MACLELLANS MOUNTAIN QUARRY EXPANSION PROJECT

ENVIRONMENTAL ASSESSMENT REGISTRATION DOCUMENT

PROPONENT

S.W. Weeks Construction Ltd.
186 Terra Cotta Drive
New Glasgow, Nova Scotia, Canada
B2H 5G2

Report Prepared by:
McCallum Environment Ltd.

June 2018

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Environmental Assessment Registration Document

Name of Project:
MacLellans Mountain Quarry Expansion Project
Location: McLellans Brook, Pictou County, Nova Scotia
Proponent: S.W. Weeks Construction Ltd.
186 Terra Cotta Drive
New Glasgow, Nova Scotia, Canada
B2H 5G2

Report Prepared by:

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EXECUTIVE SUMMARY

S.W. Weeks Construction Ltd. (S.W. Weeks) currently owns and operates the MacLellans Mountain Quarry, operating under a Nova Scotia Environment (NSE) *Industrial Approval (IA)* (NSE Approval #2016-097967). S.W. Weeks plans to expand the existing MacLellans Mountain Quarry, which requires a Provincial EA registration (Class I undertaking). The purpose of the proposed quarry expansion is to continue to have quarry reserves available to serve the local market.

The current quarry footprint exists within a portion of a property (PID 00888537), owned by S.W. Weeks Construction Ltd and located 2km south of McLellans Brook, NS. The current IA encompasses quarry operations within this property. The proposed expansion of the quarry will occur within the same property, and an additional property located adjacent (north). The additional property (PID 65165748), is also owned by S.W. Weeks Construction Ltd. Expansion of the quarry will take place within three Development Areas (known as Development Areas A, B and C), over a 50 + year time period. This Project encompasses a total proposed expansion area of 32.8 hectare (ha) over the 50 + year time period. A broader 86ha Study Area was identified for the purposes of the provincial EA process.

The field data, regulatory consultation, and subsequent conclusions of this assessment indicate there are no expected significant residual environmental effects resulting from the MacLellans Mountain Quarry Expansion Project once all appropriate mitigation and monitoring has been implemented and completed. Standard construction mitigation methods will be implemented to ensure there are no significant impacts of the Project on VECs.

One wetland and three watercourses are present within the Study Area. WC1 and 2 provide fish rearing and foraging habitat (although flow of water in both features is very seasonal). WC3 is a headwater stream but observed to be dry during all site surveys and as such no viable fish access is provided within this feature. None of the watercourses provide potential spawning habitat for fish. The wetland (which is contiguous with WC2), provides potential fish access and rearing/foraging habitat, but only seasonally, and in wetter areas of the wetland which exhibit standing water. Apart from a potential access road crossing (50 + years into the quarry expansion), a minimum setback of ~50m will be applied between future quarrying areas and watercourses. A watercourse alteration permit will be obtained prior to crossing the watercourse. The current quarry footprint abuts the wetland, but future alteration of the wetland will not occur.

Species at Risk inventories within the Project Study Area revealed that no flora or fauna SAR were identified across the Study Area. One flora SOCI, Hop Sedge (S3) was identified twice within the Study Area. Both locations are within the ravine which WC2 drains through. A setback of minimum 70m will be applied to the boundary of the active construction area from the locations of Hop Sedge, therefore, no direct removal or destruction of this species will occur.

Watercourse 2 and Wetland 1 provide potential low-quality habitat (access) for Snapping Turtle and the Wood Turtle (both SAR), however limited water depths and substrate types within each feature limits the ability for them to provide suitable overwintering habitat. No Snapping Turtle or Wood Turtles were observed during field surveys.

Potential habitat is present for the Mainland Moose (SAR), the Fisher and Rock Vole (both SOCI) within the Study Area. None of the habitat present is considered critical for these species however, and additional habitat is provided within adjacent forested land, and the region in general.

As per communication with NSDNR, a bat hibernaculum exists approximately 2.2 km southwest from the southern Study Area boundary. In consultation with NSNDR and through review of other literature, it was determined that effects to bats as a result of blasting within quarries can be realised up to 1km away during hibernation periods. As such, the bat hibernaculum located 2.2km away in not considered at potential risk form blasting activities proposed during future quarry operations. No provincial government records of abandoned mine openings (AMOs) were located within the Study Area and field studies completed within the Study Area confirmed no suitable bat hibernacula exists (i.e. caves, abandoned mines or wells).

Bird usage within the natural areas of the Study Area (i.e. un-quarried portion) was determined to comprise a varied array of species (59 in total), and activity levels across all seasons studied indicated a healthy population of birds utilizing on-site habitat. Survey results indicted that the highest activity for birds appeared to be during the Fall (although an additional survey was completed in Fall versus breeding and Spring, which may have skewed results somewhat). The natural portions of the Study Area comprise a good intermix of natural forested land, cleared areas, and old pasture habitat which has created edge habitat suitable for bird foraging. However, no critical habitat for any birds identified during surveys is present within the Study Area. Across all survey seasons, a total of 16 priority species were observed either during dedicated survey periods or incidentally. Of these priority birds, five species at risk (SAR) were observed, the Bobolink, Canada Warbler, Chimney Swift, Eastern Wood-Peewee and Evening Grosbeak. Based on the mitigation measures for birds discussed in this document, and that adjacent lands and the regional area in general provide similar habitat for birds, it has been determined that residual environmental effects on birds are low, post-mitigation.

Seventy-one (71) residential properties (comprising a buildings) have been identified within 1km of the Project Study Area. All residential receptors are assumed to comprise a drilled potable water well. The closest residential building is located ~140m to the west of the existing MacLellans Mountain Quarry footprint, in close proximity to the quarry access road on MacLellans Mountain Glencoe Road (MMG Road). In its 37-year history, the MacLellans Mountain Quarry has never interacted with the groundwater table (no observed seepages through the exposed rock face of build up of water on the quarry floor). S.W. Weeks does not intend to work below the water table during quarry expansion. Quarry expansion is planned to move away from the closest residence, but closer to residential receptors located on

MacLellans Mountain Road (east of the Study Area and within ~500m) during quarrying within Development Areas A and B. Quarrying would move within 420m of a residential receptor located to the West of MMG Road should Development Area C be worked in the future (50 years +). To date, there have been no reports of negative effect to residential properties surrounding the existing quarry, however, potential effects as a result of quarrying activity (including blasting) on groundwater, water quantity and water quality has been discussed in this document. Mitigation including a water well replacement policy for wells potentially damaged by quarry activities, commitments to monitor water quantity and quality as per the Project IA, and to investigate potential quarry related issues will be implemented.

As future blasting locations extend to within 800m of residential receptors for which permission has not previously been granted, permission will be obtained as per IA requirements.

Viewplane from local residential receptors is not expected to alter significantly as a result of the Project. Some residential receptors located ~1.8km northwest of the Study Area can see a portion of the existing quarry wall, and future expansion within Development Areas A and B will potentially increase this, albeit over a long period of time. Vegetation will be remain in place across the Development Areas to within two years of proposed quarrying, and vegetation will also be left in place adjacent to the MMG Road to reduce visual impacts should quarrying within Development Area C occur in the future.

Increases in quarry operations and sales are not proposed as part of the expansion plan. As such, potential noise and dust levels are not expected to increase, blasting frequency and extent and truck traffic visiting the quarry is expected to remain consistent. There have been no health-related effects associated with the MacLellans Mountain Quarry to date, and as such none are expected as part of the proposed Project.

No significant archaeological features were identified within the Study Area during the field reconnaissance study. Evidence of field clearing, overgrown pasture, and a stone wall were observed within the Study Area. In addition, there is no evidence of significant historic or precontact land use by Mi'kmaq or European settlers within the Study Area and no concerns were received by the Kwilmu'ku Maw-klusuaqn Negotiation Office (KMKN), Office of Aboriginal Affairs (OAA) or Pictou Landing First Nation regarding the proposed Project.

The magnitude of disturbance and risk associated with the Project are all considered minimal given the size of the Project and the mitigation techniques and technologies currently available. Furthermore, this assessment concludes there are no significant environmental concerns and no significant impacts expected that cannot be effectively mitigated through well established and acceptable practices, or ongoing monitoring and response. Residual environmental effects have been determined to be minimal or low for identified Valued Ecosystem Components (VEC).

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LIST OF ACRONYMS

ACCDC	Atlantic Canadian Conservation Data Centre
AMO	Abandoned mine opening
AQHI	Air Quality Health Index
ARD	Acid Rock Drainage
ASL	Above Sea Level
ATV	All-terrain vehicle
BSC	Bird Studies Canada
CEAA	Canadian Environmental Assessment Act
CCME	Canadian Council of Ministers of the Environment
CoC	Chain of Custody
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DOE	Department of Environment
EA	Environmental Assessment
EC	Environment Canada
ECCC	Environment and Climate Change Canada
EPP	Environmental Protection Plan
FEC	Forest Ecosystem Classification for Nova Scotia
FWAL	Protection of Aquatic Life for Freshwater Guidelines
GPS	Global Positioning System
GS	General Status
HA	Hectares
IBA	Important Bird Area
IA	Industrial Approval
KM	Kilometer
KMKNO	Kwilmu'ku Maw-klusuaqn Negotiation Office
LPM	Litres Per Minute
Ltd	Limited
M	Meters
MMG Road	MacLellans Mountain Glencoe Road
MBBA	Maritime Breeding Bird Atlas
MBS	Migratory Bird Sanctuary
MEL	McCallum Environmental Ltd.
MW	Mixed Wood
NO_2	Nitrogen dioxide
NS	Nova Scotia
NSCCH	Nova Scotia Communities, Culture & Heritage
NSDEL	Nova Scotia Department of Environment and Labour
NSDNR	Nova Scotia Department of Natural Resources
NSE	Nova Scotia Environment

NSESA	Nova Scotia Endangered Species Act
NSTB	Nova Scotia Topographic Database
NSTIR	Nova Scotia Transportation and Infrastructure Renewal
O_3	Ozone
OAA	Office of Aboriginal Affairs
PC	Point Counts
PGI	Pellet Group Inventory
PID	Property Identification Number
PPV	Peak Particle Velocity
SAR	Species at Risk
SARA	Species at Risk Act
SOCI	Species of Conservation Interest
S-rank	Status rank
TH	Tolerant Hardwood
TSS	Total Suspended Solids
UTM	Universal Transform Mercator
VEC	Valued Ecosystem Components
VT	Vegetation Type
WESP	Wetland Ecosystem Services Protocol
WC	Watercourse
WL	Wetland

1 GENERAL INFORMATION

The Project summary is provided below.

Table 1. Project Summary

General Project Information	S.W. Weeks Construction Ltd. intends to expand the existing MacLellans Mountain Quarry (NSE Approval #2016-097967), currently located on Property Identification Number (PID) 00888537.
Project Name	MacLellans Mountain Quarry Expansion Project (the "Project")
Proponent Name	S.W. Weeks Construction Ltd.
Proponent Contact Information	186 Terra Cotta Drive. New Glasgow, Nova Scotia, Canada B2H 5G2 Business: (902) 755-3777 Facsimile: (902) 755-2580 email: sweeks@swweeks.com
Proponent Project Director	Stephen Weeks President
Project Location	• The Study Area is located within the boundaries of PID 00888537 and PID 65165748. • The Study Area is located approximately 2km southeast of the community of McLellans Brook and located 6km southeast of Stellarton in Pictou County, Nova Scotia. • The Study Area is located entirely within Pictou County, Nova Scotia. • The approximate centre of the Study Area is located at 532403 m E and 5042508 m N.
Landowner(s)	The Study Area is located on freehold (private) land owned by S.W. Weeks Construction Ltd.
Closest distance from the quarry to a residence	The closest residence is located approximately 50m to the south of the Study Area (adjacent to the existing quarry access road).
Federal Involvement, Permits and Authorizations	No federal departments or public sources of funding provided. No Canadian Environmental Assessment Act triggers (*Section 5, CEAA*) occur or are expected. No federal permits or authorizations are anticipated at this time.
Provincial Authorities issuing Approvals	Nova Scotia Environment (NSE)

Required Provincial Permits & Authorizations	The following permits, authorizations and/or approvals may be required for this Project which will allow for the construction and operation of the Project 1. *Environmental Assessment Approval.* Approved pursuant to Section 40 of the *Environment Act* and Section 13 (1)(b) of the *Environmental Assessment Regulations* in Nova Scotia, Canada; 2. *Industrial Approval* pursuant to Activities Designation Regulations, Division V, Section 13(f) 3. *Wetland and Watercourse Alterations* Pursuant to Activities Designation Regulations, Division I, Section 5A (2)
Provincial Regulatory Authorities Consulted during EA and Project Development Process	Nova Scotia Environment (NSE), Environmental Assessment Branch: • Candice Quinn, Environmental Assessment Officer Nova Scotia Department of Natural Resources: • Donald Sam, Species at Risk Biologist • Shavonne Meyer, Regional Biologist Office of Aboriginal Affairs: • David Mitchell, Consultation Advisor
Municipal Authorities	Municipality of Pictou County
Required Municipal Permits & Authorizations	None
Environmental Assessment Document Completed By:	McCallum Environmental Ltd. Andy Walter, B.Sc. Tessa Giroux, B.NRS. Jeff Bonazza, M.Env.Sci. **McCallum Environmental Ltd.** Suite 115, 2 Bluewater Road Bedford, NS. B4B 1G7

2 PROJECT INFORMATION

The following sections outline the proponent profile, the environmental assessment team, a description of the Project location, and the current quarry operations and proposed future operations.

2.1 Proponent Profile

S.W. Weeks Construction Ltd. is a general civil contractor with our base of operations in New Glasgow, NS since 1972. One important aspect of their work is the manufacture and supply of aggregates to other contractors, the general public, and for other projects.

S.W. Weeks Construction Ltd. (S.W. Weeks) currently owns and operates the MacLellans Mountain Quarry, operating under a Nova Scotia Environment (NSE) *Industrial Approval* (NSE Approval #2016-097967). S.W. Weeks plans to expand the existing MacLellans Mountain Quarry, which requires a Provincial EA registration (Class I undertaking). The purpose of the proposed quarry expansion is to continue to have quarry reserves available to serve the local market.

S.W. Weeks Construction Ltd. Executive Management Team consists of:

- Stephen Weeks, Project Manager and President

The Environmental Assessment Project Team is:

- Meghan Milloy, MES, McCallum Environmental Ltd;
- Andy Walter, B.Sc., McCallum Environmental Ltd.;
- Nick Hill, PhD, Fern Hill Institute of Plant Conservation;
- Ken McKenna, B.Sc., DDM;
- Laura de Boer, Professional Archeologist, Davis McIntyre & Associates;

2.2 Project Location

A Study Area was developed for the purposes of the EA. The Study Area is located approximately 2 kilometers (km) southeast from the community of McLellans Brook, and 6km southeast of Stellarton in Pictou County, Nova Scotia (Figure 1, Appendix A). The Study Area is located on the east side MacLellans Mountain Glencoe Road.

The Study Area is located within PID 00888537 and PID 65165748, both owned S.W. Weeks Construction Ltd. and encompasses the existing quarry footprint of approximately 25ha (Figure 2 and 3, Appendix A). In addition, the Study Area also encompasses a former aggregate quarry (approximately 4.3 ha in size) which is not currently operational and located adjacent to the MacLellans Mountain Glencoe Road. The Study Area is 86 hectares (inclusive of the 25ha area of existing quarry and 4.3ha area of the non-operational quarry). The remainder of the Study Area comprises a combination of intact coniferous and mixed wood forest, and evidence of historical forestry activities (Figures 5 and 6, Appendix A).

The approximate centre of the Study Area is located at UTM 20N 532403 m E and 5042508 m N. Highway 104 is located approximately 5.2km northwest of the Study Area and the Northumberland Strait is located approximately 20km north of the Study Area.

The existing MacLellans Mountain Quarry is located off the MMG Road with access provided via an existing paved road.

The Study Area is situated in a rural setting, approximately 6km southeast of the community of Stellarton and 1.7km northwest of the community of Kirkmount. There are approximately 71 residences within 1km from the outer edge of the Study Area. The closest residence to the Study Area is located 50m south of the Study Area on MMG Road (Figure 3, Appendix A). Apart from the existing quarry footprints and some woods access roads and all-terrain vehicle (ATV) trails, the Study Area comprises natural forested land, with evidence of historical forestry activities present throughout.

The MacLellans Mountain Quarry Expansion Project Study Area is not located in any protected or conservation areas within federal, provincial, or municipal jurisdiction. Figure 4 (Appendix A) shows the Study Area and surrounding significant habitats or conservation areas. The Nova Scotia Provincial Landscape Viewer identified the following:

- a mapped Significant Habitat for Species at Risk (the Landscape Viewer does not identify what Species at Risk is identified) approximately 1km west of the Study Area within the McLellans Brook;
- a mainland moose concentration area approximately 1.4km east of the Study Area;
- a mapped Significant Habitat for Migratory Bird area is located 10.5 km north of the Study Area; and,
- a Deer Wintering Area is located 7km south of the Study Area.

The closest NSE Wetland of Special Significance is located 5.2 km southwest of the Study Area.

2.3 Existing Quarry Operations

The MacLellans Mountain Quarry is the largest supplier of aggregates within Pictou County and provides material to NSTIR, government agencies and other contractors and private projects. Currently, the production at the MacLellans Mountain Quarry has averaged 250,000-meter tonnes of aggregate from the quarry per year, during active periods.

The existing MacLellans Mountain Quarry operations consist of a laydown area on the quarry floor, two aggregate crushers (one permanent and one portable), aggregate stockpiles, stabilized grubbings and overburden stockpiles, scale and a scale house. Two aboveground fuel tanks exist and are located outside the main shop and are inspected by Bluewave Energy. A liquid asphalt tank is onsite and maintained by a contracted maintenance company. A series of sediment ponds and rock lined drainage ditches are also

present. An existing paved access road (gated) to the quarry from MMG Road is located within the southwestern portion of the Study Area. The MacLellans Mountain Quarry's working face is currently located in the north-northeastern extent of the existing quarry, and the height of the quarry face is approximately 75 meters.

The following sections provide additional information related to the operations and best management practices which are followed at the MacLellans Mountain Quarry.

2.3.1 Drilling and Blasting

Blasting typically occurs between two and four times per year. Under the current and previous IA's, blasting has been completed at locations that result in a less than 800m setback to specific residences located on MacLellans Mountain Glencoe Road. As the quarry expands into future development areas (See Section 2.4.1), blasting will move away from these residences, but closer to other residences that will fall within 800m of future blasting locations. Any new residences which fall within 800m of future blasting areas will be contacted regarding the proposed blasting activities. S.W. Weeks Construction Ltd. currently monitors blasting at the existing quarry through an independent subcontractor. Monitoring occurs at a location on MacLellans Mountain Glencoe Road, and another on McLellans Brook Road. S.W. Weeks Construction Ltd has committed to undertake further monitoring near structures as requested by concerned neighbours. The independent subcontractor is a qualified blasting company which is sub-contracted to undertake the drilling and blasting operations in accordance with the *General Blasting Regulations* contained in the *Nova Scotia Occupational Health and Safety Act* (1996).

The qualified blasting company will be responsible for blast design, methods, monitoring and activities consistent with the Nova Scotia Department of Environment and Labour (NSDEL) *Pit and Quarry Guidelines* (NSDEL 1999). Pre-blast surveys have been completed for all structures within 800m of the point of blast following Nova Scotia Department of Environment (NSDOE) *Procedure for Conducting a Pre-Blast Survey* (NSDOE 1993). As future development areas extend within 800m of additional structures, pre-blast surveys will be completed for these structures as per IA conditions.

Weather conditions including high humidity or cloud cover, can cause the levels of overpressure and noise to appear more severe for surrounding residents than on a day when the humidity is low and there is lack of cloud cover. When possible, S.W. Weeks and its sub-contractors will avoid blasting when weather conditions include significant temperature inversions, strong winds, foggy, hazy or smoky conditions with little or no wind, or still, cloudy days with a low cloud ceiling.

2.3.2 Processing Activities

Specific processing activities including crushing and screening will be determined based on need. Currently, no washing process takes place on the site. Two crushers, one permanent and one portable, are currently used at the existing MacLellans Mountain Quarry. Various aggregate products (i.e. gravels,

drainage stones, environmental stone, armour stone) are produced based on need and stockpiled in designated areas within the quarry. Aggregate stockpiles, topsoil and overburden piles are located in designated areas within the quarry. Stockpiles are built, and material hauled and moved within the quarry with a front-end loader. An excavator will also be used for material handling.

2.3.3 Water Management

Currently, the majority of the surface water runoff and drainage occurring at the site seeps into the underlying fractured bedrock across the quarry floor. Environmental controls are in place to mitigate any potential surface runoff entering a wetlands, watercourses or adjacent properties (Figure 5, Appendix A). A series of rock lined drainage ditches and underground pipes direct water from northern portions of the quarry into a series of two settling ponds which are present in southern, central portions of the existing quarry area. In addition, berms are present alongside the northwestern extent of the existing quarry, which directs all water flow southeastward (away form the mapped watercourse and wetland) towards and into the settling ponds. Existing settling ponds are rock lined and consist of deeper sections and small berms to detain water flow and enable sediment deposition. Water drains from the settling ponds via a ditch to the southwest, beyond the Study Area boundary, into an un-named watercourse located south of the Study Area. There have been no known issues with sediment entering surface water receptors to date. The current Project IA (and ongoing communication with the regional NSE office) ensures monitoring requirements associated with surface water exiting the existing quarry are implemented.

Additional settling ponds and/or water management methods will be added as needed as the quarry expands, and surface water runoff potentially increases. These structures will be approved and implemented in association with the current MacLellans Mountain Quarry IA.

2.3.4 Waste Management

Overburden is currently stored in a windrow along the northern side of the quarry area, running parallel to Watercourse (WC) 2 (located to its northwest). This overburden will be re-used during rehabilitation and reclamation of the quarry at the end of its operational phase. Sediment is actively managed on site with erosion and sediment control measures including the existing settling ponds in the southern, central portion of the quarry floor. If other surface water discharges are identified in other directions leaving the quarry area, additional erosion and sediment control measures will be implemented and monitored, as needed, to manage runoff outside the approved quarry area.

2.3.5 Hazardous Waste Management

As previously discussed, two aboveground fuel tanks exist outside the main quarry building located at the entrance to the quarry. These are regularly inspected by Bluewave Energy. A liquid asphalt tank is located adjacent to the scale house in the southwestern portion of the quarry and maintained by a contracted

maintenance company. There are no future plans to store additional hazardous materials, chemicals or petroleum products at the quarry site.

Regular maintenance of the equipment (loaders, excavators and portable crushing equipment) is planned at the quarry site. Used oil and filters are currently removed from the quarry site and this practice will continue with the proposed expansion. Re-fueling of equipment will continue to be conducted on site on a regular basis at distances greater than 100m from any surface water and the operators will remain with the equipment at all time when re-fueling activities are taking place.

2.3.6 Transportation and Production

Haul trucks that purchase aggregate from the MacLellans Mountain Quarry are not owned by S.W. Weeks Construction Ltd. rather they are owned by the quarry customers. Transportation routes for haul truck traffic are therefore variable, but generally follow the MacLellans Mountain Glencoe Road north continuing on to Glen Road to McLellans Brook Road. Truck traffic generally heads west to Highway 348 or east to Highway 347 to access Highway 104. The number of haul trucks per day is dependent on quarry customer volume and projects in the local area.

The quarry will typically operate for 12 hours per day, 5 days a week, although operation can extend to 6 days a week during exceptionally busy periods. Truck activity at the MacLellans Mountain Quarry typically varies day to day, consisting of various types of vehicles. Truck traffic is not expected to change as the quarry expands. The peak operation season typically extends from May through November. Although haul trucks are not owned and operated by S.W Weeks Construction Ltd., customers are encouraged to cover truckloads to minimize dust and to contain aggregate material as necessary. The quarry is active year-round.

2.3.7 Noise Management

Sound levels within the quarry are monitored as requested by NSE at the property boundaries of the quarry, in accordance with the NSDEL *Pit and Quarry Guidelines* (NSDEL, 1999). Blasting (approximately two-four times per year) accounts for the predominant source of noise from the quarry. As previously discussed, blasting will be planned to occur on days where weather conditions are less likely to cause excessive sound levels.

2.3.8 Dust Control

Dust emission and particulate matter will be monitored at property boundaries adjacent to the quarry, at the request of NSE, in accordance with the NSDEL *Pit and Quarry Guidelines* (NSDEL, 1999). Should it be required, dust emissions will be controlled with the application of water.

2.3.9 Viewscape

The MacLellans Mountain Quarry is located in a rural location and is not visible from any adjacent public vantage points (i.e. MMG Road) or from the nearest residence, located on MMG Road (50m south of the Study Area). One resident located approximately 1.8km northwest of the Study Area noted during the Public Information Session that he could see the existing working face of the quarry from his home. The currently inactive former aggregate quarry located adjacent to MacLellans Mountain Glencoe Road (Figures 5 and 6, Appendix A) is partially visible from the MacLellans Mountain Glencoe Road.

2.3.10 Risk Management

A contingency plan for the MacLellans Mountain Quarry and its proposed expansion is the responsibility of the Proponent: the quarry owner and operator. The contingency plan will cover notification procedures for emergencies, identification of owner team leaders and contacts, spill prevention, spill procedures, and incident reporting procedures. This plan will be provided to NSE as part of the Environmental Protection Plan (EPP), which follows the EA registration and approval.

