize erosion potential. Runoff outfall locations should be protected with erosion resistant material, if required.

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Environmental Component	Potential Effect	Preliminary Proposed Mitigation (to Address Potentially Adverse Effects[1])
		• Existing slopes and stockpiles will be graded to a stable angle as soon as possible to eliminate potential slumping and runoff. • Newly exposed sites (minimal planned) will be revegetated or stabilized as soon as possible after they have been disturbed. Where revegetation is not possible, other erosion protection methods, such as riprapping, bioengineering, or erosion matting should be used. • Excavated erodible material stockpiles will be placed in suitable designated areas and properly constructed silt fences will be installed to limit the transport of sediment. • If mud is deposited on local roadways the contractor will be required to implement a system to prevent mud on streets from entering local storm drains. • A spill prevention and response plan will be developed and implemented. • Chemical handling procedures will be developed to prevent/minimize the potential for spills due to improper handling. • All employees responsible for chemical handling to be trained in proper handling and emergency spills response procedures. • All chemical handling and storage to be conducted at designated sites, away from watercourses and outside of floodplain areas. • Barriers will be erected around designated chemical storage areas to prevent damage due to accidents such as trucks backing into area. • An adequate supply of spill containment and clean up material to be maintained on site. • Equipment to be monitored to ensure that it is well maintained and free of leaks.
Significant Earth or Life Science Features	**<u>Project Benefit:</u> Preservation and improvement of the provincially significant Marmoraton Mine Earth Science ANSI (Open Pit wall formation) by lowering the water within the Open Pit.**	• Project planning and design will consider opportunities for creation and maintenance of continuous public viewing.

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Environmental Component	Potential Effect	Preliminary Proposed Mitigation (to Address Potentially Adverse Effects[1])
Surface Water	**Project Benefit: Improvements to surface water runoff quantity and quality.** **Project Benefit: Reduction in wetland encroachment.** **Project Benefit: Improvements to existing water crossings.** Localized, increase in local runoff rates and quantity, and associated decreases in runoff duration as a result of vegetation clearing, land grading, ditching, or drainage improvements resulting in more impervious surfaces. Localized, adverse effects on surface water quality due to erosion, inundation, sedimentation and accidental spills. Potential for change in hydrology as a result of existing groundwater inputs being altered through Open Pit dewatering and as a result of long-term water management activities on site (i.e., decant of surplus water from reservoirs).	• A sediment and erosion control plan will be implemented. • Work activities to cease if high levels of turbidity are observed until remedial action can be initiated. • A hydrology monitoring plan will be implemented, during the Investigation phase to monitoring effects of the local surface waters during Open Pit dewatering. • Work site isolation, containment, clean-up and good general housekeeping practices will be implemented to prevent escape of debris. • Effluent Open Pit discharge to the environment will meet federal and provincial regulatory approval requirements. • Designated refueling and maintenance areas will be established away from flowing watercourses, drainage ditches, channels, wetlands or other wet areas. • Designated hazardous material storage areas will be located away from watercourses and wetlands. Storage areas will be above ground and enclosed by an impervious secondary containment structure (e.g., berm or container) capable of holding the entire volume of the stored material, as well as some additional volume of rainwater. • Secondary containment areas will be monitored to ensure their integrity. • Only machinery/equipment that is clean and well maintained (e.g., no leaks) will be operated in or near watercourses or drainage areas. No washing of equipment will take place within or near watercourses. • Adequate spill clean-up materials/equipment (e.g., absorbents) will be provided on site. • No alkaline cement products to be deposited directly or indirectly into or adjacent to any watercourse. • Concrete materials that are cast in place will remain inside formed structures, isolated form the flow of any watercourses until they are fully cured (i.e., after a minimum of 48 hours if temperature is above 0°C or a minimum of 72 hours if air temperature is below 0°C).