2.4 Future Quarry Operations

In order to continue production and supply aggregate to the local market, S.W. Weeks Construction Ltd. plans to expand the existing MacLellans Mountain Quarry. The proposed quarry expansion is proposed to increase reserves, not increase production. The timing and rate of quarry expansion and development is based on market need for local aggregate. However, current production rates are expected to remain consistent as the quarry expands. If a large project was to occur in proximity, the proposed development plans could vary if an increase need of aggregate is required at that time.

Presently, there are no anticipated changes to the current operations within the quarry including the amount and frequency of blasting, quarry hours of operation, and number and frequency of haul trucks collecting aggregate from the site.

2.4.1 Development Plan

Expansion of the MacLellans Mountain Quarry has been proposed in three development stages. S.W. Weeks has identified three proposed approximate development areas (Development Areas A, B and C). Expansion will occur within these proposed Development Areas and will include a combination of quarrying activities, and components that support the quarrying activity (i.e. access roads, stockpile and overburden areas among others). Approximate locations of Development Areas are indicated on Figure 5 (Appendix A).

The following items were considered when determining the extent and location of Development Areas:

- Separation distances from the boundaries of Development Areas to public roads:100m;

- Development Areas not encroaching within 30m of an adjacent property boundary; and
- Development Areas not encroaching within 30m of watercourses and wetland habitat.

Expansion of the quarry will continue northeast from the existing quarry face to access the desirable aggregate in Development Areas A and B (Figure 5, Appendix A). The current quarry floor sits at an elevation of ~136m above sea level and rises to the natural forested land beyond the existing quarry face to the north and northeast (~200m above sea level). Proposed quarry activities will not result in excavation deeper than the existing quarry floor (i.e. a pit), rather, additional carving of the existing quarry face into the side of the incline will occur and groundwater interaction is not expected. Quarrying within Development Area C (>50 years), will likely extend from a new access road constructed from the stockpile area in the existing quarry, and into the adjacent land (west). Quarrying in Development Area C will eventually adjoin with the inactive current aggregate quarry adjacent to MacLellans Mountain Glencoe Road (Figure 5 (Appendix A).

The initial phase of expansion, within Development Area A, is planned for a 20-year period (1 to 20 years). This quarry expansion will extend the quarry to the north and east within Development Area A, located within the current property (PID 00888537). The second phase of expansion, within Development Area B, is planned for 20 – 50-year period (PID 00888537). This expansion area encompasses land to the north and west of Development Area A. Both of these development areas are comprised of forested lands with historic harvesting activities present.

Development Area C is located in the adjacent (west) property (PID 65165748), which is also owned by S.W. Weeks Construction Ltd. This area will be considered to accommodate further expansion post 50 years, should it be required. The inactive aggregate quarry also exists within PID 65165748; however, it is not currently in operation. Development Area C comprises forested lands with evidence of historical forestry activities. Development Area C will comprise of a combination of quarrying activities and associated quarrying components (i.e. crushers, stockpiles, and site access roads). As is identified on Figure 5 (Appendix A), a maximum quarrying extent has been identified within Development Area C. The maximum quarrying area extent was defined to ensure an 800m setback from surrounding residential communities to the northwest of the Study Area were met and indicates the maximum extent in which quarrying activities are proposed. The remainder of Development Area C (i.e. northwestern extent), has been identified to comprise other potential quarry components (i.e. access roads, laydown areas etc). In addition, a small extension to Development Area C is proposed across WC2 to accommodate a potential access road connecting the existing quarry and Development Area C.

The Development Areas have been designed based on the Proponent's expectation of local aggregate need over the next 50 years and beyond. As such, rate of expansion is estimated, and could vary from those defined in this document. Extent of quarry expansion will be overseen as part of the provincial IA permitting process. The estimated size of quarry expansion for each of the three Development Areas is provided below:

- Development Area A: 3.8 ha over 1-20 years;
- Development Area B: 8.5 ha over 20-50 years; and
- Development Area C: 20.5 ha over 50 years onward[1]

Therefore, the total proposed quarry footprint for the MacLellans Mountain Quarry is 32.8ha.

[1] *Of the 20.5ha footprint associated with Development Area C, 13.4ha is specific to the maximum quarrying area (i.e. areas subject to blasting and removal of rock for aggregate production). The maximum quarrying area was developed to increase setbacks to residential properties located northwest of the Study Area. The remaining 7.1ha of Development Area C will comprise other quarry related infrastructure (i.e. equipment storage, laydown areas, stockpile areas etc).*

The majority of the three Development Areas are forested. Clearing and grubbing to support quarry expansion will be completed as necessary and will be limited to minimize exposed soil and potential for erosion. Approximately 2-3 years of quarrying area will be cleared of vegetation at the top of the existing quarry face at any given time. Topsoil and overburden removed during this process will be added to existing stockpiles present in the existing quarry.

No wetlands have been identified within the proposed Development Areas. One watercourse crossing (WC2) may be required to support quarry expansion into Development Area C.

Expansion of the quarry is not expected to change the viewscape for the residents on MMG Road. Development Areas A and B will not be visible from any public vantage point along MMG Road, however, as discussed in Section 2.3.9, the current quarry face is visible to some residents located approximately 1.8km northwest of the Study Area. It is likely that expansion into Development Areas A and B will expose more of the quarry face to these residents, albeit over a 50-year time period. The existing inactive aggregate quarry located west of Development Area C (Figure 5, Appendix A) is currently visible from the MMG Road. Should quarrying extend into Development Area C in the future, it will do so from along the northern boundary of the Study Area (i.e. farthest distance from the MMG Road) and is unlikely to be visible from MMG Road. As quarrying extends southwestward within Development Area C (i.e. 70 years +), it is expected that the additional quarrying area will be visible from MMG Road and residences located west of MMG Road.

2.4.2 Quarry Components

Existing quarry infrastructure will remain in place during expansion within Development Areas A and B including an existing asphalt plant operation (permitted under a separate IA approval) and two crushers (one permanent and one portable). No new quarry infrastructure or changes to topsoil, overburden piles and stockpile locations are expected in these areas. Existing aggregate piles are currently located at various locations within the existing quarry limits. The scale and the scale house are and will continue to be located adjacent to the paved access road within quarry limits. The existing paved access road (gated)

to the quarry from MMG Road located within the southwestern portion of the Study Area will continue to be used to access the quarry in the future.

Should quarrying within Development Area C occur in the future, initially, quarry related components such as the crusher and stockpiles will remain in the current quarry. As quarrying extends and creates increased quarry floor area in Development Area C, quarry components may be relocated. Environmental controls will be implemented in conjunction with a new IA for this Development Area. In addition, construction of a quarry access road across WC2 from the existing quarry would be required to access Development Area C. No additional access roads from the MMG Road into the quarry are planned.

2.5 Decommissioning and Reclamation

Decommissioning and reclamation is planned towards the end of the operational window within the Development Areas proposed for the MacLellans Mountain Quarry. This approach would include progressive reclamation of portions of the existing quarry and Development Areas A and B, once the aggregate resource in these areas were exhausted. A detailed reclamation plan will be completed at the request of NSE prior to operations ceasing at the quarry (or a portion of the quarry). Decommissioning will involve removal of equipment and all structures from the quarry property. Reclamation will involve identification of short and long-term goals and options for the site including, but not limited to: sloping, seeding, planting of native species, and fertilizing. Long term, the quarry site is expected to be used for timber production and harvesting and will be sloped and levelled and allowed to regenerate.

2.6 Anticipated Schedule of Activities

The following milestone schedule (see Table 2) outlines the Project schedule.

Table 2. Schedule of Project Activities

Task	Anticipated Completion Date
Environmental Studies	Winter, Spring, Summer, and Fall 2017
Engagement	Mi'kmaq engagement (via Project Description letters): March-May 2018 April 10, 2018 (Information Session and ongoing throughout the Project to inform Project design)
Environmental Assessment Registration	June 2018
Expected EA Decision	August 2018
Provincial Permitting (Industrial Approval)	Current IA for PID 00888537 expires December 31, 2026 and covers expansion into Development Areas A and B. Renewal of this IA may be required post 2026, and a new IA will be required should expansion occur within Development Area C.
Quarry Expansion Window	2018- unknown (to maximum quarry extent described in this document)
Reclamation	Progressive with quarry operations

3 ENVIRONMENTAL ASSESSMENT SCOPE

Nova Scotia's *Environmental Act* and Environmental Assessment Regulations regulate provincial environmental assessments. The MacLellans Mountain Quarry Expansion Project requires a provincial environmental assessment registration as it is considered a *Class I* undertaking under Section 9(1) of the Nova Scotia Environmental Assessment Regulations.

3.1 Boundaries of the Assessment- Spatial and Temporal

Spatial boundaries of the EA are defined by the MacLellans Mountain Quarry Expansion Study Area (Study Area) (Figures 2 and 3, Appendix A). The Study Area covers portions of PIDs 65165748 and 00888537 and was designed to buffer and surround the proposed expansion (development) areas for the MacLellans Mountain Quarry. All assessments used this Study Area as the spatial boundary for assessment with the exception of the following, expanded area evaluations:

1. The Municipality of Pictou County was considered for the purpose of data collection relating to existing socioeconomic conditions and evaluation;
2. Potable wells located within a 1.0 km buffer of the Study Area (Figure 3, Appendix A) were assessed as potential receptors to evaluate groundwater interaction; and,
3. The downstream receiving aquatic environment including Stewart Brook, McLellans Brook and the East River of Pictou were evaluated (desktop) as part of the aquatic environment.

The temporal boundaries of the EA include the construction (expansion), operation and maintenance, and decommissioning/ reclamation phases of the Project, and associated activities.

3.2 Assessment Scope

The EA planning process allows for the prediction of environmental effects of a proposed Project and identifies measures to minimize and then mitigate potential adverse environmental effects. The EA attempts to predict significant residual adverse environmental effects once mitigation measures are implemented.

The EA focused on specific environmental components called valued environmental components (VECs). VECs are specific components of the biophysical, socio-economic, human health, cultural environments. VECs are important (not only economically) to a local human population or has a national or international profile. If altered, a VEC is important for the evaluation of environmental impacts of a proposed undertaking. The scope of the assessment for this Project included: the selection and assessment of potential VECs; evaluation of the potential VEC interactions with Project activities, identification of environmental effects, if any, for each VEC; and identification of thresholds to determine the significance of residual environmental effects.

4 ENVIRONMENTAL ASSESSMENT METHODOLOGIES

The EA registration document for the MacLellans Mountain Quarry Expansion Project describes the biophysical, social, and economic environment. All VECs were identified, and the potential for interaction between individual VECs and Project activities were determined. Methods to minimize and mitigate environmental effects resulting from the Project are provided in this chapter.

The Project team, through an evaluation of the VECs, identified Project environmental effects that, post-mitigation, have the potential for a residual effect on the environment. The significance of these residual effects was then determined and evaluated (Section 9.2).

This chapter details the following key aspects of the EA methodologies:

A. Biophysical: birds, bats, species at risk, wildlife, vegetation and habitat, watercourse evaluation, and wetland functional assessment and delineation.
B. Archaeological Resource Assessment.

4.1 Biophysical Assessments

In February of 2017, field components of the biophysical EA were initiated. These field components continued through until October 2017 complying with the requirements for a *Class I* undertaking under Section 9(1) of the Nova Scotia Environmental Assessment Regulations. The field studies were focused on highlighting the ecological linkages within the Study Area, as well as with the habitats surrounding the Study Area. The field components included:

1. Avian baseline surveys: spring migration, breeding bird, fall bird migration, nocturnal owl and Common Nighthawk;
2. Botanical surveys (late and early) for priority species;
3. Opportunistic herpetofauna, mammal and other taxonomic group surveys for priority species;
4. Wetland and watercourse identification and evaluation;
5. Surface water sampling;
6. Habitat surveys;
7. Winter wildlife, moose and bird surveys; and,
8. Archaeological assessments- Phase I (Desktop) and Phase II (Field).

4.1.1 Priority Species

Assessment of wildlife, vegetation, and habitat was completed based on the requirements outlined in the Nova Scotia Environment (NSE) *Guide to Addressing Wildlife Species and Habitat in an EA Registration Document*, (NSE September 2009). A priority species list was created in accordance with this guide as outlined below (NSE, 2009). The purpose of the priority species list is to identify a broad list of species which have the potential to be present within the Study Area, and to inform the field programs. The

desktop priority list was based on general species habitat requirements and the broad geographic area that individual species are known to occur.

Development of a priority list of species for each taxonomic group was completed based on a compilation of listed species from the following sources:

1) Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the *Federal Species-at Risk Act* (SARA 2002). All species listed as Endangered, Threatened, or of Special Concern;
2) *Nova Scotia Endangered Species Act* (NSESA 1999). All species listed as Endangered, Threatened, or Vulnerable; and,
3) Conservation Rank: All species designated as S1, S2 or S3 or any combination thereof (i.e. S3S4 is considered a priority species) as defined by the Atlantic Canadian Conservation Data Centre (ACCDC).

Collectively, this group of species is known as Priority Species. This umbrella grouping includes species of conservation interest (SOCI) that are not listed species under provincial or federal legislation (COSEWIC species and ACCDC S1, S2 and S3 species or any combination thereof (i.e. S3S4 is considered a priority species)), and Species at Risk (SAR) which are listed on SARA or NSESA.

Breeding bird status qualifiers are used to determine whether a species is a priority species, based on the time of year in which the species was observed. For instance, Pine Grosbeak has an SRank of S2S3B, S5N. If observed during breeding season, this species would be considered a priority species. Outside of breeding season, this species would not be considered a priority species.

The priority list of species was first narrowed by broad geographic area. The priority list of species was then further narrowed by identifying specific habitat requirements for each species. For example, if a listed species on the *Nova Scotia Endangered Species Act* (NSESA) required open water lake habitat, and no open water lake habitat is present inside the Study Area footprint, this species was not carried forward to the final list of priority species for field assessments within the Study Area.

Data was requested from the ACCDC and the Nova Scotia Communities Culture and Heritage (NSCCH) Environmental Screening Report to obtain records of rare species existing or historically found within the general location of the property. The results of the database search were also reviewed to identify priority species that could be potentially located within the Study Area (based on recorded sightings within, or in close proximity to the Study Area, and general geographic and habitat requirements).

An in-text short list was created using the Priority Species List and the ACCDC/NSCCH reports to outline those SAR with the highest potential of occurring within the Study Area, based on distribution and documentation by the ACCDC/NSCCH. The in-text priority species shortlist provided herein was

developed by identifying SAR that have been documented within 20 km of the Study Area by the ACCDC. The in-text list is provided in Section 5.6.

The final broad priority list of species used for field assessments is attached in Appendix C. The ACCDC and NSCCH reports are also included as Appendix C.

Targeted SOCI and SAR surveys, including vegetation, were completed in Summer 2017, and moose surveys, were completed from February to May of 2017, to assess for all identified priority species across the Study Area. A list of all rare species records found within 100 km of the Study Area was also assembled prior to the survey being undertaken (from ACCDC and NSCCH data results) to provide additional information regarding the potential presence of priority species within the Study Area. In addition, incidental priority species were noted during all field surveys.

4.1.2 Habitat Surveys

A habitat assessment was completed by McCallum Environmental Ltd. (MEL) personnel on May 9, 2017 within the Study Area. Habitat survey routes were created using available forestry and wetlands databases with the goal of assessing all of the major habitat types and landscape features throughout the Study Area. These results were also used to inform necessary targeted surveys for the remaining baseline environmental field program. The habitat survey focused on assessing upland habitats, as detailed evaluation of all wetland habitat is completed as part of the surface water evaluation.
A MEL field team walked the Study Area on May 9, 2017, following a meandering transect that reached all major habitat types expected within the Study Area. The Forest Ecosystem Classification for Nova Scotia (FEC) guides (Keys, Neily, Quigley and Stewart, 2010) were used to identify the ecosites and vegetation types present at each habitat survey point throughout the Study Area. The following were described at each habitat survey point:

- Vegetation Type – was determined using Part 1 of the FEC guide (Neily et al., 2011). Each survey point was classified by overall forest group code and vegetation type using the keys provided in the guide book. Forest Groups are general groupings of vegetation types. Within each forest group (e.g. open woodland), there are several specific vegetation types. Vegetation types are recurring and identifiable plant communities which reflect differences in site conditions, natural disturbance regimes and successional stage. For example, TH4 is a tolerant hardwood forest group dominated by Sugar Maple and White Ash vegetation type, while TH6 is a tolerant hardwood (TH) forest group dominated by Red Oak and Yellow Birch vegetation type.
- Ecosite – was determined using Part 3 of the FEC Guide (Keys et al., 2010). This guide provides keys to identify ecosite using an edatopic grid, which is a two-dimensional diagram used to plot ecosystems and ecosites based on their relative moisture and nutrient regimes. Ecosites are units which represent ecosystems that have developed under a particular nutrient and moisture regimes. A finite range of vegetation types will naturally grow in any given ecosite.
- Dominant vegetation – within each forest strata (canopy, shrub layer, and understory).

- Natural or anthropogenic disturbance – was recorded at each habitat survey point. Level and type of disturbance were noted. Examples of anthropogenic disturbances include timber harvesting or road development. Natural disturbance regimes include fire, pests, wind throw and natural senescence.
- Stand age classification (Over-mature, Mature, Immature and Regenerating) – was determined through qualitative observations of multiple factors such as total basal area, level of canopy coverage, and species composition of the understory herb and shrub layers. The level of anthropogenic disturbance was described, particularly the presence of logging roads and harvested trees (clear-cut or selective harvest, and approximate time since harvest).

4.1.3 Avian

A review of the Canada Important Bird Areas database, ACCDC, and Maritime Breeding Bird Atlas (MBBA) square 20NR34 was completed to support bird survey design and methodology. The ACCDC and MBBA square results are included in Appendix C.

A NSCCH report (Appendix C) for the presence of natural and heritage resources was requested and consulted prior to completion of field surveys. The NSCCH report contained records for the following priority bird species located within or surrounding the Study Area:

- Boreal Chickadee
- Cape May Warbler
- Ruby-crowned Kinglet
- Eastern Wood-pewee
- Olive-sided Flycatcher
- Eastern Phoebe
- Eastern Kingbird
- Pied-billed Grebe

Avian field monitoring programs were completed by MEL personnel and Ken McKenna, and included the following surveys:

- Spring nocturnal owl (April 4, 2017);
- Spring migration (May 1 and May 25, 2017);
- Breeding bird (June 7 and June 22, 2017);
- Raptor nest (during all biophysical field surveys);
- Common Nighthawk (June 27 and July 12, 2017); and,
- Fall migration (August 28, September 18, and October 6, 2017).

Detailed descriptions of each survey methodology are provided in the following sections.

4.1.3.1 Spring Nocturnal Owl

A Spring nocturnal owl survey was completed by Ken McKenna on April 4, 2017. The objectives of the nocturnal owl survey are to: gather information on the presence and distribution of owl species within and surrounding the Study Area; determine the location of active nests; and record other SOCI and SAR incidental observations.

The methods for monitoring nocturnal owls followed the *Guideline for Nocturnal Owl Monitoring in North America* (Takats et al. 2001). In Nova Scotia, data collected through the Bird Studies Canada Nova Scotia Nocturnal Owl Survey program shows peaks in Barred Owls (*Strix varia*) and Great Horned Owls (*Bubo virginiatus*) in early April, while Northern Saw-whet Owls (*Aegolius acadicus*) are late April to mid-May. Other owl species have been observed at numbers that are too low to determine peak calling periods (Greg Campbell, personal communication, April 9, 2015).

Wind can limit the ability of owls to hear a call broadcast and/or the ability of the observer to hear an owl calling. It is recommended that a survey be suspended if wind speed is Beaufort 4 or higher (i.e., > 20 km/hr; Takats et al. 2001). However, if there are other circumstances affecting detection, it may be necessary to reduce the wind threshold; this is at the discretion of the observer. If conditions were not suitable for surveying, then the survey was deferred or moved to a more suitable location.

Owls have been observed to be less vocal when temperatures are significantly lower than average for the season, thus surveys would also be delayed in this circumstance (Takats et al. 2001). Surveys are to be stopped in the case of heavy precipitation; light drizzle and flurries are not likely to reduce calling rates or detectability (Takats et al. 2001).

Ensuring that the broadcast could not be heard beyond 800 meters minimizes bias at the next survey station due to owls hearing the recording from the previous station (Takats et al. 2001).

The broadcast used by the Bird Studies Canada (BSC) Nova Scotia Nocturnal Owl Survey program was used for the survey. It consists of a 9.5-minute broadcast which includes alternating owl calls with silent listening periods (BSC Atlantic Region 2015). Only the calls of two owl species, the Boreal Owl (*Aegolius funereus*) and Barred Owls, are used in the call broadcast (BSC 2015). According to a study in 2009, the Boreal Owl has only been reported as breeding in Nova Scotia four times (Lauff, 2009). The Barred Owl is targeted because it has been used as an indicator of ecosystem health due to its dependence on cavities in large trees for nesting (Allen 1987).

Point count survey stations were spaced from 1.0 to 1.8 km apart. Some of the louder owls, such as the Barred Owl, can be heard at distances of two kilometers or more. However, most of the smaller owls cannot be heard as far or as clearly (Takats et al. 2001). Surveys were conducted between half an hour after sunset and midnight (Takats et al. 2001). There are four species of nocturnal owls that could potentially breed within or around the Study Area: Great Horned Owl (*Bubo virginianus*), Barred Owl (*Strix varia*), Long-eared Owl (*Asio otus*), and Northern Saw-whet Owl (*Aegolius acadicus*).

As per the guidelines, the nocturnal owl survey took place when vocal activity of the majority of owl species is greatest, at four-point count locations in proximity to the Study Area (all of the point count locations are within a range of 150 m to 1200 m from the Study Area).

4.1.3.2 Spring Migration

Spring migration surveys were completed by Ken McKenna on May 1 and May 25, 2017. Surveys were conducted at eight-point count stations within (six points) and surrounding (two points) the Study Area (Figure 6, Appendix A). The point count locations were placed in representative habitat types within the Study Area and surrounding area. Surveys began at, or within, half an hour of sunrise and were completed within four-and-a-half hours or by 10:00 a.m., whichever came first. Weather conditions (i.e., precipitation and visibility) were monitored and confirmed to be within the parameters required by monitoring programs such as Environment and Climate Change Canada's (ECCC) Breeding Bird Survey Guidelines (i.e. good visibility, little or no precipitation, light winds not exceeding 19 km/h (12 mph). Bird observations were recorded at four distance regimes: within a 50 m radius, 50 to 100 m radius, outside the 100 m radius, and flyovers. A record was made of the start and end time of the observation period and a hand-held GPS unit was used to geo-reference the location for each point count station. General observations including the temperature, visibility, wind speed, and date were also recorded. Species recorded between point counts were recorded as incidentals. Bearings (in degrees) were taken for priority species observed both during dedicated survey periods and incidentally.

4.1.3.3 Breeding Birds

Surveys for breeding birds were conducted by Ken McKenna on June 7 and 22, 2017 at the same eight (8) point count stations as surveyed in the spring, within and surrounding the Study Area (Figure 6, Appendix A). Two rounds of surveys for breeding birds were conducted to capture early and late breeding. The surveys were conducted using the same methodology as the spring migration surveys. Early morning point count surveys were conducted from 30-minutes before sunrise till 10:00 a.m. Species and number of birds observed at each point count location were recorded. The point counts are located in a mix of habitat types including: edge of a grassy field, within mixedwood forest, the edge of a trail within mixedwood forest, regenerating mixedwood forest, and along a trail in proximity to quarry operations.

4.1.3.4 Common Nighthawk

The Common Nighthawk (*Chordeiles minor*) prefers to nest in gravelly substrates and is best detected while foraging for insects shortly after sunset. Suitable habitat is available for this species within the Study Area (i.e. existing quarry area, cutblocks, and roadside clearings), therefore dedicated surveys for the Common Nighthawk were conducted from the end of June to mid- July at either dawn (1 hour before sunrise to 30 minutes after sunrise) or dusk (30 minutes before sunset to 1 hour after sunset), as described in the Common Nighthawk Survey Protocol (Saskatchewan Ministry of Environment, 2015). Five survey point count locations were surveyed once by Ken McKenna on June 27 and repeated on July 12, 2017

(Figure 6, Appendix A). The point count locations are situated next to MacLellans Mountain Glencoe Road or Brookville Road surrounded by: forested and cutblock habitat, forested and field habitat or forested and existing quarry habitat. Each point count survey consisted of a three-minute passive surveying period, followed by three minutes of alternating 30-seconds call playback of the conspecific Common Nighthawk call and 30-seconds of silence (passive surveying).

4.1.3.5 Raptor Nest Surveys

Raptor nest surveys were completed by MEL staff throughout the Study Area during other biophysical surveys completed within the Study Area. High vantage viewpoints on the landscape were used to survey for raptor nests around the Study Area.

4.1.3.6 Fall Migration

The same point count locations surveyed during the spring migration and breeding bird surveys were used for the fall migration surveys (Figure 6, Appendix A). Ten-minute point counts were conducted by Ken McKenna on August 28, September 18, and October 6, 2017, during peak migration following the same survey protocol as spring migration. Surveys began at, or within, half an hour of sunrise and were completed within four-and-a-half hours or by 10:00 a.m., whichever came first. Weather conditions (i.e., precipitation and visibility) were monitored and confirmed to be within the acceptable parameters as discussed previously.

4.1.4 Vegetation Surveys

The vascular plant surveys focus on identifying general vegetative communities, with particular focus on identifying priority species following the guidance of the Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSE, Sept 2009). The early botany survey was completed by Nick Hill on June 29, 2017 and the late botany survey was completed by John Gallop on September 11, 2017. The majority of the Study Area comprises forested upland habitat, with smaller infrequent historical clear-cut areas, and old agricultural meadow. A meandering transect was completed throughout these areas, however specific effort was also afforded to the riparian habitat associated with the mapped watercourse in central portions of the Study Area.

The Priority Species list (Appendix C) and the NSCCH report were consulted before completing botanical surveys. The NSCCH report contained records for the following priority plant species located within or surrounding the Study Area (Table 3).

Table 3: Nova Scotia Communities, Culture & Heritage Report Priority Plant Species

Common Name	Scientific Name	NSESA	SRank
Wiegand's Wild Rye	*Elymus wiegandii*	-	S1
Wolly Sedge	*Carex pellita*	-	S1?

Common Name	Scientific Name	NSESA	SRank
Black Ash	*Fraxinus nigra*	T	S1S2
Round-lobed Hepatica	*Hepatica nobilis var obtuse*	-	S1S2
Blue Cohosh	*Caulophyllum thalictroides*	-	S2
Showy Lady's Slipper	*Cypripedium reginae*	-	S2
Narrow-leaved Panic Grass	*Dichanthelium linearifolium*	-	S2
Canada Lily	*Lilium canadense*	-	S2
Purple-veined WIllowherb	*Epilobium coloratum*	-	S2?
Pubescent Sedge	*Carex hirtifolia*	-	S2S3
Marsh Bellflower	*Campanula aparinoides*	-	S3
Canada Wood Nettle	*Laportea canadensis*	-	S3
Climbing False Buckwheat	*Polygonum scandens*	-	S3

4.1.5 Bats

A desktop review for known bat hibernaculum nearby and within the Study Area was completed. The Nova Scotia Department of Natural Resources (NSDNR) records of abandoned mine openings (AMOs) were reviewed for the Study Area and within 5km of the Study Area, as AMOs potentially provide bat hibernacula. The ACCDC report, the Recovery Strategy for the Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*), and Tri-colored Bat (*Perimyotis subflavus*) in Canada (Environment Canada, 2015), and the Nova Scotia Museum's records of bats were also consulted. During habitat surveys within the Study Area, MEL personnel also looked for signs of habitat that could support winter bat hibernation.

4.1.6 Herpetofauna Surveys

Habitat survey results within the Study Area indicated that there was limited habitat potential within the Study Area for priority herptofaunal species (Wood Turtle and Snapping Turtle), therefore, no targeted herpetofauna surveys were undertaken. However, all watercourses were evaluated for wood turtle habitat during wetland and watercourse surveys in 2017 and efforts were made to locate these species including overturning rocks and inspection of crevices, fallen logs and other potential habitats. Incidental observations of herptofauna across the Study Area were documented during all field surveys completed through 2017.

4.1.7 Wildlife Surveys

Winter wildlife surveys were completed in February and March of 2017. The survey involved the completion of two transects: one within the Study Area and one along Willard Fraser Road south of the Study Area (Figure 6, Appendix A). The two transects were walked and all signs of ungulates or a priority species, including tracks, scat, browse, and hair snags that were observed were recorded. Other mammal

signs were noted as well. Any birds that were present or could be heard were also recorded. Locations of observations were geo-referenced with a handheld GPS unit.

One spring Pellet Group Inventory (PGI) survey was completed May 8, 2017 along Transects 1 and 2. Transects were surveyed for deer and moose pellet piles. If any pellet piles or tracks were observed, they were geo-referenced and photographed.

Incidental mammal observations were documented and photographed throughout the field surveys in 2017. Observations of mammals included such features as dens and nests, scat, tracks, and forage evidence.

4.1.8 Wetlands

The NS Environment Act defines wetlands as:

> *Land referred to as a marsh, swamp, fen, or bog that either periodically or permanently has water table at, near, or above the land surface or that is saturated with water, and sustains aquatic processes as indicated by the presence of poorly drained soils, hydrophytic vegetation, and biological activities adapted to wet conditions.* (Environment Act, 2006)

Wetland functions are the natural processes associated with wetlands and include water storage, pollutant removal, sediment retention and provision of nesting/breeding habitat. Functions may also include values and benefits associated with these natural processes and include aesthetics/recreation, cultural values, and subsistence production. The discussions of wetlands presented herein primarily uses terminology associated with the Canadian Wetlands Classification System (Warner and Rubec, 1997) or in line with the methodologies adapted by Nova Scotia for wetland delineation.

A desktop review of available topographic maps, appropriate provincial databases and aerial photography was completed to aid in determination of wetland habitat in the Study Area. Mapped wetland areas were identified from the NSE Wetland Inventory Database (Figure 2, Appendix A).

Field surveys were conducted by MEL personnel in August of 2017 across the Study Area to identify wetland habitat. Targeted surveys were completed within the Study Area where mapped wetland systems were present to confirm and delineate wetland habitat. Meandering transects were also completed to support efforts to delineate all wetlands present within the broader Study Area. Wetland delineation was completed based on micro-topography, and observed surface hydrology, vegetation, and soils in accordance with Nova Scotia Environment wetland delineation methodology. Qualified wetland delineators delineated wetlands. Wetland boundaries were documented using an SXBlue GPS unit and SX Pad hand held field computer capable of sub 1 m accuracy. Any inlet and outlet streams or other features associated with each wetland were marked during the delineation process.

Observations were made on wetland types, water flow path, dominant vegetation communities (and SAR/SOCI, if present), fish habitat potential and characterizations. General wetland functions were recorded utilising the Wetland Ecosystem Services Protocol (WESP) methodology.

4.1.9 Aquatic Surveys

A desktop review of available topographic maps, appropriate provincial databases and aerial photography was completed to aid in determination of watercourses in the Study Area. Topography maps were reviewed (1:50,000, 1:30,000, and 1:10,000) to identify all mapped watercourses. Mapped watercourses were identified from the NS Topographic Database (Figure 2, Appendix A) (Government of Nova Scotia 2015).

Field surveys were conducted by MEL personnel in August of 2017 across the Study Area to identify watercourses. Watercourses were documented using an SXBlue GPS unit and SX Pad hand held field computer capable of sub 1m accuracy. Observations of fish habitat quality and fish habitat potential for each identified watercourse were documented, as well as wood turtle habitat potential.

4.1.10 Surface Water Sampling

Surface water samples were collected by MEL personnel from three mapped watercourses: Two samples were collected in within WC2 as indicated on Figure 6 (Appendix A). Water sourcing WC2 is predominantly from undeveloped, forested land to the west of the watercourse. Therefore, one sample (referred to as S1, in Figure 6, Appendix A) was collected adjacent to the existing quarry access road, in a portion of WC2 which is reflective of downstream conditions from the proposed quarry expansion area to the west of WC2. This was sampled on October 26, 2017. An up-stream portion of WC2 was also sampled on May 30, 2018. Referred to as S3, this sample reflects the uppermost point along WC2 where flowing water was observed. The third sample (S2) is located on an unnamed watercourse downstream of the existing quarry. This watercourse receives water sourced from the on-site settling ponds via a channel as described in Section 2.3.3 (and indicated in Figure 6, Appendix A). The unnamed watercourse drains into Stewart Brook which is located east of the MacLellans Mountain Glencoe Road. S2 was sampled on October 26, 2017.

The samples were collected from the surface of the water column by submerging the sample bottle neck enough so water from the surface filled the bottle. The sample bottles were labelled with the sample location and date. A Chain of Custody (CoC) was filled out for the samples. The surface water samples were kept cool and were transported to Maxxam Analytics, in Bedford, Nova Scotia for processing. The two surface water samples were analysed for Total Suspended Solids (TSS) and RCAp-MS total metals.

4.2 Archaeological Resource Assessment

Davis MacIntyre and Associates Limited completed an archaeological resource impact assessment for the MacLellans Mountain Quarry Expansion Project in 2017. This assessment consisted of two components:

i. Phase I archaeological resource impact assessment
ii. Field reconnaissance Phase II archaeological resource impact assessment

The methodologies of these two components are described below.

4.2.1 Phase I

As part of this assessment, a historic background study was conducted. Historical maps, manuscripts and published literature were consulted at Nova Scotia Archives and Records Management in Halifax. In addition, the Maritime Archaeological Resource Inventory was searched to understand prior archaeological research and known archaeological resources within or neighbouring the Study Area.

4.2.2 Phase II

Vanessa McKillop, Laura de Boer, Courtney Glen and Vanessa Smith conducted a field reconnaissance of the Study Area on September 27, 2017. Transects were completed through the Study Area, in an east-west or north-south direction.

GPS tracklogs of all reconnaissance areas were retained for records, and any sites determined to have potential for archaeological resources were recorded with photographs and GPS coordinates. The terrain and vegetation were noted in the interest of recording negative evidence for historic cultural activity.

5 BIOPHYSICAL ENVIRONMENT

5.1 General Spatial Setting for Project

The proposed Project is located in the Nova Scotia Uplands Ecoregion, as defined by the Nova Scotia Department of Natural Resources (Neily, Quigley, Benjamin and Stewart, 2005).

The Nova Scotia Uplands Ecoregion extends from Parrsboro in Cumberland County to Kellys Mountain in Cape Breton. The total area of the Nova Scotia Uplands Ecoregion is 9712 km^2 or approximately 17.6% of the province. This ecoregion is predominantly uplands with elevations ranging between 150-300m above sea level within the mainland and Cape Breton Island. However, lowlands exist throughout the ecoregion, which is comprised of valley habitat. (Neily et al., 2005)

The Nova Scotia Uplands Ecoregion is geologically diverse. The underlying geology is Cretaceous peneplain surface, with Precambrian to Paleozoic eras metamorphic, intrusive and volcanic rocks. There

are several major faults present within the ecoregion, including the Cobequid-Chedabucto Fault zone and the Hollow Fault. Within the ecoregion, the parent material is generally sandy loams on the hills, whereas clay loams and loams are found on the flat areas. Well to moderately well-drained soils are found where gently rolling topography is, and rapid to well-drained soils are found where on steep sloped areas. Imperfectly to poorly drained soils are common in the flat topography areas throughout in the ecoregion (Neily et al., 2005).

Within the hills of the uplands, hardwood forests are dominated by Sugar Maple, Beech, Red Maple and Yellow birch. Along with the above hardwoods, White and Red Spruce and Balsam Fir form mixedwood forests on valleys and slopes throughout the ecoregion, with Eastern Hemlock common in ravines. In areas with imperfect and poorly drained soils, Black Spruce and Tamarack dominate. Where repeated burning has occurred, large areas of barrens dominated by Bracken Fern and Sheep Laurel dominate (Neily et al., 2005).

5.1.1 Natural Subregion

The Nova Scotia Uplands Ecoregion is further subdivided into eight ecodistricts. The MacLellans Mountain Quarry Expansion Project exists in the Pictou Antigonish Highlands Ecodistrict. The elevation within the ecodistrict range is between 210-245 m above sea level, however Eigg Mountain sits at 300m above sea level. Freshwater total area within the ecodistrict is 720 ha or 0.5% of the ecodistrict. The total area of this ecodistrict is 1,334 km^2 or 13% of the ecoregion (Neily et al., 2005).

The geology within the ecodistrict is noted as being extremely complex. The bedrock consists of Precambrian to Paleozoic sediments and volcanics, which are usually deformed and metamorphosed. The bedrock also contains intrusions of precarboniferous granite to gabbroic plutons.

Tolerant hardwood forests are found on crests and upper slopes of hills within the ecodistrict. Red Spruce and Eastern Hemlock are found on the lower slopes. Tolerant forest, dominated by Sugar Maple, Yellow Birch, Red Spruce, American Beech with scattered Eastern Hemlock dominate the steep slopes surrounding streams and rivers. Black Spruce dominate the imperfectly drained sites (Neily et al., 2005).

5.1.2 Land Use and Habitat

Table 4 below displays the land use types and area (in hectares) of each type within the Study Area:

Table 4. Calculations of Land Use

Land Use/Land Type	Area (hectares)	% of Study Area
Wetland Habitat	0.7	0.7
Quarry	27.5	29
Hardwood Forest	13.2	13.9

Land Use/Land Type	Area (hectares)	% of Study Area
Softwood Forest	17.7	18.6
Mixed wood Forest	6.8	7.2
Unknown Forest Type	28.1	29.6
Roads	1.0	1
TOTAL STUDY AREA[1]	95	100%

[1] *For the purposes of this calculation Study Area includes the existing quarry area*

Land use within the Study Area is dominated by forested land, with some timber-harvesting activities present. The total area of forested habitat accounts for 66.0% of the Study Area land base. The two existing quarries (one being inactive) account for the next dominant land use within the Study Area.

5.2 Atmospheric Environment

5.2.1 Weather and Climate

The Nova Scotia Uplands Ecoregion summers tend to be warm and the winters are long and cold (Neily et al., 2005). Snowfall is the greatest within Cobequid Hills and Cape Breton Hills in the ecoregion. Local weather, especially temperatures, can vary due to the hilly topography creating microclimatic environments, where sheltered and exposed conditions occur (Neily et al., 2005).

The average low temperature (based on statistics from the past 30 years) was recorded at -11.0 degrees Celsius in January and the average high temperature was recorded at 24.8 degrees Celsius in July (recorded at Lyons Brook, Nova Scotia) located 22.16 km northwest of the Study Area (Government of Canada, 2010). Average annual precipitation at this location is recorded at 1232.2 mm. Average annual rainfall at this location is recorded at 953.3 mm with maximum rainfall levels in October of each year (average 128.1 mm in October). Average annual snowfall has been measured at 279.0 cm with the maximum snowfall occurring each year in January (69.6 cm) (Government of Canada, 2010).

5.2.2 Air Quality

Measured air quality parameters across Nova Scotia include ground-level ozone (O_3), particulate matter (PM2.5), and nitrogen dioxide (NO_2), and these values are used to calculate a score in the Air Quality Health Index (AQHI) (ECCC, 2016). The AQHI is a scale from 1-10+, representing the following health risk categories: Low (1-3), Moderate (4-6), High (7-10), and Very High (10+). The monitoring station closest to the Study Area is located in Pictou, Pictou County, NS. The AQHI at this site is considered low, when assessed in January 2018 (ECCC, 2016).

5.3 Geophysical Environment

5.3.1 Physiography and Topography

Forest cover within the Study Area consists of multiple forest and successional types. Immature or regenerating forests dominate the northern extent of the Study Area. Forest types in this area include deciduous dominant forest comprising Red Spruce and Trembling Aspen stands and Red Maple and Red Spruce dominant stands. Mature softwood forest dominates the southern extent of the Study Area. Forest types in this area include mixed forests dominated by Balsam Fir and Paper Birch, Red Maple and Paper Birch, and Red Spruce and Eastern Hemlock.

The topography within the Study Area is sloping west towards the MacLellans Mountain Glencoe Road. The highest point within the Study Area is on the eastern side of the existing quarry (approximately 222 m above sea level), whereas the lowest point is adjacent to the MacLellans Mountain Glencoe Road (approximately 74 m above sea level). One ravine is located within the center of the Study Area, which gives rise to a wetland and WC2 which drain water southwest into Stewart Brook (Figures 5 and 6, Appendix A).

5.3.2 Surficial Geology

The surficial geology of the Study Area consists of three types of surficial geologic units: Kame Fields and Esker Systems, Stony Till Plain (Ground Moraine), and bedrock (NSDNR 2012a).

Bedrock dominates the underlying surficial geology of the Study Area. The bedrock is described as being a variety of types and ages consisting of glacially scoured basin and knobs and is overlain by a thin, discontinuous veneer of till. The topography of the bedrock is described as flat to strongly rolling, with ridges of hard rock exposed in thin till areas. The acid rain buffer capacity is usually poor but depends on the rock type (NSDNR 2012a).

Glaciofluvial deposits formed the Kame Fields and Esker Systems. The fields and systems consist of gravel, sand and silt with a topography described as steep sided ridges (eskers), steep-sided mounds or hummocks (moulin kames), and on the valley sides pitted terraces are present (kame terrace). Due to the irregular topography, rapid drainage occurs (NSDNR 2012a).

Stony Till Plain is described as stony, sandy matrix, which is derived from the underlaying bedrock with a topography described as flat to rolling, with many surface boulders. Due to the stony, sandy matrix, the Stony Till Plain is highly erodible with rapid drainage. This till has poor buffering capacity for acid rain (NSDNR 2012a).

5.3.3 Bedrock Geology

The Study Area overlies bedrock formations from the Georgeville, Arisaig, and both the Upper and Middle Windsor Groups (NSDNR 2012b). The Arisaig Group is described as shallow marine siltstone, mudstone, shale, minor limestone, arkose and rhyolite. The Middle Winsor Group consists of halite, anhydrite, gypsum and mudstone, whereas the Upper Windsor Group consists of mudstone, sandstone, minor gypsum and shallow marine limestone (NSDNR 2012b).

Surficial geology and bedrock geology within the Study Area are shown on Figure 7 and Figure 8 in Appendix A.

5.3.3.1 Acid Rock Drainage (ARD)

Exposing and physically disturbing sulphide-bearing rocks can cause acid rock drainage to develop and can negatively impact the environment, human health and infrastructure. Acidic runoff, with pH levels as low as 3, can be harmful for aquatic habitats and can cause fish kills. ARD can contaminate drinking water supplies with increased concentrations of toxic and carcinogenic heavy metals (The Province of Nova Scotia, 2017).

Although ARD testing has not been completed in the past at the MacLellans Mountain Quarry, no evidence of ARD has been observed within the site (i.e. rust stains on quarry face or within on site settling ponds). Furthermore, regular testing of the properties of aggregate is performed at the quarry for NSTIR construction projects, and to date, no evidence of pyrite (which indicates potential acidic producing rock) has been observed. Based on a higher probability of acid producing bedrock to occur in Southwestern Nova Scotia, the NSDNR has developed an ARD Potential Map for this area. The Study Area does not fall within this mapping layer due to it being located beyond this high probability area, further suggesting that potential for ARD to occur is low. The rock groups which underlie the Study Area are less likely to comprise acid producing rock in comparison to others such as the Goldenville Formation and Halifax Formation of the Cambro-Ordovician Meguma Group.

5.3.4 Hydrogeology and Groundwater

Water supplies for individual homes near the Study Area are provided by drilled potable wells.

Details associated with individual wells within a 1 km radius of the Study Area were identified through a review of the NS Well Logs Database (NSE 2016). This database provides information on more than 100,000 water wells in the province, including information on well locations, geology and well construction, well depth and yield. A total of 24 well logs (all drilled) were available for review. Table 5 outlines well characteristics for each of these wells. General conclusions relating to the groundwater resource in the Study Area were derived from this information. Locations of the drilled wells are provided on Figure 3 (Appendix A).

The average depth to bedrock based on drilling data was generally 6.26 m. Wells appeared to be drilled to an average depth of 53.10 m below grade and were constructed as 152 mm wells with an average 10.38 m depth of casing (casting depth ranges from 6.09 m to 16.75 m). Static water levels were not always recorded in the well logs, but information that was provided indicated an average static depth to water of 7.42 m. A general review of water yields for these wells indicated an average yield of approximately 30.46 litres per minute (LPM).

Table 5. Well Characteristics within 1 km of the Study Area

Well Number	Address / Community	Depth (m)	Casing (m)	Depth to Bedrock (m)	Static Level (m)	Yield (LPM)	Elevation (m ASL)	Easting	Northing	Accuracy ± (m)
32480	Kirkmount Road	66.99	6.09	1.83	NA	10.22	225	533500	5042500	707
50126	1348 McLellans Brook Road	42.63	15.53	12.48	6.09	13.62	145	532159	5043422	532
960918	McLellans Brook	36.54	12.18	2.74	6.09	27.24	79	531500	5043500	707
951992	Bradley Drive	22.84	7	2.44	10.66	90.8	149	532500	5043500	707
2950	RR#4 MacLellans Mountain	74.6	16.75	13.7	8.22	13.62	166	533500	5043500	707
811786	McLellans Brook	28.93	NA	NA	9.14	9.08	77	531719	5042434	1130
942899	Thorburn	48.72	6.09	3.65	7.31	27.24	166	533500	5043500	707
932521	Thorburn	106.58	12.18	7.61	24.36	1.36	166	533500	5043500	707
852181	RR#4 New Glasgow	87.39	13.4	7.61	7.61	3.18	79	531500	5043500	707
800167	RR#1 Thorburn	44.76	NA	0.61	0.91	59.02	216	533346	5042443	1130
840019	RR#1 New Glasgow	52.37	6.7	NA	7.61	9.08	216	533346	5042443	1130
811759	McLellans Brook	32.28	7.61	NA	12.18	4.54	77	531719	5042434	1130
20452	Kirkmount	48.72	12.18	7.31	7.61	7.94	174	532500	5041500	707
1705	Trenton, McLellans	46.28	12.18	NA	11.57	113.5	166	533500	5043500	707
911684	McLellans Brook	60.9	7.92	NA	9.14	9.08	79	531500	5043500	707

Well Number	Address / Community	Depth (m)	Casing (m)	Depth to Bedrock (m)	Static Level (m)	Yield (LPM)	Elevation (m ASL)	Easting	Northing	Accuracy ± (m)
990193	McLellans Brook	85.26	12.18	6.09	-0.03	0.05	149	532500	5043500	707
990194	McLellans Brook	42.63	12.79	11.27	3.04	13.62	149	532500	5043500	707
60169	MacLellans Mountain Road	60.9	6.09	1.22	3.04	6.81	203	533403	5041557	201.097
71274	2116 MacLellans Mountain Glencoe Road	44.15	7	4.57	1.52	90.8	109	532127	5041761	807.9804
82023	1349 McLellans Brook Road	50.24	15.22	11.57	6.09	31.78	81	531709	5043697	15
932766	McLellans Brook	28.93	6.09	NA	NA	45.4	79	531500	5043500	707
81697	Site 16C, New Glasgow	54.81	12.18	5.48	6.09	45.4	152	532736	5043573	15
932772	McLellans Brook	36.54	8.83	NA	NA	90.8	79	531500	5043500	707
942539	RR#4 New Glasgow	70.34	12.18	NA	7.61	6.81	149	532500	5043500	707
Average		**53.10**	**10.38**	**6.26**	**7.42**	**30.46**	**138.75**	**NA**	**NA**	**NA**

There were no wells observed within the Study Area during field studies. According to the information available in the Well Logs Database, the closest mapped drilled groundwater well used for potable purposes is located 30m west of the Study Area; however, the accuracy for this well within the database is ±1130m. This coupled with the fact that according to aerial imagery no structure is present at this location suggests this well location is inaccurate.

In order to determine a more precise location for adjacent residential wells, the Nova Scotia Topographic Database (NSTB) was reviewed to identify buildings within 1km of the Study Area. In total 71 buildings were identified within 1km of the Study Area. Although the NSE Well Logs Database does not indicate wells at the 71 buildings, they have been assumed to exist. The closest residential receptor assumed to also have a potable well is located ~ 105m south from the southern extent of Development Area C, and approximately 140m west of the current MacLellans Mountain Quarry footprint (Figure 3, Appendix A).

5.3.4.1 New Glasgow Water Supply Area

According to the ACCDC report, the New Glasgow Water Supply Area is the closest NSE Protected Water Area. The water supply area is located approximately 3.3 km south (upgradient) of the Study Area. The New Glasgow Municipal Water Supply is adjacent to the New Glasgow Water Supply Area and is located approximately 4.19 km southwest of the Study Area.

5.4 Terrestrial Environment

This section describes the MacLellans Mountain Quarry Expansion Study Area habitat, avian use, wildlife, and vegetation communities.

5.4.1 Habitat

A habitat assessment was completed on May 9, 2017 by Tessa Giroux. In addition, general habitat characteristics were recorded on June 29, 2017 by botanist Nick Hill within the Study Area. The Study Area contains: the existing MacLellans Mountain Quarry, the inactive aggregate quarry adjacent to MMG Road, and a mosaic of natural and disturbed habitat exhibiting evidence of both natural and anthropogenic disturbance regimes.

Evidence collected during the surveys suggests that there is a long history of agriculture in the area; farms were at lower elevations near the Study Area and hayfields were present in northern portions of the Study Area at higher elevation (e.g. 200m). The Study Area has many signs that it has long been settled such as old fences and old garden plants that persist in wooded areas in the middle of the site [e.g. European Columbine (*Aquilegia vulgaris)*; Common Valerian (*Valeriana officinalis)*, and Common Apple (*Malus pumila*)]. In addition, all habitats have established exotics: Coltsfoot (*Tussilago farara)* and Bittersweet Nightshade (*Solanum dulcamara)* along streams, Creeping Buttercup (*Ranunculus repens)* in the wetland, and Common Hawkweed (*Hieracium lachenalii*) throughout well-drained hardwood slopes. Some of the

hayland areas in the northern extent of the Study Area have reverted to young forest stands. A majority of the forested areas within the Study Area are approximately 60 years old.
The combination of these long-term anthropogenic disturbances has meant that there is little mature woodland, and the late succession trees that would have prevailed [e.g. Sugar Maple (*Acer saccharum)*, Yellow Birch (*Betula alleghaniensis)*, Eastern Hemlock (*Tsuga canadensis)*, and Ironwood (*Ostrya virginiana*)] occur in most places in a lower frequency than early successional trees [e.g. White Spruce (*Picea glauca)*, Balsam Fir *(Abies balsamea)*, Pin Cherry *(Prunus pensylvanica)*, and White Birch (*Betula papyrifera*)].