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Environmental Component	Potential Effect	Preliminary Proposed Mitigation (to Address Potentially Adverse Effects[1])
Groundwater	Dewatering may affect the local groundwater levels/quality and may affect surface water flows. Potential effects on groundwater quality due to accidental spills.	• A spill prevention and response plan will be developed and implemented. • As the Open Pit has been historically dewatered (during operation of the mine pre-1978), groundwater levels/users are not anticipated to be adversely affected. • Groundwater modelling will be undertaken to assess the potential for effects and support mitigation, if required • Series of wells will be installed and monitored during dewatering during the Investigation phase as well as during construction dewatering and operation.
Vegetation Communities (including SAR Plants)	Alteration to community/damage to trees along the edge of woodlands/treed areas may result in: - damage to adjacent trees/shrubs and groundcover outside of work area - creation of new edge trees within wooded areas - disturbance to the rooting zone through soil compaction and rutting. Adverse effects (e.g., disturbance, destruction) to SAR plants. **<u>Project Benefit:</u> Net increase in vegetated/naturalized area as a result of repurposing and reclaiming existing mine lands.**	• Vegetation removal is minimal and will be limited to the footprint of the Project during site preparation and other construction activities. • Where feasible, time construction activities related to site preparation for the winter months. • Where feasible, maintain an appropriate setback from the rooting zone of edge trees. • Restrict construction activities by demarcating work areas. • Felled trees will be directed to cleared areas to prevent damage to those remaining. • Further studies will assess presence of SAR plants and potential for adverse effects. • Revegetation to use native seeds and plants to extent possible.

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Environmental Component	Potential Effect	Preliminary Proposed Mitigation (to Address Potentially Adverse Effects[1])
Wetlands	**Project Benefit: Reduction in rock encroachment, site run-off; implementation of riparian setbacks, were possible.** **Project Benefit: Increased water flow to Marmora Mines Provincially Significant Wetland.** Potential localized effects from dewatering/construction on wetlands in the Project Location; and provincially significant wetland located in close proximity.	• Project design to avoid altering and where possible improve existing wetlands. • Where possible, implement vegetated setbacks where there are currently none. • Implement a marsh monitoring program to track improvements and inform future commitments. • Ensure any imported soils are weed free to reduce introduction of invasive species. • Produce an invasive species management plan.
Wildlife (Birds, Amphibians, Reptiles and Mammals) and Wildlife Habitat	**Project Benefit: Reduced potential for wildlife conflicts, specifically:** - turtles nesting within the disturbed mine/ active aggregate lands - ground nesting birds (e.g., common nighthawk). **Project Benefit: Long-term improvement/ availability of habitat through:** - increased wetland setbacks - reclaimed/vegetated riparian areas - vegetated embankments and areas within the solar facility - reclaimed/vegetated temporary work areas - net increase in vegetated/naturalized areas expected as a result of the Project. Disturbance/avoidance of habitat as a result of increased noise, vibration and human presence. Habitat alteration (e.g., as a result of changes in moisture regime and introduction of invasive species).	• The majority of the Project footprint to be sited on previously disturbed lands. • Complete a pre-construction survey to ensure there are no wildlife within the Project construction area. • Where feasible, avoid construction activities related to site preparation outside of sensitive seasons for wildlife. • Where habitat is identified within the Project footprint, boundaries will be demarcated to avoid off-site disturbance. • Develop and implement an invasive species management plan. • Implement speed limits to minimize the potential for incidental take of transient species. • Staff will be trained on measures to take where wildlife are observed on site and potential effects may occur. • Install exclusionary fencing to prevent amphibians and reptiles from entering the construction site. Exclusionary fencing should not prohibit access to nearby habitats; careful consideration of placement, type of fencing and design will be required. Where required, redirect amphibians and reptiles to areas where they can avoid the potential for incidental take and still have access to habitats. • Qualified personnel should be properly trained on safe handling and removal procedures and circumstances (e.g., when it is appropriate to relocate wildlife).

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Environmental Component	Potential Effect	Preliminary Proposed Mitigation (to Address Potentially Adverse Effects[1])
	Injury or incidental take of during migration and/or natural travel patterns to and from habitats. Collision with vehicles and machinery. Removal of nest and eggs.	
Fish and Fish Habitat (Including SAR Fish and their Habitat)	Potential alteration, disruption and destruction of fish and benthic fauna habitat. Flow regime changes near potential discharge locations for Open Pit dewatering. **<u>Project Benefit:</u> Potential for decant water to improve fish habitat in Moira River watershed.** **<u>Project Benefit:</u> Removal of historical mine infrastructure (e.g., Mud Lake pumphouse, abandoned water crossing abutments) resulting in improvements to the aquatic environment.** **<u>Project Benefit:</u> Replacement of existing, undersized, blocked culvert resulting in improvement of overall habitat and fish passage between Mud Lake and Moira River.** **<u>Project Benefit:</u> Reduction of runoff and surface water quality/wetland improvements.**	• Further studies will be undertaken to assess fish and fish habitat. • Potential effects to hydrology and quality of surface waters will be characterized to identify potential for adverse effects; pumping scenarios will be designed to mitigate potential for adverse effects to habitat, if required. • Transmission line to use existing road network/rights-of-way to the extent possible to reduce water crossing/riparian impacts. • Any works. • Site offers abundant opportunity to improve fish habitat (as required). • Project expected to be built/operated to ensure no net loss of the productivity of fish habitat. • Open Pit not considered fish habitat given offline/artificial nature, any work within natural waters (i.e., fish habitat) will be isolated, dewatered with a fish rescue/ salvage completed by qualified biologist. • Work will follow DFO's Interim code of practice: Temporary cofferdams and diversion channels, Interim code of practice: End-of-pipe fish protection screens for small water intakes in freshwater, Code of practice: Culvert maintenance or any other code of practice/best management practice to avoid undue harm.