One wetland and three watercourses are present within the Study Area, (described in detail within Section 5.5.1). One watercourse (WC2) and the wetland exist within a ravine that runs southwest through the Study Area.

Based on the completion of the FEC surveys, the majority of the site falls within the Acadian Ecosites AC10, with pockets of AC9 and AC11. These ecosites represent medium soil richness, and the moisture regime (depending on topographic position, slope gradient, and soil drainage) varies from dry to moist (Keys et al., 2010).

The southern and western extent of the Study Area is considered disturbed habitat due to quarry activities. An ATV trail runs parallel to the northern Study Area boundary, bisecting the entire Study Area. Timber-harvesting activities, including clear-cuts, are present in the northern extent of the Study Area as well. Outside of quarrying areas, the majority of the site consists of undisturbed and disturbed forest habitat. Mature forest is present within the center of the Study Area, with regenerating forest found in the northern extent. This regenerating forested area is in the early to mid-regenerating stage with abundant Balsam Fir, Red Spruce, and White Birch, within the canopy. Balsam Fir saplings are dominant in the understory with Wild Lily-of-the-Valley dominating the ground cover. Portions of the mature forest habitat is dominated by Eastern Hemlock with either Red Spruce or Red Maple co-dominating the forest. The remaining potions of the mature forest is dominated by Balsam Fir within the center extent of the Study Area. Open meadow habitat surrounded by forested habitat is found in the northeastern extent.

The upland forested habitat present in the Study Area encompasses a range of vegetation types (as defined by Neily et al., 2010), such as Mixedwood (MW1, MW2 and MW2A), Spruce Hemlock (SH3 and SH5) and Intolerant Hardwood (IH6 and IH6A). The Mixedwood Forest Group (MW) comprises of both coniferous and deciduous forest types and support a variety of wildlife species, including species associated with both forest types. Red Spruce- Red Maple- White Birch- Goldthread (MW2) vegetation type is the most dominant Vegetation Type (VT) within the Study Area. The Aspen variant (MW2A) was the next most dominant VT. Red Spruce and Red Maple are the dominant overstory trees, with an aspen species co-dominant in the variant MW2A. MW2 is a common VT found throughout mainland Nova Scotia and is associated with fresh to fresh-moist, nutrient medium soils. The SH5 is the next dominant VT within the Study Area. The Red Spruce- Balsam Fir- Schreber's moss (SH5) has abundant Red

Spruce with a range of Balsam Fir present. SH5 is a typical Acadian softwood VT and is associated with dry to fresh, nutrient poor to medium soils.

5.4.2 Vegetation

The early botany survey was completed by Nick Hill on June 29, 2017 and the late botany survey was completed by John Gallop on September 11, 2017. These surveys were completed to support the identification of Priority Species. A total of 223 species were identified within the Study Area. One SOCI was observed, Hop Sedge (*Carex lupulina*, S3). A list of all species identified within the Study Area is provided in Appendix D.

Further details relating to potential SAR and SOCI flora species are provided in Section 5.6.1. One SOCI, Hop Sedge, and no SAR flora species were identified during field surveys.

5.4.3 Herpetofaunal Species

Herpetofaunal species were inventoried at the Study Area through incidental observations by MEL biologists during ongoing surveys, especially wetland delineation and watercourse evaluations (i.e. Wood Turtle habitat). Specific focus was given to identifying priority species, especially those identified as having appropriate habitat within the Study Area through the desktop evaluation for priority species. Wood Turtles (listed as Threatened by SARA) are noted to have been observed within 5km of the Study Area by ACCDC. Wood Turtle habitat was not observed within the Study Area. Two species were identified during field surveys, neither of which are a priority species (Table 6).

Table 6. Herpetofaunal species inventoried during 2017 field surveys.

Scientific Name	Common Name	ACCDC Prov. Rank
Lithobates clamitans	Green Frog	S5
Pseudacris crucifer	Spring Peeper	S5

The Study Area provides seasonal herpetofaunal habitat notably within the wetland habitat identified and watercourses present. However, neither features provide supporting habitat (i.e. breeding or overwintering) for turtle species due to the lack of open water in the wetland and continuous water throughout the year in the watercourse.

No SAR and SOCI herpetofaunal species were identified during field surveys. No Wood Turtle or Snapping Turtle habitat, breeding or overwintering, were observed throughout other areas across the Study Area. Further details relating to potential SAR and SOCI herpetofaunal species are provided in Section 5.6.2.

5.4.4 Wildlife Surveys and Mammals

The closest Mainland Moose Concentration Area is located approximately 1.4 km east of the Study Area. Four targeted surveys were conducted for Mainland Moose on and near the Study Area. Three winter wildlife surveys were completed in February and March 2017 by MEL personnel. No Mainland Moose signs were observed. During the winter wildlife surveys, signs of the following species were observed: American Mink, American Red Squirrel, Bobcat, Eastern Coyote, Northern American Porcupine, Northern Raccoon, Snowshoe hare, and White-Tailed Deer.

One spring wildlife survey and a pellet group inventory survey was completed on May 8, 2017. No Eastern Moose sign were observed. Signs of the following species were observed during the spring wildlife survey: American Black Bear, Eastern Coyote, Green Frog, and Snowshoe Hare.

Incidental observation of mammal species was documented during all field survey activities during 2017 across the Study Area. Specific focus was given to searching for signs of priority species identified as having appropriate habitat within the Study Area.

Table 7 lists those species that were confirmed within the Study Area either visually or by sign (scat, footprints, etc.). A discussion of bat usage within the Study Area is provided in Section 5.4.6.

Table 7. Confirmed Mammalian Species during 2017 Field Surveys.

Scientific Name	Common Name	ACCDC Prov. Rank
Canis latrans	Eastern Coyote	S5
Erethizon dorsatum	Northern American Porcupine	S5
Lepus americanus	Snowshoe hare	S5
Lynx rufus	Bobcat	S5
Mustela erminea	Short-tailed Weasel	S5
Neovison vison	American Mink	S5
Odocoileus virginianus	White Tailed Deer	S5
Procyon lotor	Northern Raccoon	S5
Tamiasciursus hudsonicus	American Red Squirrel	S5
Ursus americanus	American Black Bear	S5

Other common carnivore/omnivore species such as Red Fox *(Vulpes vulpes)* and Striped Skunk (*Mephitis mephitis)* may inhabit the Study Area or surrounding areas, at least periodically.

Further details relating to potential SAR and SOCI mammal species are provided in Section 5.6.3. No SAR and SOCI mammals were identified during field surveys.

5.4.5 Avian

The following sections outline the results from the desktop review and the field surveys completed within and adjacent to the Study Area.

5.4.5.1 Desktop Results

There are no Important Bird Areas (IBA) within 50 km of the Study Area. (Bird Studies Canada, 2012). The closest IBA, Pomquet Beach Region (NS009), is approximately 54 km east of the Study Area.

- Pomquet Beach Region (NS009) is located approximately 54 km east of the Study Area within mainland NS. This IBA is located approximately 8km northeast of Antigonish. The communities of Antigonish Harbour and Monks Head are found within Pomquet Beach Region IBA. It is a series of barrier beaches, with one to two-meter tides. Pomquet is one of the longer beaches, 5 to 10m wide at high tide, while having broader expanses of sand flats during low tide. Piping Plovers have used the Pomquet Beach Region for breeding for years. Piping Plovers are designated *Endangered by Species at Risk Act* (SARA) and The Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The Pomquet Beach portion of the IBA is a provincial park, which does not fully afford protection of the kind needed at a Piping Plover site. The habitat is protected from development, however recreational activities, such as All-Terrain-Vehicles and beachgoers, are permitted. Bird Studies Canada (2015).

The habitats provided within this IBA are not consistent with habitat available within the Study Area. The IBAs are mainly associated with coastal colonial nesting species and shorebirds dependant on exposed mudflats or sandy beaches.

The Project will not disrupt large contiguous wetland or forest habitat that may be of importance to birds. The closest Canada Wildlife Service Migratory Bird Sanctuary (MBS) in Nova Scotia is Amherst Point MBS, which is located approximately 130km northwest of the Study Area. Amherst Point MBS contains the most productive wetlands within the province of Nova Scotia. Over 200 bird species have been observed within this MBS, including abundant waterfowl and shorebirds. Various waterfowl and shorebirds uncommon to Nova Scotia have been observed nesting within the MBS (Government of Canada, 2017).

5.4.5.2 Avian Survey Results

Baseline surveys for birds were completed from April to October 2017, by Ken McKenna. A total of 560 minutes (9 hours and 20 mins) of surveys were completed over three seasons. These surveys resulted in the observation of 978 individuals, representing 59 species within or in proximity to the Study Area. An additional nine species were observed only incidentally during the three seasons: Canada Warbler (*Cardellina canadensis*), Eastern Wood-pewee (*Contopus virens*), Killdeer (*Charadrius vociferous*), Mourning Warbler (*Geothlypis philadelphia*), Red-tailed Hawk (*Buteo jamaicensis*), Rose-breasted

Grosbeak (*Pheucticus ludovicianus*), Savannah Sparrow (*Passerculus sandwichensis*), Swamp Sparrow (*Melospiza georgiana*), and Tree Swallow (*Tachycineta bicolor*). Across all survey seasons a total of sixteen (16) priority species were observed either during dedicated survey periods or incidentally. Of the 16-priority species five species are SAR and 11 are SOCI according to ranks designated by the ACCDC. These priority species are discussed in Section 5.6.4.
Bird species were identified based on functional bird groups to understand how each group of birds is using the Study Area. These functional groups include:

1. **Waterfowl:** Ducks, geese, or other large aquatic birds, especially when regarded as game;
2. **Shorebirds**: Waders, from the Order Charadriiformes;
3. **Other waterbirds**: Includes seabirds (i.e. marine birds), grebes (Order Podicipediformes), loons (Order Gaviiformes), Ciconiiformes (i.e. storks, herons, egrets, ibises, spoonbills, etc.), pelicans (Order Pelicaniformes), flamingos (Order Phoenicopteriformes), Gruiformes (i.e. cranes and rails), kingfishers. gulls and dippers (the only family of passerines considered waterbirds);
4. **Diurnal Raptors**: Birds within the families Accipitridae (i.e. hawks, eagles, buzzards, harriers, kites and old-world vultures), Pandidonidae (i.e. Osprey), Sagittariidae (i.e. Secretary bird), Falconidae (i.e. falcons, caracaras, and forest falcons), Cathartidae (i.e. new world vultures), and one species from the Order Strigiformes (i.e. Hawk Owl);
5. **Nocturnal Raptors**: Birds of the Order Strigiformes (i.e. owls; with exception of the Hawk Owl, which is a diurnal species of owl);
6. **Passerines**: Any bird of the Order Passeriformes, which includes more than half of all bird species. This is with exception of the dippers, which are a passerine considered a waterbird; and,
7. **Other Landbirds**: Birds within the Orders Galliformes (i.e. quail, pheasant, and grouse), Columbiformes (i.e. pigeons and doves), Cuculiformes (i.e. cuckoos), Caprimulgiformes (i.e. nighthawks and whip-poor-wills), Apodiformes (i.e. swifts and hummingbirds), and Piciformes (i.e. woodpeckers, flickers and sapsuckers).

The most abundant group observed on site were passerines. The seasonal specific survey results are discussed below:

5.4.5.2.1 Spring Migration

Eight (8) point count locations were surveyed during the spring bird migration period. The spring bird migration survey was conducted twice on May 1 and May 25, 2017. During spring migration, a total of 303 individuals representing 51 species were observed. With incidental observations removed (those outside of point count locations), 274 individuals, representing 48 species, not including one unidentified woodpecker species, were observed during the dedicated survey period (see table 8 below).

Seven priority species were observed during the spring migration surveys, not including the incidental observations. Two of the seven priority species were considered SAR: Bobolink (SARA Threatened) and

Evening Grosbeak (NSESA Vulnerable). Five SOCI: Blackpoll Warbler (S3S4B), Red-breasted Nuthatch (S3), Ruby-crowned Kinglet (S3S4B), Swainson's Thrush (S3S4B), and Yellow-bellied Flycatcher (S3S4B), were observed during the spring migration survey.

Three additional species were observed incidentally during the spring migration survey: Canada Goose (*Branta canadensis*), Canada Warbler (*Cardellina canadensis*, SARA Threatened), and Killdeer (*Charadrius vociferous*, S3B).

Table 8. Spring Migration: Species and Abundance of Birds

Species Code	Common Name	Scientific Name	#	Points Obs.	Bird Group
AMCR	American Crow	*Corvus brachyrhynchos*	8	1, 2, 3, 5, 7	6
AMGO	American Goldfinch	*Spinus tristis*	8	5, 7, 8	6
AMRE	American Redstart	*Setophaga ruticilla*	8	4, 5, 6, 7, 8	6
AMRO	American Robin	*Turdus migratorius*	27	1, 2, 3, 4, 5, 6, 7, 8	6
BEKI	Belted Kingfisher	*Megaceryle alcyon*	2	4	3
BAWW	Black and White Warbler	*Mniotilta varia*	4	3, 6, 7	6
BLBW	Blackburnian Warbler	*Setophaga fusca*	5	2, 3, 7, 8	6
BCCH	Black-capped Chickadee	*Poecile atricapillus*	25	1, 2, 3, 4, 5, 6, 7, 8	6
BLPW	Blackpoll Warbler	*Setophaga striata*	1	8	6
BTNW	Black-throated Green Warbler	*Setophaga virens*	10	1, 2, 3, 4, 5, 6, 7, 8	6
BLJA	Blue Jay	*Cyanocitta cristata*	12	2, 3, 4, 5, 6, 7, 8	6
BHVI	Blue-headed Vireo	*Vireo solitarius*	7	3, 4, 5, 6, 8	6
BOBO	Bobolink	*Dolichonyx oryzivorus*	1	7	6
CSWA	Chestnut-sided Warbler	*Setophaga pensylvanica*	1	4	6
CHSP	Chipping Sparrow	*Spizella passerina*	2	4	6
COGR	Common Grackle	*Quiscalus quiscula*	3	4, 7	6
CORA	Common Raven	*Corvus corax*	3	8	6
COYE	Common Yellowthroat	*Geothlypis trichas*	2	2, 4	6
DEJU	Dark-eyed Junco	*Junco hyemalis*	4	2, 4, 6, 7	6
DOWO	Downy Woodpecker	*Picoides pubescens*	2	4	7
EUST	European Starling	*Sturnus vulgaris*	1	4	6
EVGR	Evening Grosbeak	*Coccothraustes vespertinus*	6	1, 2	6
GCKI	Golden-crowned Kinglet	*Regulus satrapa*	1	5	6
HAWO	Hairy Woodpecker	*Picoides villosus*	1	6	7
HETH	Hermit Thrush	*Catharus guttatus*	5	1, 2, 3, 6	6
LEFL	Least Flycatcher	*Empidonax minimus*	2	1, 4	6
MAWA	Magnolia Warbler	*Setophaga magnolia*	5	2, 3, 5, 6, 8	6
MODO	Mourning Dove	*Zenaida macroura*	1	4	7
NAWA	Nashville Warbler	*Oreothlypis ruficapilla*	2	3, 4	6
NOFL	Northern Flicker	*Colaptes auratus*	6	2, 4, 5, 6, 7	7
NOPA	Northern Parula	*Setophaga americana*	8	1, 2, 3, 4, 5, 6, 8	6
OVEN	Ovenbird	*Seiurus aurocapilla*	13	1, 2, 3, 4, 5, 6, 7, 8	6

Species Code	Common Name	Scientific Name	#	Points Obs.	Bird Group
PIWO	Pileated Woodpecker	*Dryocopus pileatus*	2	4	7
PUFI	Purple Finch	*Haemorhous purpureus*	15	1, 2, 3, 4, 5, 6, 7, 8	6
RBNU	Red-breasted Nuthatch	*Sitta canadensis*	2	2, 3	6
REVI	Red-eyed Vireo	*Vireo olivaceus*	4	4, 5, 6	6
RWBL	Red-winged Blackbird	*Agelaius phoeniceus*	2	7	6
RNPH	Ring-necked Pheasant	*Phalaropus lobatus*	9	1, 2, 4, 7, 8	7
RCKI	Ruby-crowned Kinglet	*Regulus calendula*	6	2, 3, 4, 6	6
RUGR	Ruffed Grouse	*Bonasa umbellus*	4	2, 3, 5, 7	7
SOSP	Song Sparrow	*Melospiza melodia*	5	2, 4, 7	6
SWTH	Swainson's Thrush	*Catharus ustulatus*	1	2	6
WTSP	White-throated Sparrow	*Zonotrichia albicollis*	18	1, 2, 3, 4, 5, 6, 7, 8	6
WIWR	Winter Wren	*Troglodytes hiemalis*	2	4, 6	6
YEWA	Yellow warbler	*Setophaga petechia*	2	4, 8	6
YBFL	Yellow-bellied Flycatcher	*Empidonax flaviventris*	1	6	6
YBSA	Yellow-bellied Sapsucker	*Sphyrapicus varius*	5	2, 7, 8	7
YRWA	Yellow-rumped Warbler	*Setophaga coronata*	9	2, 3, 4, 5, 7	6
	Woodpecker species	*NA*	1	3	7
	Total Species: 48	***Total Number:***	**274**		

Notes: Incidental observations during the spring migration surveys are not included (those observed outside of point count locations). Bird group is coded as: 1 = waterfowl; 2 = shorebirds; 3 = other waterbirds (i.e. that are not waterfowl or shorebirds); 4 = diurnal raptors; 5 = nocturnal raptors; 6 = passerines (excluding dippers) and 7 = other landbirds.

The three most commonly observed species were American Robin (n=27), Black-capped Chickadee (n=25), and White-throated Sparrow (n=18). No obvious concentration of ducks or shorebirds was observed. The majority of observations were of a few individuals, and no large group of birds were observed. The most abundant species group observed on site during the spring migration period was passerines, followed by other landbirds as the next most abundant group on-site.

5.4.5.2.2 Breeding Season

The breeding bird survey consisted of eight point count stations, which were surveyed twice in the month of June 2017. A total of 369 individuals representing 51 species were observed. With incidental observations removed (those outside of point count), 302 individuals representing 44 species were observed and included in the summary below.

Six species were observed only incidentally: Downy Woodpecker, Eastern Wood-pewee (SARA Special Concern), Killdeer (S3B), Mourning Warbler, Tree Swallow, Yellow-bellied Flycatcher (S3S4B). Of these six incidental species, three are considered priority species, one SAR, Eastern Wood-pewee and two SOCI, Killdeer and Yellow-bellied Flycatcher.

During dedicated breeding bird point count surveys, six priority species (two SAR and four SOCI) were observed. The two SAR were Bobolink (SARA Threatened) and Chimney Swift (SARA Threatened). The four SOCI observed during breeding bird point count surveys were: American Kestrel (S3B), Red-breasted Nuthatch (S3), Ruby-crowned Kinglet (S3S4B), and Swainson's Thrush (S3S4B).

The breeding status of the bird species observed during breeding bird surveys are noted in Table 9 below. The surveyor recorded any notes on bird behavior observed, including distraction display, carrying food, and carrying nesting material. The following are the breeding status (MBBA 2018) observed during the breeding bird surveys:

- Observed- species observed in its breeding season
- Possible- species observed during breeding season in suitable nesting habitat or singing males or breeding calls heard, in suitable nesting habitat during breeding season
- Probable- agitated behavior observed or the occurrence of an adult bird, at the same place, on at least two days a week during breeding season
- Confirmed- adult carrying food or distraction display

Table 9. Breeding Season Surveys: Species and Abundance of Birds

Species Code	Common Name	Scientific Name	#	Points Obs.	Bird Group	Breeding Status
ALFL	Alder Flycatcher	*Empidonax alnorum*	10	1, 2, 3, 4, 8	6	Probable
AMCR	American Crow	*Corvus brachyrhynchos*	6	1, 2, 4, 5, 6, 7	6	Possible
AMGO	American Goldfinch	*Spinus tristis*	12	2, 3, 4, 5, 6, 7, 8	6	Probable
AMKE	American Kestrel	*Falco sparverius*	1	4	4	Possible
AMRE	American Redstart	*Setophaga ruticilla*	9	3, 4, 5, 6, 7, 8	6	Probable
AMRO	American Robin	*Turdus migratorius*	29	1, 2, 3, 4, 5, 6, 7, 8	6	Probable
BEKI	Belted Kingfisher	*Megaceryle alcyon*	1	4	3	Possible
BAWW	Black and White Warbler	*Mniotilta varia*	5	2, 3, 4, 6, 7, 8	6	Possible
BCCH	Black-capped Chickadee	*Poecile atricapillus*	14	2, 3, 4, 5, 6, 7, 8	6	Probable
BTNW	Black-throated Green Warbler	*Setophaga virens*	15	1, 2, 3, 5, 6, 7, 8	6	Probable
BLJA	Blue Jay	*Cyanocitta cristata*	6	1, 2, 4, 6, 7	6	Probable
BHVI	Blue-headed Vireo	*Vireo solitarius*	11	1, 2, 3, 5, 6, 7, 8	6	Probable
BOBO	Bobolink	*Dolichonyx oryzivorus*	1	4	6	Possible
BWHA	Broad-wing Hawk	*Buteo platypterus*	1	8	4	Possible
CANG	Canada Goose	*Branta canadensis*	1	6	1	Observed
CEDW	Cedar Waxwing	*Bombycilla cedrorum*	3	2, 7	6	Possible
CSWA	Chestnut-sided Warbler	*Setophaga pensylvanica*	7	1, 2, 7, 8	6	Probable
CHSW	Chimney Swift	*Chaetura pelagica*	2	4	7	Possible
CHSP	Chipping Sparrow	*Spizella passerina*	2	4, 7	6	Possible
COGR	Common Grackle	*Quiscalus quiscula*	5	4, 8	6	Possible

Species Code	Common Name	Scientific Name	#	Points Obs.	Bird Group	Breeding Status
COYE	Common Yellowthroat	*Geothlypis trichas*	7	1, 2, 4, 7, 8	6	Probable
DEJU	Dark-eyed Junco	*Junco hyemalis*	6	1, 6, 7, 8	6	Confirmed
EUST	European Starling	*Sturnus vulgaris*	5	4	6	Probable
GCKI	Golden-crowned Kinglet	*Regulus satrapa*	1	2	6	Possible
HAWO	Hairy Woodpecker	*Picoides villosus*	2	2, 3	7	Possible
HETH	Hermit Thrush	*Catharus guttatus*	2	1	6	Probable
MAWA	Magnolia Warbler	*Setophaga magnolia*	10	1, 2, 3, 4, 5, 8	6	Probable
MODO	Mourning Dove	*Zenaida macroura*	5	1, 4, 6, 7	6	Probable
NAWA	Nashville Warbler	*Oreothlypis ruficapilla*	3	1,3	6	Probable
NOFL	Northern Flicker	*Colaptes auratus*	8	2, 3, 5, 6, 7	7	Probable
NOPA	Northern Parula	*Setophaga americana*	15	1, 2, 3, 4, 5, 7, 8	6	Probable
OVEN	Ovenbird	*Seiurus aurocapilla*	22	1, 2, 3, 4, 5, 6, 7, 8	6	Confirmed
PUFI	Purple Finch	*Haemorhous purpureus*	6	2, 3, 5, 8	6	Probable
RBNU	Red-breasted Nuthatch	*Sitta canadensis*	3	1, 2, 3	6	Possible
REVI	Red-eyed Vireo	*Vireo olivaceus*	21	1, 2, 3, 4, 5, 6, 7, 8	6	Probable
RNPH	Ring-necked Pheasant	*Phalaropus lobatus*	5	1, 2, 3, 4	7	Probable
RCKI	Ruby-crowned Kinglet	*Regulus calendula*	1	3	6	Possible
RTHU	Ruby-throated Hummingbird	*Archilochus colubris*	1	5	7	Possible
RUGR	Ruffed Grouse	*Bonasa umbellus*	2	4, 6	7	Possible
SOSP	Song Sparrow	*Melospiza melodia*	9	1, 2, 3, 4, 7, 8	6	Probable
SWTH	Swainson's Thrush	*Catharus ustulatus*	2	1, 2	6	Possible
WTSP	White-throated Sparrow	*Zonotrichia albicollis*	18	1, 2, 3, 4, 5, 6, 7, 8	6	Probable
YBSA	Yellow-bellied Sapsucker	*Sphyrapicus varius*	5	4, 5, 8	7	Probable
YRWA	Yellow-rumped Warbler	*Setophaga coronata*	2	1, 2	6	Possible
	Total: 44 Species	**Total Number:**	**302**			

Notes: Incidental observations not included (those observed outside of point count locations). Bird group is coded as: 1 = waterfowl; 2 = shorebirds; 3 = other waterbirds (i.e. that are not waterfowl or shorebirds); 4 = diurnal raptors; 5 = nocturnal raptors; 6 = passerines (excluding dippers) and 7 = other landbirds.

The three most commonly observed species during breeding bird surveys were the American Robin (n=29), Ovenbird (n=22), followed by the Red-eyed Vireo (n=21). Two species were noted as confirmed breeders, a Dark-eyed Junco was observed carrying food and an Ovenbird was observed performing a distraction display. American Robin was noted as a probable breeder as two pairs were noted as being agitated. The remaining probable breeders (n = 23) were observed at the same location on two subsequent breeding season surveys. Those identified as possible breeders were observed during breeding season in

suitable nesting habitat. Since the site surveyed is a relatively small part of the surrounding area, it is not possible to confirm that all species identified were actually nesting within the boundaries of the site. For instance, for a bird that was observed carrying food (confirmed breeding evidence), it is possible that the bird was nesting on an adjacent parcel of land. One species', Canada Goose, breeding status was noted as observed, as no suitable nesting habitat is present within the Study Area (i.e. no open water present).

All of the species identified, except European Starling and Ring-necked Pheasant, are native species in this area of Nova Scotia and the province in general and observed within the typical and common habitat associated with the Study Area and surrounding landscape. The majority of observations comprised one or two individuals. No large flocks of birds were observed during breeding bird surveys. The most abundant species group observed on site during the breeding bird period was passerines, followed by other landbirds.

5.4.5.2.3 Common Nighthawk Surveys

No Common Nighthawk were observed during either specialized survey at the five point count locations (Figure 6, Appendix A).

5.4.5.2.4 Fall Migration

The fall bird migration survey consisted of eight point count stations and dedicated surveys were conducted three times during the fall migration period, August 28, September 18, and October 6, 2017. During fall migration, a total of 637 individuals representing 49 species were observed. When incidental observations were removed (those observed outside of Point Count locations), 402 individuals representing 39 species remain, not including an unidentified flycatcher species, and are included in Table 10 below. The ten incidental species observed include: American Kestrel, Chipping Sparrow, Common Yellowthroat, Mourning Warbler, Red-tailed Hawk, Rose-breasted Grosbeak, Ruffed Grouse, Savannah Sparrow, Swainson's Thrush and Swamp Sparrow. Three of the ten incidental species are considered SOCI: American Kestrel (S3B), Rose-breasted Grosbeak (S2S3B), and Swainson's Thrush (S3S4B). No SAR were observed during fall migration surveys.

Table 10. Fall Migration Surveys: Species and Abundance of Birds

Species Code	Common Name	Scientific Name	#	Point Obs.	Group
AMCR	American Crow	*Corvus brachyrhynchos*	9	1, 2, 4, 7, 8	6
AMGO	American Goldfinch	*Spinus tristis*	9	1, 5, 6, 7, 8	6
AMRE	American Redstart	*Setophaga ruticilla*	3	2, 8	6
AMRO	American Robin	*Turdus migratorius*	38	1, 2, 3, 5, 6, 7, 8	6
BBWA	Bay-breasted Warbler	*Setophaga castanea*	1	2	6
BEKI	Belted Kingfisher	*Megaceryle alcyon*	1	7	3
BAWW	Black and White Warbler	*Mniotilta varia*	4	3, 6	6
BCCH	Black-capped Chickadee	*Poecile atricapillus*	93	1, 2, 3, 4, 5, 6, 8	6
BLPW	Blackpoll Warbler	*Setophaga striata*	20	1	6

Species Code	Common Name	Scientific Name	#	Point Obs.	Group
BTNW	Black-throated Green Warbler	*Setophaga virens*	5	3, 6	6
BLJA	Blue Jay	*Cyanocitta cristata*	21	1, 2, 3, 4, 5, 6, 7, 8	6
BHVI	Blue-headed Vireo	*Vireo solitarius*	4	1, 2, 4	6
BOCH	Boreal Chickadee	*Poecile hudsonicus*	2	2	6
CEDW	Cedar Waxwing	*Bombycilla cedrorum*	7	2, 8	6
COGR	Common Grackle	*Quiscalus quiscula*	1	7	6
CORA	Common Raven	*Corvus corax*	5	1, 6, 7	6
DEJU	Dark-eyed Junco	*Junco hyemalis*	2	2, 8	6
DOWO	Downy Woodpecker	*Picoides pubescens*	3	4, 7	7
GCKI	Golden-crowned Kinglet	*Regulus satrapa*	20	1, 2, 3, 4, 6	6
HAWO	Hairy Woodpecker	*Picoides villosus*	2	6, 8	7
HETH	Hermit Thrush	*Catharus guttatus*	10	2, 3, 5, 6, 7, 8	6
LEFL	Least Flycatcher	*Empidonax minimus*	1	6	6
MAWA	Magnolia Warbler	*Setophaga magnolia*	6	2, 3, 5	6
MODO	Mourning Dove	*Zenaida macroura*	1	1	7
NAWA	Nashville Warbler	*Oreothlypis ruficapilla*	1	3	6
NOFL	Northern Flicker	*Colaptes auratus*	9	1, 2, 4, 5, 8	7
NOPA	Northern Parula	*Setophaga americana*	11	2, 3, 4, 5, 6, 8	6
OVEN	Ovenbird	*Seiurus aurocapilla*	5	3, 4	6
PAWA	Palm Warbler	*Setophaga palmarum*	1	2	6
PIWO	Pileated Woodpecker	*Dryocopus pileatus*	4	2, 4, 8	7
PISI	Pine Siskin	*Spinus pinus*	1	5	6
PUFI	Purple Finch	*Haemorhous purpureus*	7	1, 2, 3, 5	6
RBNU	Red-breasted Nuthatch	*Sitta canadensis*	21	1, 2, 3, 5, 6, 8	6
REVI	Red-eyed Vireo	*Vireo olivaceus*	18	1, 2, 3, 4, 5, 6, 8	6
RCKI	Ruby-crowned Kinglet	*Regulus calendula*	3	3, 6	6
SOSP	Song Sparrow	*Melospiza melodia*	7	2, 3, 7	6
WTSP	White-throated Sparrow	*Zonotrichia albicollis*	6	2, 3, 8	6
YEWA	Yellow Warbler	*Setophaga petechia*	4	3	6
YRWA	Yellow-rumped Warbler	*Setophaga coronata*	35	1, 2, 5, 6, 7, 8	6
-	Flycatcher species	NA	1	6	6
	19 Species	Total Number:	128		

Notes: Incidental observations not included (those observed outside of point count locations). Bird group is coded as: 1 = waterfowl; 2 = shorebirds; 3 = other waterbirds (i.e. that are not waterfowl or shorebirds); 4 = diurnal raptors; 5 = nocturnal raptors; 6 = passerines (excluding dippers) and 7 = other landbirds.

The three most commonly observed species during fall migration were Black-capped Chickadee (n=93), followed by American Robin (n=38) and the Yellow-rumped Warbler (n=35). Most observations documented groups of up to two individuals, however one large flock of American Robin (n=20), and two smaller flocks of Black-capped Chickadee and Blackpoll Warbler (both n=10) were observed. The most abundant group observed on site during the fall migration period were passerines. Other landbirds were the next most abundant group observed.

5.4.5.2.5 Nocturnal Owl Surveys

The nocturnal owl survey was completed on April 4, 2017 at four point count locations. One Great-horned Owl and one Barred Owl were heard at OWL3 (Figure 6, Appendix A). No other owls were heard.

5.4.5.3 Summary of Bird Surveys

Overall, 978 individuals, representing 59 species within and adjacent to the Study Area were identified during dedicated surveys. An additional 9 species were observed incidentally. A higher number of birds were observed during the fall migration period, compared to during the spring migration and breeding periods. Over twice the amount of birds were observed during the fall migration compared to the spring migration. However, two visits were conducted in the spring and three visits in the fall, which explains the difference in number of birds observed. Historical forestry activities have created edge habitat for foraging activities and has created habitat niches for certain bird species. This edge habitat is also available along the network of ATV trails within the area.

Across all survey seasons a total of sixteen (16) priority species, five SAR and eleven SOCI were observed either during dedicated survey periods or incidentally: American Kestrel, Bay-breasted Warbler, Blackpoll Warbler, Bobolink, Boreal Chickadee, Canada Warbler, Chimney Swift, Eastern Wood-Pewee, Evening Grosbeak, Killdeer, Pine Siskin, Red-breasted Nuthatch, Rose-breasted Grosbeak, Ruby-crowned Kinglet, Swainson's Thrush and Yellow-bellied Flycatcher. Section 5.6.4 discusses these species in more detail.

5.4.6 Bat Use

According to the ACCDC report, known bat hibernaculum are present within 5km of the Study Area. Bat hibernaculum are considered as location sensitive by ACCDC and therefor no other data, including species, date, or numbers, are noted in the ACCDC report. The ACCDC report, did identify a record of 48 Little Brown Myotis within a 5km radius of the Study Area.
The Little Brown Myotis need a variety of habitats depending on the season. For overwintering habitat, they need hibernacula which include caves, abandoned mines, and wells, summer habitat include roosting habitat and foraging habitat and they need swarming habitat in late summer and early fall for mating and socializing. The Little Brown Myotis uses building and other anthropogenic structures to roost, tree cavities, tree bark, and crevices on cliffs. They feed on insects and spiders and are associated with open habitats, ponds, road, and open canopy forests. Foraging habitat for the Little Brown Myotis is provided within the Study Area. Minimal roosting habitat is provided within the Study Area (Environment Canada, 2015).

MEL initiated communication with NSDNR SAR Biologist, Mark Elderkin to discuss bat sensitivity in relation to blasting activity. It was communicated to MEL that effects to bats can be realised up to 1km away during hibernation periods. As such, a minimum of a 1km buffer from proposed projects which require blasting was recommended when assessing risk to bat SAR. Furthermore, the Ministry of Forests,

Lands and Natural Resource Operations in British Columbia provides a minimum blasting buffer of 1km from important features, with a sound concussion less than 150 decibels, shock wave less than 1.5 p.s.i, and less than 0.6 inches per second, Peak Particle Velocity (PPV) (MFLNRO 2014). According to a 2006 West Virginia government report, hibernating bats can withstand vibration levels of 0.06 to 0.20 inches per second (PPV) without adverse effects (West Virginia Dept of Environmental Protection Office of Explosives and Blasting, 2006). NSDEL provides a blasting guideline of 0.5 inches per second (PPV) (1999), which is above the West Virginia recommended limit for bat impact.

Personal communication with Mike Mason at Archibald Drilling and Blasting showed that the vibrational effects of blasting depends on the direction of the blast, but that seismographs placed approximately 1km away showed very little movement (February 21, 2018).

Although a precise location for the ACCDC identified bat hibernaculum was not provided to MEL, personnel communications with Shavonne Meyer, Regional Biologist with NSDNR, confirmed that the bat hibernaculum is identified to be approximately 2.2 km southwest from the southern Study Area boundary (Meyer. S August 2017).

No provincial government records of abandoned mine openings (AMOs) were located within the Study Area (NSDNR 2017). There are 100 records of AMOs within 5km of the Study Area. These records are all north of the Study Area. Five of the 100 records are identified as adit opening type, 10 are considered as pit opening type, 40 are considered as shaft opening type and 45 are considered as slope opening type.

The closest critical habitat for the Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*), and Tri-colored Bat (*Perimyotis subflavus*) in Nova Scotia is approximately 61km southeast of the Study Area, near the community of Sherbrooke, NS (Environment Canada, 2015). Critical habitat as defined by Environment Canada (2015) as the habitat necessary for the survival or recovery of the species.

According to the Museum of Nova Scotia's Records of Bats at Caves and Mines in Nova Scotia, one site is located in the general area. This site, McLellan's Brook Cave, was considered a minor site (<10 bats). Late summer bat activity (*Myotis spp.)* was observed around the cave, however no underground records of bats were noted. This site was assessed in 1998 (Moseley, 2007).

No observations of potential bat hibernacula (caves, abandoned mines or wells) were identified in the MacLellans Mountain Quarry Expansion Study Area during field evaluations and surveys.

5.4.7 Wildlife Habitat

Habitat across the Study Area is described in detail in Section 5.4.1. The majority of the Study Area is forested with areas that have been harvested and is in varying stages of regeneration. These varying stages

of regeneration create a variety of habitat types for a variety of species. Intact forest within the site generally falls within the Acadian Ecosites AC9 and AC10. These ecosites (described by Keys et al., 2010) represent medium soil richness, and dry to fresh moisture regime depending on topographic position, slope gradient, and soil drainage. Generally, these ecosites support early- to late-successional forests within the Study Area.

Habitat within the Study Area is currently fragmented by two existing quarries, roads, ATV trails and historical forestry operations. The extent of habitat fragmentation within the Study Area limits the habitat quality for species that prefer interior, mature, undisturbed habitats, such as Lynx and Fisher. Habitat within the Study Area is suitable for those wild species that thrive in fragmented, diverse landscapes, such as White-tailed Deer, Coyote, and Snowshoe Hare. This fragmented, diverse landscape provides edge habitat for foraging, and patches of full canopy coverage for refuge and cover through all seasons. Wildlife habitat observed was neither unique nor rare in the local or regional landscape context.

5.5 Aquatic Environment

The Study Area lies within the Forbes Lake Tertiary Watershed (IDP-3-HH) which discharges into the East River of Pictou located approximately 7.8km northwest of the Study Area. The Forbes Lake Tertiary Watershed is located within the East River Pictou Secondary Watershed (1DP-3; Figure 9, Appendix A), which is situated within the East/Middle/West Pictou Primary Watershed (1DP). The East River of Pictou drains north into the Northumberland Strait within the Atlantic Ocean. The sizes of the secondary watershed and the tertiary watershed are 21,374 ha and 9,412 ha, respectively.

Three watercourses and one wetland were identified within the Study Area. The following sections provide details about the aquatic habitat identified, including the results from the surface water sampling program.

The Study Area is on a southwest facing slope. Surface water located on the northeastern extent of the Study Area (northeast of the existing quarry) drains southwest through Wetland 1 and eventually drains into Stewart Brook beyond the southwestern Study Area boundary, which then drains into McLellans Brook. McLellans Brook drains into the East River of Pictou, which drains into the Northumberland Strait (Atlantic Ocean).

5.5.1 Wetlands

A review of the NSE Wetlands Inventory Database identified one wetland within the MacLellans Mountain Quarry Expansion Study Area. During field surveys across the Study Area, one wetland was identified (Figure 5, Appendix A).

The wetland is a basin shrub swamp, 0.72ha in size, in a terrene landscape position. The wetland exists in the bottom of a small ravine comprising a steep topographical rise at its eastern and western boundaries.

The existing quarry area abuts the southern boundary of the wetland, and land slopes away, down gradient from the wetland into the quarry area (i.e. quarry floor is lower in elevation than wetland). The wetland acts as a throughflow system due to its connection with WC2, however, the watercourse is not contiguous through the wetland; rather, it enters the wetland at its northeastern extent and exits at its southwestern extent. The wetland provides seasonal fish habitat, as it contains seasonal standing water at a depth of 30cm covering 15% of the wetland area.

The dominant tree species in the shrub layer within the shrub swamp include Bebb's Willow (*Salix bebbiana*), Pussy Willow (*Salix discolor*) and Yellow Birch (*Betula alleghaniensis*). Trace amounts of Red Maple (*Acer rubrum)* and Black Spruce (*Picea mariana*) were observed in the overstory within the shrub swamp. A variety of herbaceous species are found within the ground cover, however Broad-leaved Cattail (*Typha latifolia*) and Sensitive Fern (*Onoclea sensibilis*) are dominant in the herbaceous layer.

Hydric organic soils (hydric soil indicator A1-Histosol), 40cm in depth with a hard pan identified at 40cm were observed within the shrub swamp. A high water table and saturation at surface were present in the wetland. Surface water at an average depth of 30cm, was observed covering approximately 15% of the wetland area. The wetland provides seasonal fish habitat, as surface water is not present year-round. WESP results provide summary ratings for five Grouped Wetland Functions. As can be noted in Appendix E, the functional rating scores were Lower (Hydrologic Group and Water Quality), Moderate (Aquatic Support and Aquatic Habitat, and High (Transition Habitat); the following provides a summary of these results.

<u>Hydrologic Group – LOW</u>

- The wetland temporarily collects and detains water draining from upper portions of WC2 and surrounding higher land, prior to discharging it via downstream portions of WC2;
- However, the wetlands ability to detain large quantities of water is limited by the relatively shallow organic soil depths (40cm) and that it is contiguous with a permanent outflow channel (WC2);
- Due to its limited size, and water detention capacity in addition to its association with WC2, the wetland is not expected to contribute significantly to aquifer water quality or quantity;
- The wetland is small in size in relation to the catchment area it receives water from; and
- Surface water run-off from future up-gradient quarry expansion areas may enter the wetland in the future. Therefore, its ability to detain water, and trap sediments and other potential pollutants (metals) increases the benefits of the wetland.

<u>Water Quality – LOW</u>

- The wetland's ability to detain water and settle sediments is reduced by a lack of ground irregularity in the wetland;

- The minor volume of standing water within the wetland reduces its ability to be held up on the ground and reduce water flow velocity due to friction;
- Minimal fluctuation in water levels and subsequent ability for vegetation to filter water is reduced due to stable water depths;
- Watercourse outflow from Wetland 1 reduces its water detention capacity and ability to settle sediments;
- The adjacent quarry and future expansion increases the benefit of the wetland for filtering potential sediments and other quarry derived substances (i.e. soluble metals); and
- A lack of nitrogen fixing plants exist in the wetland.

Aquatic Support and Aquatic Habitat - MODERATE

- Due to the limited area of standing and open water (~15% of wetland), the wetland does not provide significant fish, waterbirds, turtle or amphibian habitat nor does in support summer flows in WC2;
- There is a lack of additional wetlands in close proximity to Wetland 1 which reduces the diversity of habitat for amphibians;
- A lack of micro-topography in Wetland 1 reduces the diversification of amphibian habitat; and
- Wetland type (swamp) provides less invertebrates for feeding opportunities for fish in comparison to other wetland types (i.e. riparian and marsh).

Transitional Group – HIGH

- The wetland lies adjacent to large tract of natural land cover lacking roads or impervious surfaces and lacks large scale fragmentation: therefore, songbirds and mammals are more likely to use the wetland;
- The wetland lies predominantly adjacent to upland which allows easier movement for birds between wetland and upland;
- The wetland is not dominated by one shrub species, rather a combination of species (including trees, shrubs and herbaceous) which increase vegetation richness for food sources;
- Lack of extensive standing water increases vegetative structure for nesting songbirds;
- Smaller areas of standing water however provide aerially foraging birds a food source;
- The wetland is not accessible to humans and potential disturbance; and
- Invasive plant species appear to be absent from the wetland and adjacent buffer.
- The wetland does not comprise unique habitat for wildlife, nor were any SAR observed within the wetland. The wetland lacks a vegetated buffer on its southern boundary and it abuts the existing quarry hence reducing its ability to attract wildlife;

In addition to the above Grouped Wetland Function Results, Wetland 1 scored Moderately for its Ecological Integrity Benefits (i.e. its similarity with other similar wetland types), and High for Wetland Risk Benefits as a result of it being resilient to human and natural stressors.

5.5.2 Watercourse and Fish Habitat

There are no lakes or areas of open water in the Study Area. Three watercourses were confirmed to be present during field surveys (Figure 5, Appendix A). Physical characteristics of the watercourses within the Study Area are described in Table 12.

Watercourse 1 is an unmapped watercourse located in the northwestern extent of the Study Area. The watercourse initiates to the north of the Study Area and flows in a westerly direction through the northwestern corner of the Study Area. WC1 flows through a culvert under MacLellans Mountain Glencoe Road and continues south draining into Stewart Brook. WC1 provides seasonal fish passage and habitat potential including, rearing and foraging. No spawning or overwintering habitat is present within WC1 within the Study Area. No barriers to fish passage were observed within WC1 within the Study Area.

A mapped watercourse (WC2) was identified within the central portion of the Study Area. The watercourse initiates north of the Study Area and flows in a southwesterly direction parallel to the existing quarry. The watercourse flows into, and out of Wetland 1, although it does not remain continuous throughout the wetland. The watercourse continues through the Study Area and through two culverts, one under the MacLellans Mountain Quarry access road, and one under the MacLellans Mountain Glencoe Road, before draining into Stewart Brook. The southern portion of WC2, at the outflow portion of Wetland 1 provides fish passage and potential habitat including, rearing and foraging. No spawning or overwintering habitat is present within WC2 within the Study Area. The potential for fish to be present in the section of WC2, north of the wetland is low, due to the lack of a defined channel and seasonally dry conditions.

WC3 is an unmapped watercourse, initiates from a small seepage in the hillslope within the Study Area and flows in a westerly direction into northern portions of WC2. WC3 does not support habitat for fish due to a lack of consistent flowing water and watercourse characteristics. WC3 acts as a seasonal stream which collects surface water run-off from higher land to the east during periods of high flow.
The watercourses were evaluated for habitat characterizations based on parameters identified in the *Standard Methods Guide for Freshwater Fish and Fish Habitat Surveys in Newfoundland and Labrador* (NL Guide) (Sooley et al., 1998). As described in the guide, water quality and quantity tolerances of the Atlantic Salmon (*Salmo salar*) were used as an index of the relative health of the river for fish populations. The Atlantic Salmon were used as the indicator species for several reasons (Sooley et al., 1998);

- Salmon inhabit areas targeted for the assessments (riffles and pool habitat);

- Salmon are sensitive to acidification;
- Salmon are a predatory species at the top of the food chain; and
- Data exists that defines preferred habitat conditions for this species.

WC2 contains Type IV fish habitat downgradient of Wetland 1, however, due to the lack of flowing water in up-stream portions of WC2 throughout the majority of the year, fish access is very limited in this portion of the watercourse. WC1 and 3 do not contain any salmon habitat. The description of the fish habitat type found within the Study Area as described in the NL Guide (Sooley et al., 1998) is documented below:

Type IV watercourse consists of:

- poor juvenile salmonid rearing habitat with no spawning capability,
- provides shelter and feeding habitat for larger, older salmonid (especially Brook Trout),
- water flows usually are sluggish and varies in depth
- substrate is soft sediment or sand, occasionally large boulders or bedrock and;
- general habitat types consist of flats, pools and glides.

WC2 exhibits sluggish waterflow, no spawning capability, and pools which provides shelter and feeding habitat, all Type IV characteristics. The substrate is dominated by gravel with pebbles and cobbles co-dominating with minor small boulders and sand present throughout. WC2 provides potential feeding and rearing habitat only when water depth allows and provides no spawning or overwintering habitat.

Table 11 below describes the physical characteristic of the three watercourses identified within the Study Area.

Table 11. Physical Characteristics of Watercourses within the Study Area

Watercourse	Reference UTMs (Upstream)		Section Length (m)	Velocity (m/s)	Gradient	Wetted Width (cm)	Bankfull Width (cm)	Average Depth (cm)	Bank Height (cm)	Substrate (%)	Habitat Type (%)	Habitat Type (Sooley et al., 1998)
	E	N										
1	531933	5042840	251	N/A- Dry during survey	5%	N/A- Dry during survey	150	N/A- Dry during survey	10-80	SB=20, Ru=20, Pe=20, Gr=20, Sa=20	N/A- Dry during survey	N/A- Dry during surveys
2	532286	5042434	307	0.05	4%	20-75	50-100	10	20-250	SB=5, Co=20, Pe=20 Gr-50 Sa=5	Run=80, Pocket= 15, Pool= 5	IV
3	532608	5042807	378	N/A- Dry during survey	8%	N/A- Dry during survey	100	N/A- Dry during survey	20-40	SB=5, Ru=35, Co=15, Sa=35, Si/Mud=10	N/A- Dry during survey	N/A- Dry during surveys

SB=Small Boulder, Ru=Rubble, Co=Cobble, Pe=Pebble, Gr=Gravel, Sa=Sand, Si/Mud=Silt/Mud

5.5.3 Water Quality

Water sampling and water quality field measurements were collected within WC2 and WC3 to establish current conditions.

5.5.3.1 Surface Water Sampling

Three surface water samples were collected (Figure 6, Appendix A) as discussed in Section 4.1.10. The samples were analysed at Maxxam Analytics in Bedford, Nova Scotia for TSS and RCAp-MS Total Metals in Water. Table 12 below provides the locations for the three surface water samples.

Table 12. Surface Water Samples Locations

Sample ID as per Figure 6	Sample Location Description	Sample Location (UTM; 20T)	Date Sampled
S1	WC2 downstream	532109m E 5042250m N	October 26, 2017
S2	Mapped watercourse south of Study Area	532094m E 5041895m N	October 26, 2017
S3	WC2 upstream	532599mE, 5042793mN	May 30, 2018

The surface water sample results were compared to the Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Aquatic Life for Freshwater (FWAL) guidelines. The results for these samples and the CCME guidelines are provided in Appendix F.

TSS and RCAp-MS Total Metals in Water were analysed to establish a baseline for comparison of surface water quality. Sample results recorded at S2 and S3 meet all the applicable CCME FWAL water quality guidelines. S1 meets all but five applicable water quality guidelines. Table 13 provides a comparison of the CCME FWAL exceedances at S1.