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Environmental Component	Potential Effect	Preliminary Proposed Mitigation (to Address Potentially Adverse Effects[1])
Socioeconomic Environment	**Project Benefit: Economic development, employment and procurement opportunities.** **Project Benefit: Direct, indirect, and induced economic benefits.** **Project Benefit: Opportunities for benefits to the tourism, recreation, education and training sectors.**	Engagement with Indigenous and local communities will be undertaken throughout all phases of the Project to maximize socioeconomic benefits to the extent possible.
Traffic	Disruption to local traffic on routes used, causing delays. **Project Benefit: Long-term reduction in truck traffic to and from the site.**	• Access timing restrictions will be in place during construction to minimize traffic disruption. • Designated transportation routes to avoid tight turning areas and delays. • Use of a police or security escort to guide/accompany any transport conveys as necessary. • Use of flagmen to facilitate traffic flow and control. • Driving of construction vehicles in a proper manner and respect all traffic laws, regulations, and company policies. • Signage providing any detour directions to be prominently displayed. • Repair/regrading of vehicle imprints or erosion gullies as necessary.
Waste Management	Generation of solid and hazardous waste.	• Sanitary facilities on site will include portable self-contained comfort stations. • Containment and haulage of sewage wastes by designated hauler. • Proper storage of solid wastes on site prior to disposal off site at local registered disposal facilities. Transportation of all municipal wastes to a licensed landfill by a licensed hauler. • Proper storage of hazardous wastes in secure containers inside impervious berms until disposal off site at a registered facility. • Reuse and recycling to be practiced whenever possible.

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Environmental Component	Potential Effect	Preliminary Proposed Mitigation (to Address Potentially Adverse Effects[1])
Use of Lands and Resources for Traditional Purposes by Indigenous People	Effects on spiritual relationships and connection with the environment. Effects on locations of sentimental, traditional and heritage value. Effects on traditional use of lands and resources as sites of value and interest to First Nation(s). Effects on cultural practices. Changes to land and resources resulting in effects on exercising rights.	• Engagement with Indigenous communities will be undertaken throughout all phases of the Project to mitigate potential effects to lands and resources used for traditional purposes.
Health and Safety	**Project Benefits: Proper signage, fencing and site presence to reduce current public trespassing.** Injury from equipment or activities.	• Prevention of access to the site upon commencement of work at the Project Location through the use of gates, signage, fencing, and other security procedures. • Temporary minor realignment of local trails in the vicinity of the Project. In addition, signage directing recreational users will be placed at strategic locations to ensure clear direction to users. • Dewatering of the Open Pit for comprehensive Open Pit wall stability assessment. • Adherence by workers to prescribed procedures. • Completion of safety training program by all workers. • Strict adherence to the Ministry of Labour occupational health and safety. regulations pertaining to construction sites regarding worker safety. • First aid equipment, as appropriate to the activity to be maintained on site. • Material Safety Data Sheets (MSDS) for any hazardous material used on site to be available close to the location where the material is used and stored. • An accident and emergency spill response plan. • Spill containment and clean-up materials on site. • Training to deal with emergency situations.

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Environmental Component	Potential Effect	Preliminary Proposed Mitigation (to Address Potentially Adverse Effects[1])
Physical and Cultural Heritage	Adverse effects to cultural heritage resources.	• Archaeological and cultural heritage assessments are currently being undertaken. • Should previously unknown or unassessed deeply buried archaeological resources be uncovered during development, the proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed archaeologist to carry out archaeological field work, in compliance with Sec. 48 (1) of the Ontario Heritage Act. • Any person discovering human remains must immediately notify the police.

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Appendix A Photo Log

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Figure A-1: Mine in Operation, circa 1970s, unknown source

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Figure A-2: Open Pit, 1986 (Marmora Historical Foundation, 2014)

Figure A-3: Open Pit, 2009 (Snell, 2009)

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Figure A-4: Open Pit and Non-Reclaimed Mine Lands, 2010 (NPI, 2010)

Figure A-5: Open Pit, 2022 (Hatch, 2022)

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