Table 13: S1: CCME FWAL Guideline Exceedances

Sample Parameter	CCME FWAL Guideline	WQ1 Results
Total Aluminum	100ug/L	1300 ug/L
Total Cadmium	0.04 ug/L	0.094 ug/L
Total Copper	2 ug/L	2.7 ug/L
Total Iron	300 ug/L	2500ug/L
Total Lead	1 ug/L	4.6 ug/L

TSS sample results recorded at each location were as follows:

S1 (October 26, 2017) – 74 mg/L
S2 (October 26, 2017) – <1 mg/L
S3 (May 30, 2018) – 6mg/L

As discussed in Section 4.1.10, S1 is located in downstream portions of WC2. The majority of water sourced to WC2 is via run-off from natural forested land to the north of WC2, with smaller amounts sourced from natural forested land to the northeast of the existing quarry. As indicated on Figure 6 (Appendix A), western portions of the existing quarry footprint extend to the boundary of Wetland 1 and within 25m of WC2. However, these areas of the quarry footprint do not experience quarrying activity or processes and have been used in the past for storage of equipment. Sediment and erosion control methods are in place along the western boundary of the existing quarry footprint including silt fencing and berms. The berms separate the quarry footprint from the adjacent wetland and watercourse, and land slopes downgradient southward and incorporates rock lined ditches to facilitate the movement of water to the on-site settling ponds. As such, there are no direct inputs of water from the existing quarry into WC2.

Sample results within WC2 indicate that at the downstream location (S1), some exceedances in comparison CCME FWAL guidelines were present, in comparison to the upstream location (S3) which met FWAL guidelines. At this time, the cause of the variance in water quality measurements between the upstream and downstream samples is unknown. It is noteworthy to consider however, that the TSS levels at each location also vary. S1 also exhibited higher TSS levels (74 mg/L) compared to S3 (6mg/L). Higher TSS levels can indicate potential sedimentation in water and can subsequently increase total metal concentration results. Other factors such as preceding precipitation volumes, seasonal water flow variances, and up-stream conditions can affect the water quality results. Additional investigation is required to determine the variances in conditions recorded to date.

5.5.3.2 Water Quality Measurements

Water quality measurements were recorded during field surveys on August 29, 2017 at S1 in WC2. Water quality measurements could not be recorded within WC3 due to a lack of surface water at the time of survey.

Temperature within WC2 was recorded at 18.2°C and pH was measured at 6.04. CCME FWAL Guidelines set the range for pH at 6.5 to 9.0. The pH of WC2 falls below the CCME pH guidelines indicating that marginally acidic conditions are present.

5.6 SAR and SOCI

A SAR is a species which is legally protected under the federal *Species at Risk Act* (SARA) or the provincial *Nova Scotia Endangered Species Act* (NSESA), while a SOCI is a species that is listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or one which is classified as S1 to S3 by the ACCDC.

A review of ACCDC and CCH report confirms the presence of several Priority Species in proximity to the Study Area (Figure 10, Appendix A). The ACCDC identified the following records of SAR, SOCI and Special Areas within 5km of the Study Area including:

- 3 records of 3 vascular flora,
- no records of nonvascular flora,
- 112 records of 34 vertebrate,
- 6 records of 4 invertebrates,
- 4 managed areas,
- no biologically significant sites, and
- 2 location sensitive species.

Of these identified records, eight SAR, of which four were observed during field surveys, were identified within 5km of Study Area:

- Barn Swallow (NSESA Endangered, SARA Threatened, COSEWIC Threatened) – This species was not observed during the EA bird field study.
- Bobolink (NSESA Vulnerable, SARA Threatened, COSEWIC Threatened) – This species, along with its potential habitat was identified during the EA bird field study.
- Canada Warbler (NSESA Endangered, SARA Threatened, COSEWIC Threatened) –This species, along with its potential habitat was identified during the EA bird field study.
- Chimney Swift (NSESA Endangered, SARA Threatened, COSEWIC Threatened) – This species, along with its potential habitat was identified during the EA bird field study.
- Common Nighthawk (NSESA Threatened, SARA Threatened, COSEWIC Special Concern) – This species was not observed during the EA bird field study.
- Eastern Wood Pewee (NSESA Vulnerable, SARA Special Concern, COSEWIC Special Concern) – This species, along with its potential habitat was identified during the EA bird field study.
- Olive-sided Flycatcher (NSESA Threatened, SARA Threatened, COSEWIC Special Concern) – This species was not observed during the EA bird field study.
- Rusty Blackbird (NSESA Endangered, SARA Special Concern, COSEWIC Special Concern) – This species was not observed during the EA bird field study.

The managed areas that were identified by ACCDC within 5km of the Study Area include the Thorburn Spur Rail Corridor, New Glasgow Municipal Water Supply and the New Glasgow Water Supply Area.

Two location sensitive species, Wood Turtle and bat hibernaculum, were identified within 5km of the Study Area. Wood Turtle is listed as Threatened by SARA and NSESA. No Wood Turtles were observed during field surveys within the Study Area. No suitable nesting habitat was identified during field surveys within the Study Area. No suitable bat hibernaculum was encountered within the Study Area during field surveys. Additional information regarding bat hibernacula and potential effect to bats associated with blasting activities is discussed in Section 5.4.6.

A summary of federally and provincially protected species identified within 20km of the Study Area is provided below (Table 14). For avifaunal priority species, breeding status as documented in the Maritime

Breeding Bird Atlas square summary (square 20NR34) is also included. If the species was observed during atlas surveys, with no breeding evidence noted, this is indicated below as well.

Table 14. Summary of ACCDC observations of federally and provincially protected species within 20km of the Study Area.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	S Rank	Distance	MBBA
Hirundo rustica	Barn Swallow	Threatened	NA	Endangered	S3B	3.5 ± 7.0	Confirm
Bucephala islandica (Eastern pop.)	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern	NA	S1N	19.1 ± 0.0	Obs
Fraxinus nigra	Black Ash	NA	NA	Threatened	S1S2	6.9 ± 0.0	NA
Dolichonyx oryzivorus	Bobolink	Threatened	NA	Vulnerable	S3S4B	3.5 ± 7.0	Probable
Wilsonia canadensis	Canada Warbler	Threatened	Threatened	Endangered	S3S4B	3.5 ± 7.0	Possible
Chaetura pelagica	Chimney Swift	Threatened	Threatened	Endangered	S2B, S1M	3.5 ± 7.0	Possible
Chordeiles minor	Common Nighthawk	Threatened	Threatened	Threatened	S2S3B	3.5 ± 7.0	Possible
Contopus virens	Eastern Wood-Pewee	Special Concern	NA	Vulnerable	S3S4B	2.2 ± 0.0	Possible
Myotis lucifugus	Little Brown Myotis	Endangered	Endangered	Endangered	S1	2.8 ± 0.0	NA
Danaus plexippus	Monarch	Special Concern	Special Concern	NA	S2B	1.1 ± 0.0	NA
Alces americanus	Moose	NA	NA	Endangered	S1	11.2 ± 0.0	NA
Contopus cooperi	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S3B	1.0 ± 0.0	Probable
Charadrius melodus	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B	12.7 ± 7.0	Obs
Calidris canutus rufa	Red Knot rufa ssp	Endangered	NA	Endangered	S2M	15.9 ± 0.0	Not obs
Euphagus carolinus	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	3.5 ± 7.0	Confirm
Asio flammeus	Short-eared Owl	Special Concern	Special Concern	NA	S1S2B	7.8 ± 7.0	Obs
Chelydra serpentina	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	15.6 ± 0.0	NA
Glyptemys insculpta	Wood Turtle	Threatened	Threatened	Threatened	S2	2.4 ± 5.0	NA

5.6.1 Flora

The Study Area was assessed for rare, sensitive and at-risk vegetation during the field surveys in 2017. Early spring season surveys and late season surveys were completed throughout the Study Area. Care was taken to assess for potential rare vegetation species and habitats that were identified from the ACCDC data search and which were present on the priority species list.

During field studies within the Study Area, one flora SOCI, Hop Sedge (S3) was identified twice within the Study Area (Figure 10, Appendix A). Both locations are within the ravine which WC2 drains through. The first location comprised seven reproductive individuals over a 20m by 10m area, within the southwest portion of Wetland 1 near the outflow of WC2. At the second location, two individuals in vegetative state were observed approximately 5m apart. The plants were located in the northern extent of the Study Area within a damp seepage area in proximity to WC2.

Based on data provided by the ACCDC, 3756 records of 263 vascular, 713 records of 53 nonvascular flora were identified within the 100km buffer around the Study Area. According to the ACCDC report, one flora SAR, Black Ash was observed within 20km from the Study Area.

Black Ash

Typical habitat for the Black Ash (Threatened listed on NSESA); S1S2) includes poorly drained soils and swampy woods. Potential Habitat for the Black Ash is present within the Study Area, however no Black Ash was identified within the Study Area during field surveys.

5.6.2 Herpetofauna

Herpetofauna species were inventoried within the Study Area through incidental observations by MEL biologists during surveys in 2017, especially wetland and watercourse evaluations. Of particular emphasis was the potential for Wood Turtles and their habitat to be present. Care was taken to assess for potential rare species and habitats that were identified from the ACCDC data search and which were present on the priority species list. According to ACCDC, one location sensitive species, Wood Turtle (*Glyptemys insculpta*), has been observed within 5km of the Study Area and one SAR, Snapping Turtle within 20km of the Study Area. SARA, COSEWIC and NSESA list Wood Turtles as Threatened. Habitat descriptions for each of these species is provided below. No herpetofauna species at risk or species of conservation interest were observed within the Study Area during 2017 field surveys.

Wood Turtle

Wood Turtles are listed Threatened under SARA, COSEWIC and NSESA. The species live along permanent streams but may roam, during summer, overland and can be found in a variety of terrestrial habitat. Wood Turtle nest on sand or gravel-sand beaches and banks. This species prefers clear rivers, streams or creeks with moderate current and sandy or gravelly substrate. They overwinter in numerous

microhabitat types, which include burrowing in mud, under overhanging bank or in the bottoms of stream pools (Environment Canada, 2016b).

No overwintering or nesting habitat for the Wood Turtle was identified within the Study Area. WC1 substrate is co-dominated by small boulders, rubble, pebbles, gravel and sand, WC2 is dominated by gravel, with pebbles and cobbles, and WC3 is dominated by sand and rubble with silt/mud, cobble and small boulders present. The potential for the Wood Turtle to nest in these watercourses are low. However, Wood Turtles could use the watercourses for passage to other habitats beyond the Study Area limits.

No opportunistic observations of Wood Turtles were documented during any wetland or watercourse surveys throughout the entirety of the Study Area.

Snapping Turtle

Snapping Turtles are listed as Vulnerable under the NSESA and Special Concern under SARA and COSEWIC. Snapping Turtles use a variety of habitats; however, the preferred habitat is slow-moving water with a soft mud bottom and dense aquatic vegetation. They overwinter in aquatic environments which will not freeze to the bottom (ECCC, 2016).

No soft muddy bottom watercourse or wetlands are located within the Study Area therefore suitable overwintering or nesting habitats for the Snapping Turtle are not present.

No opportunistic observations of Snapping Turtles were documented during any wetland or watercourse surveys throughout the entirety of the Study Area.

5.6.3 Mammals

Table 15 provides a summary of mammalian SOCI and SAR with potential to be found within the Study Area, based on habitat preference. Bat species are discussed in further detail in Section 5.4.6.

Table 15. Potential Mammalian Priority Species within Study Area

Scientific Name	Common Name	ACCDC Provincial Rank	NS Protection
Alces americanus	Mainland Moose	S1	Endangered
Pekania pennanti	Fisher	S3	-
Microtus chrotorrhinus	Rock Vole	S2	-

Mainland Moose

Mainland Moose (*Alces americanus*) are the only mammalian SAR that may potentially be located within the Study Area. The Mainland Moose is listed as Endangered under the NSESA and ranked as S1

by the ACCDC. According to the ACCDC report, Mainland Moose have been recorded within a 20km radius from the Study Area. The habitat requirements for Mainland Moose are mixed wood habitats, where its food source, twigs, stems and foliage of young deciduous trees and shrubs are abundant. In mainland Nova Scotia, it is estimated less than 1,000 Mainland Moose individuals are present (MTRI, 2015).
No observations of Mainland Moose were recorded during dedicated surveys or incidentally during field assessments.

Fisher
The Fisher is ranked as S3 by the ACCDC in Nova Scotia. No reports of any Fisher were observed within 100 km of the Study Area, according to ACCDC. Fishers inhabit mixed forests with dense tree cover and hollow trees to den in. They do not like large open areas, including clear-cut (Sabean, 1989). The Study Area habitat contains large open areas including clear-cuts and existing quarries, the preferred habitat for the Fisher are not present within the Study Area. No observation of this species was documented during field surveys.

Rock Vole
The ACCDC ranks the Rock Vole as S2 in Nova Scotia. Habitat for Rock Voles include rocks or talus slopes, they occur in mossy areas near flowing water in coniferous forest, spruce clear-cuts (mainly recent cuts), grassy balds near forest and sterile-looking rocky road fills (Lansing, 2005). The habitat preferences for the Rock Vole are present within the Study Area, however there were no observations of this species within the Study Area during field surveys in 2017.

5.6.4 Avian

Sixteen (16) avian priority species, five SAR and eleven SOCI (see Table 16) were identified within or surrounding the Study Area during the field surveys. Additionally, the following SOCI were observed incidentally during other field surveys, including during spring wildlife and habitat surveys; one Killdeer, 11 Ruby-crowned Kinglet, one Red-breasted Nuthatch and one American Kestrel. All of the below priority species were observed within the Study Area.

Table 16. SAR and SOCI observed during dedicated survey periods

Common Name	Scientific Name	SARA	COSEWIC	NSESA	ACCDC S-Rank
Bobolink	*Dolichonyx oryzivorus*	T	T	V	S3S4B
Canada Warbler	*Cardellina canadensis*	T	T	E	S3B
Chimney Swift	*Chaetura pelagica*	T	T	E	S2B, S1M
Eastern Wood-Peewee	*Contopus virens*	SC	SC	V	S3S4B
Evening Grosbeak	*Coccothraustes vespertinus*		SC	V	S3S4B, S3N
America Kestrel	*Falco sparverius*				S3B
Bay-breasted Warbler	*Setophaga castanea*				S3S4B
Blackpoll Warbler	*Setophaga striata*				S3S4B

Common Name	Scientific Name	SARA	COSEWIC	NSESA	ACCDC S-Rank
Boreal Chickadee	*Poecile hudsonica*	-	-	-	S3
Killdeer	*Charadrius vociferus*				S3B
Pine Siskin	*Spinus pinus*				S2S3
Red-breasted Nuthatch	*Sitta canadensis*				S3
Rose-breasted Grosbeak	*Pheucticus ludovicianus*		SC	V	S3S4B, S3N
Ruby-crowned Kinglet	*Regulus calendula*	-	-	-	S3S4B
Swainson's Thrush	*Catharus ustulatus*	-	-	-	S3S4B
Yellow-bellied Flycatcher	*Empidonax flaviventris*	-	-	-	S3S4B

The potential for these species to be impacted by this Project is evaluated below. Potential effects of the Project on these species, as well as proposed mitigation measures, are discussed in more detail in Section 9.2.5.

Bobolink

Two Bobolinks were observed, one during spring migration surveys at PC7 and the other was observed during breeding bird surveys at PC4 (Figure 10, Appendix A). Possible breeding evidence was observed during the breeding bird survey. The preferred habitat for the Bobolink is open areas, including large fields with grasses and broad-leaved plants. Bobolinks build their nest on the ground at the base of large non-woody plants like clover species or meadow-rue species (Cornell University, 2015). Potential suitable habitat and nesting habitat is found in the grassy meadows in the northeastern extent of the Study Area.

Canada Warbler

One Canada Warbler was observed incidentally at PC4 (Figure 10, Appendix A) during spring migration surveys. Breeding habitat for the Canada Warbler consists of a variety of habitat, but commonly comprises of moist forests with a dense deciduous shrub layer. Nests are built on or near the ground on raised hummocks, within root masses, rotting tree stumps, clumps of grass and rock cavities (Environment Canada. 2016a). Potential low-quality breeding habitat is present within Wetland 1 due to the presence of a viable shrub layer comprising willow species. Wetland 1 will be avoided by future quarrying activities.

Chimney Swift

Two Chimney Swifts were observed during breeding bird surveys at PC4 (Figure 10, Appendix A). Possible breeding evidence was observed during the breeding bird survey. They build their nests in dark places, away from predators and inclement weather, historically in large hollow trees or rock crevasses, more recently they nest in stone or brick chimneys (COSEWIC, 2007). No quality breeding habitat is present within the Study Area, due to the lack of nesting areas (i.e. brick or stone chimneys) within the Study Area.

Eastern Wood-Pewee

Two Eastern Wood-Pewees were observed incidentally during breeding bird surveys. Breeding habitat for the Eastern Wood-Pewee include mature and intermediate-age deciduous and mixed forests, with an open understory. They are often associated with edge habitats and forest clearings (COSEWIC, 2012). Potential suitable nesting habitat is found at various locations within the northern extent of the Study Area.

Evening Grosbeak

Ten Evening Grosbeaks were observed during spring migration surveys at PC1 and PC2 and four of the ten were observed incidentally during spring migration (Figure 10, Appendix A). Breeding habitat consists of open, mature mixed wood forest, where fir species or White Spruce are dominant (COSEWIC, 2016a). Low-quality breeding habitat is present within the Study Area, due to the high amount of timber-harvesting.

American Kestrel

Two American Kestrels were observed, one during breeding bird surveys at PC4 and one incidentally during fall migration surveys. Possible breeding evidence was observed during the breeding bird survey. American Kestrels nest in cavities, including old woodpecker holes, natural tree hollows, rock crevices and nooks in buildings and other human-built structures. They prefer open areas with short vegetation and sparse trees, including meadows and grasslands (Cornell University, 2015). Potential breeding habitat for the American Kestrel is present throughout the northern extent of the Study Area.

Bay-breasted Warbler

One Bay-breasted Warbler was observed at PC2 (Figure 10, Appendix A) during fall migration surveys. They breed in boreal forest dominated by spruce and fir species as well as regenerating areas. They nest in dense spruce trees (Cornell University, 2015). Potential breeding habitat is present within the Study Area, specifically regenerating spruce stands in northern portions of the Study Area.

Blackpoll Warbler

Thirty-five Blackpoll Warblers, 33 observed during fall migration surveys (PC1, PC2, PC3, and incidentally) and two during spring migration surveys (PC8 and incidentally). Blackpoll Warblers build their nests in spruce or fir trees within conifer dominant forests (Cornell University, 2015). Potential breeding habitat for the Blackpoll Warbler is scattered throughout the Study Area.

Boreal Chickadee

Two Boreal Chickadees were observed during the fall migration surveys at PC2 (Figure 10, Appendix A). The Boreal Chickadee nests in tree cavities within conifer dominated forests and in mixed forest (Audubon, 2017). Potential breeding habitat is scattered throughout the Study Area.

Killdeer

Six Killdeer were observed incidentally during spring migration surveys and breeding bird surveys. Killdeer nest on the ground in open habitats, with little to no vegetation or gravelled areas. They prefer open habitats, including sandbars, mudflats, and open fields (Cornell University, 2015). Their preferred habitat is present within the Study Area, including gravel provided by the quarries and the open habitat types in the northeastern extent.

Pine Siskin

Five Pine Siskins were observed during the fall migration surveys at PC5 and incidentally. Preferred habitat for the Pine Siskin consists of coniferous or mixed wood forest with open canopies. They nest within conifer trees (Cornell University, 2015). Potential breeding habitat is scattered throughout the Study Area.

Red-breasted Nuthatch

Thirty-eight Red-breasted Nuthatches were observed during spring (PC2, PC3 and incidentally) and fall migration (PC1, PC2, PC3, PC5, PC6, PC8, and incidentally) breeding bird surveys (PC1, PC2, and PC3). Possible breeding evidence was observed during the breeding bird survey. Red-breasted Nuthatches preferred habitat is mainly in coniferous forests of spruce, fir, pine, hemlock, and larch (Cornell University, 2015). Potential breeding habitat is scattered throughout the Study Area.

Rose-breasted Grosbeak

One Rose-breasted Grosbeak was observed incidentally during fall migration surveys. They breed in moist deciduous or mixed wood forests, thickets, semi-open habitats and edge habitats next to streams, ponds, wetlands, roads, or pastures (Cornell University, 2015). Potential breeding habitat for the Rose-breasted Grosbeak is provided within the northern extent of the Study Area, specifically within habitat adjacent to the three watercourses and Wetland 1.

Ruby-crowned Kinglet

Fourteen Ruby-crowned Kinglets were observed during spring (PC2, PC3, PC4, PC6, and incidentally) and fall migrations (PC3, PC6, and incidentally), and breeding bird surveys (PC3). Possible breeding evidence was observed during the breeding bird survey. Ruby-crowned Kinglets build their nests high on a conifer tree within conifer dominant or mixed wood forests. They also use isolated trees in meadows and floodplain forests (Cornell University, 2015). Potential breeding habitat is scattered throughout the Study Area.

Swainson's Thrush

Four Swainson's Thrushes were observed during spring (PC2) and fall migration (incidentally) and breeding bird surveys (PC1 and PC2). Possible breeding evidence was observed during the breeding bird survey. Swainson's Thrush nest within the understory of conifer-dominated forests, commonly in thickets

of deciduous shrubs or conifer saplings Cornell University, 2015). Potential breeding habitat for this species is provided in re-generating cutblocks within the Study Area.

Yellow-bellied Flycatcher

Two Yellow-bellied Flycatchers were observed; one during the spring migration at PC6 and one incidentally during breeding bird surveys throughout the Study Area. Yellow-bellied Flycatchers build their nest on or near the ground in moist coniferous forests, bogs, swamps, and peatlands Cornell University, 2015). Potential low-quality breeding habitat for this species is provided in the edge habitat adjacent to Wetland 1.

5.6.5 Invertebrates

Based on data provided by the ACCDC, the 100km buffer around the Study Area contains 725 records of 53 invertebrate species. During field studies within the Study Area, no invertebrate SOCI or SAR were identified.

According to the ACCDC report, four SOCI invertebrates were identified within 5km from the Study Area: Monarch (*Danaus plexippus*; NSESA Endangered, SARA Special Concern, COSEWIC Endangered), Northern Cloudywing (*Thorybes pylades*; S2S3), Aphrodite Fritillary (*Speyeria aphrodite*; S3), and Question Mark (*Polygonia interrogationis*; S3B).

Monarch

Monarch butterflies use a variety of habitats; however, they require habitats with milkweed species (Audubon, 1981). No Monarch butterflies were observed within the Study Area. No milkweed species were identified during field surveys, therefore habitat for the Monarch is not present within the Study Area.

Northern Cloudywing

Northern Cloudywing's typical habitat is open woods, edge habitats, fields, brush, roadsides, meadows and clearings (Audubon, 1981). No Northern Cloudywings were observed within the Study Area, however potential habitat is scattered throughout the Study Area.

Aphrodite Fritillary

Aphrodite Fritillary's typical habitat is woody areas, open deciduous woods or coniferous woods and occasionally meadows (Audubon, 1981). No Aphrodite Fritillarys were observed within the Study Area, potential habitat is scattered throughout the Study Area.

Polygonia interrogationis

Typical *Polygonia interrogationis* habitat consists of woodland glades, roads, openings and streamsides (Audubon, 1981). No *Polygonia interrogationis* were observed during field surveys within the Study Area, however potential habitat is scattered throughout the Study Area.

5.6.6 Fish

Based on data provided by the ACCDC, the 100km buffer around the Study Area contains 159 records of 8 fish species. According the ACCDC report, one SAR was identified, the Atlantic Salmon (Inner Bay of Fundy population) was identified approximately 26km from the Study Area. This reference is for the population of Atlantic Salmon in rivers that drain to Bay of Fundy from mainland Nova Scotia and New Brunswick, however this population would not be present within the aquatic system that drains from the Study Area. No priority fish species were identified by ACCDC to be within 5km of the Study Area. Alewife (*Alosa pseudoharengus*; S3), Brook Trout (*Salvelinus fontinalis*; S3), and Atlantic Salmon (*Salmo salar*; S1) were reported to be within 20km of the Study Area.
The Study Area is present within the East River Pictou Secondary Watershed. The East River of Pictou is an Atlantic Salmon (*Salmo salar*) river (Gaspe-Southern Gulf of St. Lawrence population; COSEWIC Special Concern; Atlantic Salmon Federation, accessed 2018). Gaspe-Southern Gulf of St. Lawrence population is found in rivers from the Sud-Ouest River in Quebec to the rivers in the northern tip of Cape Breton, Nova Scotia (COSEWIC, 2016b).

Atlantic Salmon
Atlantic Salmon spawn in fresh water, generally in the same river where they were born. Juveniles spend one to eight years in fresh water before migrating to salt water in the North Atlantic. After staying within the salt water for one to four years, adult salmon will return to fresh water to spawn. Salmon rivers or streams are generally clear and cool, with gravel, cobble and boulder river beds (DFO, 2016). WC1, WC2, and WC3 are first order streams located in the upper reaches of the Forbes Lake Tertiary Watershed. WC2 provides potential passage, feeding, and rearing habitats although only to the extent of Wetland 1. Upgradient of WL1 WC2 becomes ephemeral and was observed to lack flowing water for extended periods of time. The southern portion of WC2 is considered Type IV fish habitat. No direct impacts to potential habitat provided for Atlantic Salmon in southern portions of WC2 will occur as a result of future quarrying. WC1 and WC3 do not provide suitable habitat for salmon. No Atlantic Salmon were observed during field surveys in 2017.

Alewife
Alewife are anadromous fish however they spawn in freshwater lakes or slow-moving portions of rivers in late spring. They are found from the Gulf of St. Lawrence to North Carolina. In Atlantic Canada, Alewife are found mostly in larger rivers (DFO, 2016). No spawning habitat is present within the Study Area for the Alewife.

Brook Trout
Brook Trout require cool water habitat. Spawning sites are usually near groundwater upwelling or spring seeps and within a lake or stream with a gravel substrate. (NSDA, 2005). No spawning habitat was identified within the Study Area for Brook Trout.

No fish species of conversation interest (SOCI) or species at risk (SAR) were identified within the Study Area.

6 SOCIO-ECONOMIC CONDITIONS

The Project is located 6km southeast of Stellarton in McLellan's Brook, Pictou County, Nova Scotia. Background on the area and populations of the county and nearby centres are summarized below.

6.1 Mi'kmaq

The Project is located within the Mi'kmaq district of *Agg Piktuk* or "the explosive place"; there are several geographic locations surrounding McLellan's Brook that have Mi'kmaq names (Rand, 1875). In Pictou County, Mi'kmaq presence was largely along the coast and river valleys due to the abundance of food sources and water transportation routes (Davis MacIntyre & Associates Limited, 2017). Neither the background study nor field survey revealed evidence of significant historic or precontact land use by Mi'kmaq or European settlers within the Project area. There are six traditional land use sites within a one-km radius of the Project (KMKNO, pers. comm., 2017). The Census of Canada in 1871 showed seven Mi'kmaq individuals resided at McLellan's Mountain at that time. The nearest First Nations communities are Pictou Landing (approximately 25km), Millbrook (approximately 76km), and Paq'tnkek (approximately 80km)

6.2 Population and Demographics

McLellan's Brook is located in Pictou County, Nova Scotia.

Pictou County, the 6th most populous county in Nova Scotia, had a total census population of 45,643 in 2011, approximately 5.0 per cent of the provincial population. From 2011 to 2016, the county population declined 4.2 per cent while the population for the province as a whole increased by 0.2 per cent. Statistics on the population and demographics of Pictou County and Nova Scotia are presented in Table 17.

The largest population centre in Pictou County is the community of New Glasgow. Other population centres near the Study Area are Stellarton, Kirkmount, and Thorburn.

Table 17: Population and Demographics for Pictou County and Nova Scotia.

	Pictou County	Nova Scotia
Population in 2016	43,748	923,598
Population in 2011	45,643	921,727
2011-2016 Population Change (%)	-4.2	0.2
Total private dwellings (2016)	22,525	458,568
Total number of households (2016)	19,305	401,990
Population density per square km (2016)	15.4	17.4

	Pictou County	Nova Scotia
Land area (square km) (2016)	2,846.3	52,942.3
Median Age of the Population (2016)	48.4	45.5

The population of Pictou County has a median age of 48.4 years, nearly three years older than that of the province as a whole, which has a median age of 45.5. The population by age cohort in Pictou County is presented in Figure 1 (below).

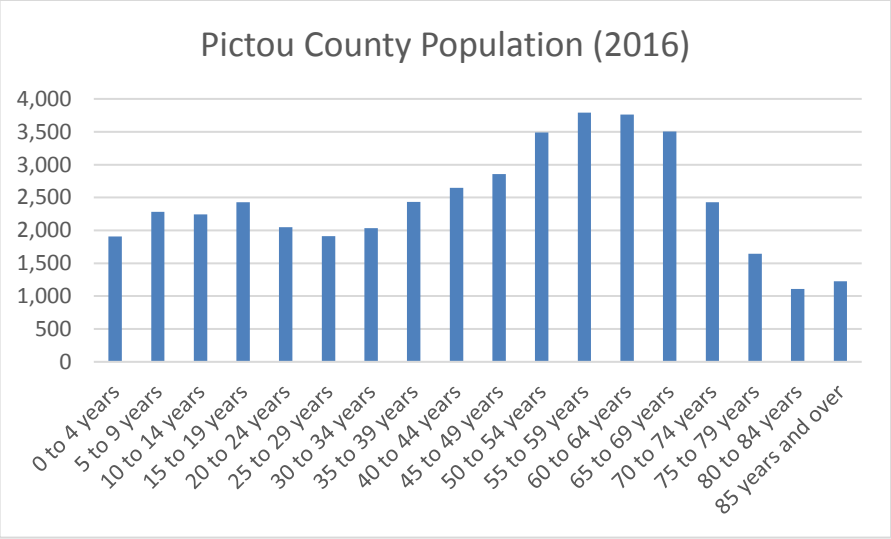

Figure 1. Population by Age Cohort, Pictou County
Source: Statistics Canada 2016 Census of Population Community Profiles

Median income in Pictou County (2015) for persons 15 years and older with income was $30,402. Employment income accounted for 61.9% of income, while 18.5% came from Government Transfers.

6.3 Economy

Historically, Pictou County has relied on resource-based industries to drive the economy; these included agriculture, mining, fisheries, and forestry. Today the economy relies heavily on retail trade and health care and social assistance, which make up 19% and 15% respectively. The labour force by industry is outlined in Table 18, below.

Table 18: Labour Force by Industry, Pictou County

Industry	Total	Percentage
Retail trade	3820	19%
Health care and social assistance	3005	15%

Industry	Total	Percentage
Manufacturing	2045	10%
Construction	1755	9%
Accommodation and food services	1395	7%
Educational services	1340	7%
Public administration	895	4%
Transportation and warehousing	845	4%
Agriculture; forestry; fishing and hunting	785	4%
Other services (except public administration)	770	4%
Administrative and support; waste management and remediation services	740	4%
Professional; scientific and technical services	575	3%
Wholesale trade	445	2%
Finance and insurance	340	2%
Arts; entertainment and recreation	310	1%
Management of companies and enterprises	295	1%
Real estate and rental and leasing	265	1%
Information and cultural industries	255	1%
Mining; quarrying; and oil and gas extraction	225	1%
Utilities	165	1%

Source: Statistics Canada 2016 National Household Survey

About 50.5% of the experienced labour force in Pictou County is male. The participation rate (*i.e.*, the percentage of working age population in the labour force) in 2016 for the county was 56.9%, slightly lower than the provincial average of 61.3%. The unemployment rate for Pictou County in 2016 was 12.5%, slightly higher than the provincial average of 10.0%.

Economic activity within 5km of the Project includes farming, construction, towing services, excavation, automobile repair shops, among others. Historical land use within the Study Area and vicinity is dominated by timber harvesting, agricultural activity with commercial activity (including an active quarry and an inactive quarry) in the southeastern extent.

6.4 Tourism

Tourism in Nova Scotia is an important and growing industry; between 2010 and 2016 it increased by 28% in the province. The Northumberland Shore, of which Pictou County is part, saw 8.3% of the province's visitors in 2016 (Tourism Nova Scotia, 2016). Tourism in summer is playing an increasingly vital role in many local economies in Nova Scotia. The Northumberland Shore is becoming known for its beaches, artist studios, hiking trails, and sea food.

The nearest tourism destination to the Project is Stellarton, which is over 6km away.

6.5 Recreation

There is a wide variety of recreational activities within Pictou County, these include fishing, hunting, hiking, ATVing, kayaking, and many others. In the McLellan's Brook area, activities mostly include ATVing and hiking. There are ATV trails within the northern extent of the Study Area, however, they are not publicly accessible trails.

The closest Provincial Park to the Study Area is Powell's Point Provincial Park located near Little Harbour, approximately 13km north of the Study Area. This Provincial Park is a large, day-use park with shoreline access, sandy beaches and a boat launch for access to the Northumberland Strait.

Cape George Lighthouse and Hiking Trails are located approximately 75km northeast of the Study Area and offers site-seeing and bird watching opportunities north of Antigonish.

Canso Islands National Historic Site is located approximately 125km southeast of the Study Area, in Canso, NS. This National Historic Site is 18th century fishing settlement and ruins of a battle-ravaged stone fortress

7 ARCHAEOLOGICAL RESOURCES

Two phases of the archaeological resource impact assessment were completed for the MacLellans Mountain Quarry Expansion Project. The first, Phase I, was a historical assessment of the potential for archaeological resources to be present within the Study Area. The second, Phase II, was the field reconnaissance program within the Study Area. The results described below are taken directly from the assessment completed by Davis McIntyre & Associates (Appendix G).

7.1 Phase I

A historic background study was conducted in August 2017. Historical maps, manuscripts and published literature were consulted at the Nova Scotia Archives. In addition, the Maritime Archaeological Resource Inventory, managed by the Nova Scotia Culture and Heritage Development Division, was consulted to determine if known archaeological resources exist near the Study Area. No archaeological sites were identified within 5km of the Study Area through this process. However, two pre-contact sites were recorded within approximately 6km from the Study Area. These sites demonstrate the significance of Pictou County as a traditional resource area for the Mi'kmaq.

The Kwilmu'ku Maw-klusuaqn Negotiation Office (KMKNO) was contacted in August 2017. Their database indicated that there are six traditional land use sites within a 1km radius of the Study Area. There is a long-standing tradition of land use in the general area and a reliance on the larger waterways

near the Study Area for transportation, hunting, gathering, and fishing. There is a low potential for encountering First Nation cultural resources within the Study Area.

7.2 Phase II

An archaeological field reconnaissance was conducted in September 2017 within the Study Area. The assessment was directed by Vanessa McKillop, Laura de Boer, Courtney Glen and Vanessa Smith of Davis MacIntyre & Associates Limited.

During the field reconnaissance, evidence of field clearing, overgrown pasture, and a stone wall were observed within the Study Area. However, these do not appear to be associated with significant archaeological features.

The 2017 report is provided in Appendix G.

8 ENGAGEMENT SUMMARY

8.1 Public Engagement

Public engagement was completed for the MacLellans Mountain Quarry Expansion Project via an information session. In addition, a Project Description letter was developed and sent to stakeholders and Mi'kmaq representatives.

One community information session was held for the MacLellans Mountain Quarry Expansion Project in April 2018.

In advance of the information session 389 flyers were distributed via Canada Post to residents within the rural route encompassing the Study Area (RR0004), which includes the communities of McLellans Brook, Kirkmount, Churchville, Coalburn, Brookville, Priestville and MacLellans Mountain (Appendix H). The flyers announced the information session date and location, a general description of the quarry location, as well as opened the line of communication directly with the S.W. Weeks Project team. If people had questions, comments or concerns about the Project, the flyer provided contact information for the local S.W. Weeks representative.

In addition to the flyers, a notice providing the same information was advertised in The News, a daily newspaper based out of New Glasgow on March 31, 2018 (Appendix H).

Project Description letters, along with an invitation to the information session were also sent to local representatives, including:

- Chief Andrea Paul, Pictou Landing First Nation;
- David Mitchell, NS Office of Aboriginal Affairs;

- Melissa Nevin, Kwilmu'kw Maw-klusuaqn (KMKNO);
- Randy Palmer, Councillor - District 10;
- Sean Fraser, MP;
- Tim Houston, MLA; and,
- Twila Gaudet, KMKNO.

On April 10, 2018, S.W. Weeks hosted the Information Session at the Thorburn Fire Hall in Thorburn (5:30-7:30 pm). This provided residents, community members and other interested parties an opportunity to view and discuss with S.W. Weeks representatives (2 in attendance) information on the Project. The Project was introduced to the community through a series of poster boards and three consultants from MEL (Andy Walter, Project Manager, Melanie MacDonald, Senior Biologist and Meghan Milloy, Vice President) were present to describe the Project, the EA process, and proposed and expected timelines of the Project.

  - Twenty one (21) people attended the Information Session (according to signatures on the sign in sheet provided at the front door);
  - Attendees were encouraged to fill out comment cards. Two comment cards were received.

The Sign in Sheet and Comment Cards are provided in Appendix H.

During the information session event, S.W. Weeks and the consultants discussed the Project with local residents and members of the public. The following concerns were relayed to the Project team regarding the Project:

- Concern was noted about the viewplane from residences located on McLellans Mountain Glencoe Road and Glen Road should the quarry be expanded into the 50 year + expansion area. The two residents that provided these concerns (see comment cards) indicated that they would like to see a green belt comprising trees left in place to hide the view of the quarry footprint in this area. Viewplane effect and mitigation is discussed further in (Table 20), Section 9.1.
- An additional concern regarding viewplane was raised by a resident located approximately 1.8km northwest of the Study Area. The concern communicated was specific to the existing face of the quarry and its potential to increase in size and become more visible from the individual's residence. The Project Team explained the rate of quarry expansion expected over a long duration, and that removal of vegetation would be limited to two years in advance of new quarrying. The resident indicated that the anticipated rate of expansion would likely not cause a considerable impact to the viewplane from his house.
- Concern was raised by one local resident regarding truck traffic. Specifically, the individual was concerned about issues experienced in the past at the intersection of Sharmack Drive and Glen Road located approximately 800m north of the Study Area. Engine braking and speed of driving

in close proximity to family dwellings and the safety of children was communicated to the Project Team. Although trucks are not owned and operated by S.W. Weeks, the Proponent has committed to reinforcing the concept of respectful and safe operation of trucks when visiting the MacLellans Mountain Quarry. As part of this commitment the Proponent will place a sign at the quarry entrance and along trucking routes to increase driver awareness to speed and safe driving practices when visiting the quarry. Truck traffic potential effects and mitigation are discussed further in (Table 20), Section 9.1.

- One resident expressed concern regarding potential effects to building foundations and their groundwater well as a result of blasting at the quarry. The Project Team advised the individual that frequency of blasting will not increase above current levels, that monitoring of blasting activity will continue to occur to ensure compliance with IA requirements, and that future blasting associated with the expansion plan would not be moving closer to their property from current blasting locations. Potential effect to groundwater and building foundations are discussed further in Sections 5.3.4 and 9.2.2.
- One resident expressed concern over groundwater quality and quantity as a result of quarrying activity in the future (notably blasting). The Project Team identified the anticipated expansion plan happens to be moving away from this individual's property. The individual noted that to date they hadn't experienced water quality or quantity issues and as such, since quarrying is anticipated to move away from the property and frequency of blasting is remaining consistent, it was agreed upon that negative impacts to water quality and quantity at the property in question was not expected. Potential effect to water quality or quantity are discussed further in Sections 5.5.3, and 9.2.2.

8.2 Mi'kmaq Engagement & Traditional Use

The Project Description letter and an invite to the April 10th, 2018 information session were submitted to the KMKNO, Pictou Landing First Nation, and the NS OAA on March 6, 2018. To date, confirmation of receipt was provided by KMKNO and OAA, however no other responses have been received and no representatives from Pictou Landing First Nation or the KNKMO were present at the open house.

8.3 Additional Engagement

Additional engagement was completed by S.W. Weeks President Stephen Weeks regarding the proposed Project. Details of the consultation is provided in Table 19 below.

Table 19: Additional Engagement

Individual	Date	Method of Engagement	Consultation Details
Gary Maher – Resident of Glen Road	March 3, 2018	Phone discussion	- Mr Maher has some questions/concerns after seeing the Community Session flyer - Concerns were related to Development Area C and its potential effect on the view plane from Mr. Maher's property. - Stephen Weeks advised Mr. Maher that Development Area C would not be quarried for at least 50 years and that for the purposes of the EA, the entire potential future expansion area was being evaluated. - Mr. Maher was content with the response and confirmed his plans to attend the Community Information Session.

Randy Palmer – District 10 Councilor Pictou County	March 9, 2018	In person meeting	- Mr. Palmer was provided the Project Description document and Stephen Weeks explained the proposed quarry expansion Project. Items discussed were:
			  - Purpose of the EA
			  - Development Plan and timelines
			  - Explanation of no planned increases in quarry production or sales.
			- Discussed upcoming Community Information Session and invitation to local residents.
			- Discussed blasting frequency (no anticipated change) and the blast monitoring currently being performed.
			- Mr. Palmer voiced his appreciation of the information and confirmed his plans to attend the Community Information Session.

Sean Fraser – Federal MP North Nova	March 13, 2018	In person meeting	- Same information discussed above was presented in addition to ground vibration and air concussion effects as a result of blasting. - Mr. Fraser was happy do discuss the Project and was very supportive of the approach.
Tim Houston – Provincial MLA – Pictou East	March 19, 2018	In person meeting	- Same information discussed above. - Mr. Houston was supportive of the approach and noted he would attend the Community Information Session if he was not travelling.

9 DISCUSSION OF IMPACTS

9.1 Valued Ecosystem Component Selection

The scope, methodology and baseline environmental conditions for the Project have been described in detail in Sections 3 through 8 in this registration document. Each potential VEC, as identified and defined in the NSE *Guide to Preparing an Environmental Assessment Registration Document for Pit and Quarry Developments in Nova Scotia*, revised September 2009, has been described and baseline environmental work has been completed to evaluate each VEC based on the site-specific conditions relating to the MacLellans Mountain Quarry.

Evaluation, based on the environmental baseline work completed for each VEC over the course of a four-season survey period, and the expertise of the various members of the EA Project Team, has been completed to determine which VEC's could have potential residual effects once planned mitigation has been completed. Potential effect and mitigation for each VEC is provided in Table 20 and VECs with potential Project interactions and potential residual effects are indicated. All VEC's which comprise potential residual effect have been carried forward (in Section 9.2) for further discussion.

Table 20. Valued Ecosystem Component (VEC) Evaluation

VEC Category	Valued Ecosystem Components (VECs)	Description of Potential Impacts	Mitigation	Residual Effects (Section 9.2)	Applicable Section of Report
Atmospheric Environment	**Noise Levels**	• Quarry related noise as a result of blasting. • Quarry related noise as a result of quarry operations.	• There are no anticipated changes to the current frequency of blasting (i.e. two to four times a year), the operating hours of the quarry or production rates; therefore, noise levels are expected to remain consistent with current conditions. • Noise levels will be monitored in accordance with NSE IA Conditions. • A Project EPP will be developed and will include site specific measures to reduce and mitigate noise levels during operations if and as required.	**No**	Description of VEC Section 5.2
	Air Quality	• Continued generation of dust during construction and operation activities. • Continued current usage of quarry equipment resulting in ongoing air emissions during construction, operation and decommissioning.	• Project-related air emissions and dust are expected to be minimal, localized in nature and expected to remain consistent with current levels produced at the MacLellans Mountain Quarry. • Quarrying production is not expected to increase from current levels therefore dust emissions are not expected to increase. • Dust emission and particulate matter will be monitored at the property boundary of the quarry at the request of NSE. • Should it be required, dust emissions will be controlled with the application of water		

VEC Category	Valued Ecosystem Components (VECs)	Description of Potential Impacts	Mitigation	Residual Effects (Section 9.2)	Applicable Section of Report
			• A Project EPP will be developed and will include site specific measures to reduce and mitigate dust levels during operations.		
Geophysical Environment	**Physiography and Topography**	• Physiography (natural forested land) within the Study Area will convert to a clear quarry area over the period of the expansion. Impacts to vegetation and habitat are discussed below. • Topography (land elevations) will be altered by quarrying. Potential impacts to surface water run-off characteristics and viewscape for surrounding lands could occur. • Viewscape from neighboring residential properties may change as quarry expands.	• The quarry footprint will avoid sensitive natural features (wetlands and watercourses as discussed below). • Expansion of the quarry is proposed over 50+ years. Therefore, changes in physiography will be very slow allowing for a period of adaptation, surface water management, progressive quarry reclamation and revegetation. • Change in view plane only likely to occur for some residences 1.8km northwest of the Study Area and houses adjacent to MMG Road should Development area C occur. Potential changes will occur over a long duration, and vegetation will be maintained between the MMGR and future quarrying areas to reduce potential impact. Progressive reclamation will reduce the potential impact.	**No**	VEC Section 5.3.1

VEC Category	Valued Ecosystem Components (VECs)	Description of Potential Impacts	Mitigation	Residual Effects (Section 9.2)	Applicable Section of Report
	Surficial and Bedrock Geology	• Disturbance of surficial soils leading to increased potential for sediment and erosion and sedimentation in waterbodies and wetlands. • Potential for Acid Rock Drainage.	Due to the potential residual effects on Surficial and Bedrock Geology once mitigation efforts are employed, this VEC has been considered for further assessment. • Detailed effects and mitigation measures are discussed in Section 9.2.1	**Yes**	Description of VEC: Section 5.3.2 and 5.3.3 Effects Assessment and Mitigation: Section 9.2.1
	Hydrogeology and Groundwater	• The closest residence is ~140m from the current quarry footprint. Approximately 71 residences are within a 1km radius from the EA Study Area boundary. All residences anticipated to have domestic drilled wells. • Potential damage from blasting activities to potable groundwater wells. • Potential interaction with groundwater via blasting or quarrying activities. • Potential interaction with adjacent wetlands and watercourses as a result of blasting.	Due to the potential residual effects on Hydrology and Groundwater once mitigation efforts are employed, this VEC has been considered for further assessment. • Detailed effects and mitigation measures are discussed in Section 9.2.2	**Yes** – potential residual effects of blasting on local groundwater.	Description of VEC Section 5.3.4 Effects Assessment and Mitigation: Section 9.2.2
	Habitat/ Vegetation	• Loss of vegetation due to clearing activities to support quarry expansion	Due to the potential residual effects on Habitat and Vegetation once mitigation efforts are employed, this VEC has been considered for further assessment.	**Yes**	Description of VEC: Section 5.4.1 and 5.4.2

VEC Category	Valued Ecosystem Components (VECs)	Description of Potential Impacts	Mitigation	Residual Effects (Section 9.2)	Applicable Section of Report
Terrestrial Environment *Note: SOCI and SAR and birds have been considered as separate VECs (below).*		• Habitat fragmentation. • Introduction of invasive species.	• Detailed effects and mitigation measures are discussed in Section 9.2.3		Effects Assessment and Mitigation: Section 9.2.3
	Herpetofauna Species and Mammals	• Sensory disturbance to fauna. • Mortality of fauna species due to clearing and construction activities.	Due to the potential residual effects on Herpatofauna and Mammals once mitigation efforts are employed, this VEC has been considered for further assessment. • Detailed effects and mitigation measures are discussed in Section 9.2.3	**Yes**	Description of VEC: Section 5.4.3 and 5.4.4 Effects Assessment and Mitigation: Section 9.2.3
	Birds (Avifauna)	• Habitat alteration. • Sensory disturbance. Potential effects are dependant on many variables such as: • Habitat present; • Migration pathways and bird community present; and • Topography	Due to the potential residual effects on birds once mitigation efforts are employed, this VEC has been considered for further assessment. • Detailed effects and mitigation measures are discussed in Section 9.2.4	**Yes**	Description of VEC: Section 5.4.5 Effects Assessment and Mitigation: Section 9.2.4
		• **MAMMALS**: Potential effects to habitat/presence of one mammal SAR (Mainland Moose) and 2 mammal SOCI (Fisher and Rock Vole) which have the potential to be found within or	Due to the potential residual effects on SOCI/SAR once mitigation efforts are employed, this VEC has been considered for further assessment.	**Yes**	Description of VEC: Section 5.6.3 Effects Assessment and

VEC Category	Valued Ecosystem Components (VECs)	Description of Potential Impacts	Mitigation	Residual Effects (Section 9.2)	Applicable Section of Report
Terrestrial Environment		immediately surrounding the Study Area.	• Detailed effects and mitigation measures are discussed in Section 9.2.5		Mitigation: Section 9.2.5
	Species of Conservation Interest (SOCI) and Species at Risk (SAR)	• **FLORA**: Potential effect to one SOCI flora (Hop Sedge), identified during baseline evaluation. • **HERPETOFAUNA**: Potential effect to overwintering Snapping Turtle (SAR) and/or Wood Turtle (SAR) which have potential to occur within the Study Area.	Due to the potential residual effects on SOCI/SAR once mitigation efforts are employed, this VEC has been considered for further assessment. Detailed effects and mitigation measures are discussed in Section 9.2.5	**Yes**	Description of VEC: Section 5.6.1 and 5.6.2 Effects Assessment and Mitigation: Section 9.2.5
		• **BATS**: No bat hibernacula were identified within the Study Area, but a known bat hibernaculum is known to be present approximately 2.2km from the Study Area.	• The 2.2km setback exceeds the 1km distance recommended to eliminate potential blasting effects to bats during hibernation periods.	**No**	Description of VEC Section 5.4.6

VEC Category	Valued Ecosystem Components (VECs)	Description of Potential Impacts	Mitigation	Residual Effects (Section 9.2)	Applicable Section of Report
	Species of Conservation Interest (SOCI) and Species at Risk (SAR)	• **BIRDS**: Five bird SAR and eleven bird SOCI were identified within the Study Area. Potential concerns for these species include: • Sensory disturbance resulting in area avoidance or behaviour changes. • Potential direct mortality during quarry expansion. • Alteration or loss of habitat/habitat fragmentation.	Due to the potential residual effects on SOCI/SAR once mitigation efforts are employed, this VEC has been considered for further assessment. • Detailed effects and mitigation measures are discussed in Section 9.2.5	**Yes**	Description of VEC: Section 5.6.4 Effects Assessment and Mitigation: Section 9.2.5
Aquatic Environment	**Watercourses/ Fish Habitat**	• Three watercourses identified in the Study Area subject to possible water quality/quantity impacts. • Potential water alteration maybe required in the future across WC2 for access road crossing into Development Area C. • Possible impacts as a result of adjacent blasting. • Potential susceptibility to sediment and erosion. • Two of three watercourses are considered to provide fish habitat.	Due to the potential residual effects on watercourses once mitigation efforts are employed, this VEC has been considered for further assessment. • Detailed effects and mitigation measures are discussed in Section 9.2.6	**Yes**	Description of VEC: Section 5.5.2 Effects Assessment and Mitigation: Section 9.2.6

VEC Category	Valued Ecosystem Components (VECs)	Description of Potential Impacts	Mitigation	Residual Effects (Section 9.2)	Applicable Section of Report
	Wetlands	• Potential indirect impacts from sediment and erosion and change in water quality from adjacent quarry operations. • The on-site wetland provides potential fish habitat.	Due to the potential residual effects on Watercourses once mitigation efforts are employed, this VEC has been considered for further assessment. • Detailed effects and mitigation measures are discussed in Section 9.3	**Yes**	Description of VEC: Section 5.5.1 Effects Assessment And Mitigation: Section 9.2.7
Socio-Economic Environment	**Land Use/Property Values**	• Potential loss of land value for adjacent properties as a result of expanding quarry. • Impacts to existing land use (human and natural) occurring within and adjacent to the Study Area.	• The proposed expansion area is bounded by undeveloped property owned by S.W. Weeks, therefore impacts to adjacent property land values is not expected. • Land within and adjacent to the Study Area is privately owned (S.W. Weeks). Therefore, public land use will be unaffected. Setbacks will be applied to wetlands and watercourses to maintain their viability.	**No**	Description of VEC Section 6.1-6.5
	Human Health	• Potential safety hazards within quarry area. • Potential air (dust) and noise (blasting and equipment) impacts as a result of active quarrying (see Atmospheric Environment above). • Potential truck traffic hazards within residential areas.	• No public access to the quarry permitted. Access is gated and locked outside of operational hours. • See Atmospheric Environment Mitigation (above). • The Proponent has committed to implementing signage within the truck routes to increase driver awareness to speed and safe driving practices when visiting the quarry.	**No**	

VEC Category	Valued Ecosystem Components (VECs)	Description of Potential Impacts	Mitigation	Residual Effects (Section 9.2)	Applicable Section of Report
Socio-Economic Environment	**Recreation**	• The Study Area is on privately owned land and does not support public recreation areas: No negative impacts expected.	• None required.		Description of VEC Section 6.1-6.5
	Tourism	• There are no tourism resources in close proximity to the Study Area: No impacts expected.	• None required.		
	Local Economy	• The Project will continue to support the local economy and local jobs within Pictou County. • S.W. Weeks will employ, whenever possible, local contractors to complete Project tasks.	• None required.		
	Mi'kmaq	• No evidence of significant historic or precontact land use by Mi'kmaq or European settlers within the Project area (Davis & MacIntyre, 2018) • No concerns received by KMKNO, OAA or Pictou Landing First Nation regarding the proposed Project.	• None required.	No	Description of VEC Section 6.1-6.5 and 8.2

As indicated in Table 20, the following seven VECs have been carried forward to the detailed effects assessment:

- Surficial and bedrock geology;
- Groundwater;
- Terrestrial Environment (Fauna/Flora);
- Terrestrial Environment (Birds);
- SOCI/SAR;
- Wetlands; and,
- Watercourses and fish habitat.

9.2 Effects Assessment

Effects assessment involves the following steps:

1. Identification of potential Project interactions on selected VEC;
2. Identification of potential effects;
3. Description of recommended mitigation;
4. Identification of expected residual effects (post mitigation);
5. Evaluation of significance of residual effects; and,
6. Description of recommended follow up and monitoring.

Project interactions and potential effects for each identified VEC are discussed and evaluated in the following sections to determine specific mitigation requirements, expected significance of residual effects, and any monitoring and follow up requirements.

9.2.1 Surficial and Bedrock Geology

Table 21 provides a summary of the potential Project interactions and environmental effects resulting from the Project-VEC interactions with soils, sediment and bedrock. The table is divided according to each of the Project phases assessed (Construction, Operation and Maintenance, Decommissioning as well as Accidents, Malfunctions, and Unplanned Events). Potential effects have been divided into siltation (as a result of unstable soils lacking vegetation and subsequent erosion and sedimentation issues), and potential for ARD resulting from disturbances to bedrock. The discussion following the table provides an analysis of key Project-VEC interactions.

Table 21: Project- VEC Interactions by Project Phase on Surficial and Bedrock Geology

	Potential Project Interactions and Environmental Effect	
	Acid Rock Drainage	**Siltation to Surface Waters/Wetlands**
Construction		
Site preparation/clearing		X
Grubbing		X
Watercourse Alteration		X
Removal of overburden	X	X
Waste management		
Expansion of storage areas for grubbings and overburden soils	X	X
Operation and Maintenance		
Rock Blasting	X	
Rock Transfer		
Sorting and Crushing	X	X
Management of surface water	X	X
Environmental Monitoring of Surface Water Discharges		X
Trucking/Transport of product		
Decommissioning		
Re-grading of rock face	X	X
Reclamation/re-vegetation		X
Accidents, Malfunctions and Unplanned Events		
Erosion and sediment control failure	X	X
Fuel spill from machinery/trucks		X
Fire	X	X

The majority of potential interaction with soil and sediment will occur during periods when soils are exposed. These instances will occur when clearing and grubbing for site preparation to remove vegetation and overburden soils for access to rock for quarry activities, when active quarrying is occurring, and when surface soils are being relocated (within the quarry as stockpiled material, or to quarry customers). Interactions with bedrock is more likely throughout the operational phase of the Project during quarrying activities (blasting, crushing etc).

Some bedrock contains minerals that can generate ARD. Typically, in Nova Scotia, ARD occurs when pyrite and other sulphide minerals are exposed to water and oxygen and react in a chemical oxidation process that releases sulphuric acid and dissolved metals into watercourses downstream (The Province of Nova Scotia, 2017). Blasting activities and general displacement of bedrock at a quarry operation increases the likelihood of ARD occurring. However, as discussed in Section 5.3.3, bedrock within the MacLellans Mountain Quarry has low potential to comprise acid producing rock, and there has been no evidence of ARD noted during historical quarrying activities within the quarry.

9.2.1.1 Mitigation

S.W. Weeks will limit sediment and erosion from occurring through management practices and planning. Topsoil and overburden piles that have been stripped prior to blasting will be stored onsite for subsequent use during reclamation. These topsoil and overburden piles will be hydro-seeded wherever possible to reduce the potential for erosion and sedimentation. Clearing and grubbing to support quarry expansion will be completed as necessary and will be limited to maximum area of 2 years quarry development at a time to minimize exposed soil and potential for erosion.

Monitoring of surface water discharge leaving the property boundaries and prior to discharge into a watercourse or wetland will be completed as per NSE IA requirements.

The above methods will be outlined in detail within a Project EPP which will be developed and will include mitigation to reduce potential effects. The EPP will provide a comprehensive review of measures to protect the environment including current environmental controls (i.e. settling pond, surface stabilization) that will be maintained and expanded as necessary to meet NSE IA requirements.

The likelihood of ARD occurring on site is considered low as bedrock on site is not acid slates and the material has low likelihood to be net acid consuming. In addition, during construction and operations (active quarrying), regular testing of rock will be conducted for acid generating potential at a rate to be determined by NSE.

The expansion of the quarry, and associated increase in exposed surfaces across the development area will occur over a long period of time (i.e. Max 32.8 hectares over 50 years +). Therefore, instantaneous changes to current conditions are not expected and measures to protect the receiving environment from potential effects will be planned in advance of interactions occurring. As such, there are no expected significant residual environmental effects on soil, sediment and bedrock resulting from the proposed expansion of the Project once all appropriate mitigation and monitoring has been implemented and completed.

9.2.2 Hydrogeology and Groundwater

Table 22 provides a summary of the potential Project interactions and environmental effects resulting from the Project-VEC interactions with groundwater and surface water. The table is divided according to each of the Project phases assessed (Construction, Operation and Maintenance, Decommissioning as well as Accidents, Malfunctions, and Unplanned Events). The discussion following the table provides an analysis of key Project-VEC interactions. Interaction and potential effects to groundwater/surface water as a result of quarrying, and potable wells surrounding the Study Area has been analysed as part of the review.

Table 22. Project- VEC Interactions by Project Phase on Groundwater

Project Activities and Physical Works	Potential Project Interactions and Environmental Effect	
	Interaction with Groundwater/Surface Water	Adjacent Potable Water Resources
Construction		
Site preparation/clearing		
Grubbing		
Watercourse Alteration	X	
Removal of overburden		
Waste management		
Expansion of storage areas for grubbings and overburden soils		
Operation and Maintenance		
Rock Blasting	X	X
Rock Transfer		
Sorting and Crushing		
Management of surface water		
Environmental Monitoring of Surface Water Discharges		
Trucking/Transport of product		
Decommissioning		
Re-grading of rock face		
Reclamation/re-vegetation		
Accidents, Malfunctions and Unplanned Events		
Erosion and sediment control failure		
Fuel spill from machinery/trucks	X	X
Fire		

Groundwater impacts as a result of quarrying can be variable and depend on conditions such as underlying geological conditions, natural groundwater characteristics and the quarrying activities taking place.

Groundwater flow interference occurs in instances where quarrying interacts with groundwater or disrupts groundwater flows into the quarry area. Dewatering (pumping) is often required in these situations to facilitate the quarrying activity, and as a result lowers the water table (drawdown) and can change groundwater flow direction. This can have an impact to water yields within surrounding potable wells and/or groundwater inputs provided to natural aquatic features such as watercourses and wetlands.

Blasting associated with quarry activities also has the potential to impact groundwater quantity due to potential localized fluctuations in groundwater flow via newly created fractures and discharge points.

Quarrying has the ability to impact water quality as a result of blasting, and the physical processing of aggregate and rock. Groundwater quality effects can are possible within surrounding potable wells and the health and sustainability of local ecological systems. By nature, blasting can increase the turbidity of groundwater as a result of increase silt as a by product of the process. Turbidity is typically an effect which is seen in close proximity to blasting locations but could be evident within potable water supply wells or natural aquatic features. Ammonia nitrate used as part of the blasting process have also been identified as a potential contaminant to groundwater which has the potential to enter drinking water when in close proximity to potable wells. Processing of aggregate and rock at a quarry (notably crushing and exposure of rock to water and oxygen), can create dissolved solids and metals which can enter groundwater and surrounding potable wells and/or aquatic features.

9.2.2.1 Mitigation

The MacLellans Mountain Quarry has been in operation since 1981 and no interaction with groundwater has occurred (including seepages through exposed rock quarry face or build up of water on the quarry floor). The quarry wall exists within eastern portions of the Study Area and is initially proposed to extend further northwest at the same excavation depths. As such, the quarry face will extend into higher land, and is not anticipated to interact with groundwater in the future. Topographical elevation and landscape conditions are consistent within the remainder of the Study Area (i.e. west of WC2), and no evidence of natural shallow surface water/groundwater interactions (i.e. springs) were observed, therefore, should quarry expansion occur in Development Area C (50 years +), groundwater is also not expected to be present within quarrying areas.

The closest residential receptor assumed to comprise a potable well is located ~ 105m from the southern extent of Development Area C and 140m west of the current MacLellans Mountain Quarry footprint (Figure 3, Appendix A). An additional 70 residential properties (assumed to comprise potable drilled wells) exist within 1km of the Study Area boundary. Quarry activities have been on-going at the MacLellans Mountain Quarry location for 37 years, without any concerns raised from the closest resident (or any others). Expansion of the quarry is proposed in a northwesterly/westerly direction, away from the nearest resident, and quarrying practices are expected to remain consistent (i.e. blasting frequency), therefore impacts are not expected at this residence. As quarrying expansion progresses northeast into Development Areas A and B, the active quarry face will advance closer to residential receptors and assumed potable wells located on MacLellans Mountain Road. As can be noted on Figure 3 (Appendix A), these receptors exist approximately 515 and 560m from the edge of Development Area B boundary. It should be noted that the two NSE wells identified on Figure 3 do not accurately represent actual well locations. Similarly, should quarrying expand into Development Area C, the closest assumed potable well associated with a residential dwelling (2279 MacLellans Mountain Glencoe Road) is approximately 440m west of the Development Area C boundary (Figure 3, Appendix A). It should be noted that the one NSE well identified on Figure 3, adjacent to MacLellans Mountain Glencoe Road, does not accurately represent the actual well location. As previously discussed, properties which fall within 800m of

Development Areas A, B or C will be contacted prior to future blasting. As well, a domestic well replacement strategy will be in place as per the Project IA committing to the replacement of potable wells confirmed to be damaged by blasting occurring at the MacLellans Mountain Quarry.

The majority of surface water runoff and drainage occurring at the site seeps into the underlying fractured bedrock within the quarry area floor. A series of settling ponds are present in southern central portions of the existing quarry area which drain water beyond the Southern Study Area boundary into an unnamed watercourse to the south (Figure 5, Appendix A). Water also likely reaches adjacent waterbodies via groundwater infiltration and subsequent surface water discharge. Current environmental controls in place (i.e. rock lined drainage ditches, settling ponds and quarry boundary berms) which will be maintained and expanded as necessary to meet NSEs IA requirements. The Proponent will implement necessary measures (as determined by NSE via the IA process) to ensure water leaving the quarry is not negatively impacting off-site receptors. Baseline water quality samples were collected during in WC2 and an unnamed tributary to Stewart Brook during 2017 and 2018 as described in Section 5.5.3. Ongoing monitoring will occur as per IA requirements to ensure that quarry operations are not impacting water quality conditions within aquatic features that drain from the site, and as well to evaluate the surface waters which maybe sourced to groundwater.

Potential effects to water quality as a result of blasting will be achieved by using an emulsion compound which is insoluble in water. This will prevent contaminants such as Ammonium Nitrate Fuel Oil entering surface water bodies and groundwater during blasting activities.

S.W. Weeks are committed to implementing a blasting communication plan with local residences including a forum for open and honest information exchange related to blasting. As part of this commitment the Proponent will contact residents prior to blasting activities occurring, as well as investigating any concerns residents may have regarding water quality and quantity which may have occurred as a result of quarry operations.

Based on the proposed activity and its consistent approach with current operations, there are no expected significant residual environmental effects on groundwater resulting from the proposed expansion of the MacLellans Mountain Quarry once all appropriate mitigation and monitoring has been implemented and completed.

9.2.3 Terrestrial Environment (Habitat, Vegetation and Fauna)

Table 23 provides a summary of the potential Project interactions and environmental effects resulting from the Project-VEC interactions with habitat, flora and fauna. The table is divided according to each of the Project phases assessed (Construction, Operation and Maintenance, Decommissioning as well as Accidents, Malfunctions, and Unplanned Events). Interaction and potential effects has been divided into

direct mortality of fauna, alteration to habitat/flora and sensory disturbance. The discussion following the table provides an analysis of key Project-VEC interactions.

Table 23. Project- VEC Interactions by Project Phase on Flora and Fauna

Project Activities and Physical Works	Potential Project Interactions and Environmental Effect		
	Direct Mortality	**Habitat Alteration**	**Sensory Disturbance**
Construction			
Site preparation/clearing	X	X	X
Grubbing	X	X	X
Watercourse Alteration	X	X	X
Removal of overburden		X	X
Waste management			X
Expansion of storage areas for grubbings and overburden soils	X	X	X
Operation and Maintenance			
Rock Blasting			X
Rock Transfer			X
Sorting and Crushing			X
Management of surface water	X	X	
Environmental Monitoring of Surface Water Discharges	X	X	
Trucking/Transport of product			X
Decommissioning			
Re-grading of rock face			X
Reclamation/re-vegetation		X	X
Accidents, Malfunctions and Unplanned Events			
Erosion and sediment control failure	X	X	
Fuel spill from machinery/trucks	X	X	
Fire	X	X	X

The highest likelihood of Project interactions with flora and fauna will occur during the construction/expansion phase during clearing, grubbing, and removal of overburden. On-going interactions with fauna during operations of the quarry are possible, although unlikely, given the general expectation of avoidance of the area by fauna species who reside in close proximity to the existing quarry. Accidents such as fuel oil spills or fire could also affect fauna and flora adjacent to the quarry.

Wildlife evidence within the Study Area was low during field evaluations, likely as a result of current quarrying activity. However, wildlife habitat directly within the footprint of the expansion area will be eliminated gradually over the expansion timeframe. Expansion will be slow and incremental over 50 + years, therefore effects (sensory and mortality) are likely to minimized in western areas of the Study Area

until expansion of the quarry occurs there (50 years +). Clearing and grubbing for site preparation will remove vegetation, reducing the quantity of terrestrial habitat, and will affect the quality of already marginal habitat. The Project will result in an increase in edge area, which may act as a barrier for some animal movements, and could increase predation on birds and small mammals, but also has potential benefits related to habitat creation (edge nesting birds), and food availability (near edge and ditches).

Portions of the proposed expansion area will require little clearing due to historical tree harvesting.

Wildlife species that currently use the habitat within the direct area of the quarry expansion will be permanently displaced during the initial stages of construction. This could potentially cause direct mortality of species that are unable to relocate to alternate suitable habitat. During construction, fauna may be affected by disturbance and noise related to construction activities (*i.e.*, blasting, and forest removal). Fauna affected may temporarily move out of the range of disturbance throughout the construction period. Similar, and more intact habitat (compared to areas of recent harvesting within the Study Area) to that identified within the Project footprint is present in surrounding lands. This provides an alternate habitat resource for all wildlife during the construction phase. There were no unique habitats identified within the Study Area, and the area of wetland will be avoided. In addition, limited impact will be experienced within the historically harvested areas and old unused agricultural field (northern/northeastern portions).

Change in wildlife habitat quality includes the potential fragmentation of habitat during construction. Habitat fragmentation can adversely affect local populations of wildlife living adjacent to the Study Area. This would be a result of specific species not willing to leave their habitat which is currently provided by contiguous forest cover. As such, the species won't enter cleared areas, which results in a reduction in available habitat to a specific species. Habitat fragmentation may adversely affect local populations of fauna living adjacent to the current quarry. However, the size of this Project (expansion area 32.8ha) and the relatively undeveloped surrounding landscape suggests that the significance of this impact would be low.

Wildlife, including birds, may be displaced from areas adjacent to the Project as a result of Construction-Operations-related noise. This potential environmental effect would be prolonged (over the lifetime of the quarry).

The most likely potential effect of the Project on flora is direct mortality resulting from construction activities. One SOCI flora (Hop Sedge (S3)) was identified within the Study Area (see Effects Assessment in Section 9.2.5). Other than that, the vegetation identified within the Study Area was determined to be locally and regionally common. Fauna species, including birds, are expected to avoid the Study Area and immediately adjacent lands during construction and operations. The most likely effect of the Project during the operational phase on fauna species is sensory disturbance from blasting, crushing activities and truck traffic.

Decommissioning of the quarry will result in a positive effect on the Project, involving the reclamation of land, regrading of the quarry face, and re-establishment of vegetation across the Study Area.

9.2.3.1 Mitigation

The Proponent is committed to the development of a Project EPP which among other commitments will specify best management practices and mitigation methods associated with vegetation removal, noise levels (sensory effects), progressive reclamation and re-vegetation of the quarry and a vegetation management plan.

In addition, the Project EPP will include methods by which the Project can take place while minimizing interactions with wildlife.

By nature of the effect (i.e. loss of 32.8 hectares of forested land), and after taking into consideration the mitigation and best management practices that will be implemented as part of the Project EPP, residual environmental effects on flora, habitat and fauna are still expected at the MacLellans Mountain Quarry. However, based on a regional context and the availability of surrounding wildlife habitat, these residual environmental effects have not been determined to be significant.

9.2.4 Terrestrial Environment (Birds)

Table 24 provides a summary of the potential environmental effects resulting from the Project-VEC interactions with birds. The table is divided according to each of the Project phases assessed (Construction, Operation and Maintenance, Decommissioning as well as Accidents, Malfunctions, and Unplanned Events). Interaction and potential effects has been divided into direct mortality of birds, alteration to habitat and sensory disturbance. The discussion following the table provides an analysis of key Project-VEC interactions.

Table 24. Project- VEC Interactions by Project Phase on Birds

Project Activities and Physical Works	Potential Project Interactions and Environmental Effect		
	Direct Mortality	**Habitat Alteration**	**Sensory Disturbance**
Construction			
Site preparation/clearing	X	X	X
Grubbing	X	X	X
Watercourse Alteration	X	X	X
Removal of overburden		X	X
Waste management			X
Expansion of storage areas for grubbings and overburden soils	X	X	X

Project Activities and Physical Works	Potential Project Interactions and Environmental Effect		
	Direct Mortality	**Habitat Alteration**	**Sensory Disturbance**
Operation and Maintenance			
Rock Blasting			X
Rock Transfer			X
Sorting and Crushing			X
Management of surface water		X	
Environmental Monitoring of Surface Water Discharges		X	
Trucking/Transport of product			X
Decommissioning			
Re-grading of rock face		X	X
Reclamation/re-vegetation		X	
Accidents, Malfunctions and Unplanned Events			
Erosion and sediment control failure	X	X	
Fuel spill from machinery/trucks	X	X	
Fire	X	X	X

The highest likelihood of Project interactions with birds will occur during the construction/expansion phase during clearing, grubbing, and removal of overburden. On-going interactions with birds during operations of the quarry are possible (especially sensory disturbance), although unlikely, given the general expectation of avoidance of the area by fauna species who reside in close proximity to the quarry. Accidents like fuel oil spills or fire could also affect birds and bird habitat adjacent to the quarry.

Bird habitat directly within the footprint of the expansion area will be eliminated albeit over a long period of time (50 years +). Clearing and grubbing for site preparation will remove vegetation, reducing the quantity and quality of terrestrial habitat for birds, and will affect the quality of already marginal habitat. The Project will result in an increase in edge area, which may increase predation on birds, but also has potential benefits related to habitat creation (edge nesting birds) and food availability (near edge and ditches).

Bird species that currently use the habitat within the direct area of the quarry expansion will be displaced during the initial stages of construction. This could potentially cause direct mortality of species if individuals are unable to relocate to alternate suitable habitat. However, as previously noted, there is large areas of other suitable nesting habitat in adjacent lands and the regional area generally. During construction, birds may be affected by disturbance and noise related to construction activities (*i.e.*, blasting, and vegetation removal). Birds are expected to temporarily move out of the range of disturbance throughout the construction period where they may use the suitable adjacent habitats. As there is no

unique habitat within the Study Area, displaced birds should be able, and are expected, to move to similar habitat patches adjacent to the Study Area.

Construction, in particular site preparation, during the breeding season for birds has the potential to cause direct mortality, abandonment of nests, the destruction of nest contents, which could include species designated as SAR or SOCI (see Section 9.2.5). If adjacent suitable habitat is not available, birds that have been displaced will not likely nest until nearby habitat becomes available, as most birds return to the same general area from year to year. This may result in a higher non-breeding population.

The environmental effects of clearing and grubbing are most severe when these activities are conducted during the period when most bird species are breeding (May to end of August). Clearing and grubbing at this time could result in the direct mortality of eggs and unfledged nestlings. The killing of birds or the destruction of their nests, eggs, or young is an offence under the *Migratory Birds Convention Act*. The construction phase (i.e. clearing, grubbing, vegetation removal) of the Project will be planned to take place outside of the nesting season for most birds (May-August) where possible. If this is not possible, pre-nest surveys will be completed to prevent disturbance to nesting birds.

Change in wildlife habitat quality includes the potential fragmentation of habitat during construction and operations (i.e. sensory disturbance from blasting, crushing activities and truck traffic). Habitat fragmentation can adversely affect local populations of birds living adjacent to the Study Area. This would be a result of specific species not willing to leave their habitat, which is currently provided by remaining contiguous forest cover. As such, the species won't enter cleared areas, which results in a reduction in available habitat to a specific species. Habitat fragmentation may adversely affect local populations of birds living adjacent to the current quarry. However, the size of this Project (expansion area 32.8 hectares) and the relatively undeveloped surrounding landscape suggests that the significance of this impact would be low.

Wildlife, including birds may be displaced from areas adjacent to the Project as a result of Construction-Operations-related noise. This potential environmental effect would be prolonged (over the lifetime of the Project).

Decommissioning of the quarry will result in a positive effect on the Project, involving the reclamation of land, regrading of the quarry face, and re-establishment of vegetation and habitat for birds across the Study Area.

Erosion and sediment control measures could fail during precipitation events and release sediment, potentially affecting wetland or stream habitat specifically used by birds. This type of effect is temporary and short-term and is highly localized to the affected area. There were no areas of wetland identified within the Study Area that provide suitable bird habitat (e.g. mudflats, shallow open water) so this effect is considered low and not significant.

Fire events during any phase of the Project could remove significant amounts of vegetation, thereby having an environmental effect on habitat for birds, and potentially result in their displacement or mortality, particularly during breeding season when the young are less mobile.

9.2.4.1 Mitigation

The Project EPP will encompass best management practices which can be applied to mitigate the effect to birds. Should site activities during active nesting periods be unavoidable, additional mitigative measures such as pre-disturbance nest searches and avoidance and setbacks from active nests will be applied. The Project is committed to use of limited lighting during construction and operations. Furthermore, there will be no general lighting at the quarry (restricted to during times when activity is occurring only).

Clearing of vegetation associated with quarrying will be limited to active areas (i.e. two years in advance of quarrying) in order to maintain intact habitat elsewhere across the unquarried portions of the site. Other methods of mitigation include monitoring of known nests within the Study Area and checks within the quarry site to identify injured or trapped birds. Large stockpiles or other areas of exposed soil will be covered or vegetated to discourage burrowing nesters during breeding season.

Residual effects are expected to birds as a result of the proposed expansion of the MacLellans Mountain Quarry. However, given the regional availability of alternate suitable habitat, the lack of critical bird habitat and taking into consideration the mitigation and monitoring discussed, effects are determined not significant.

9.2.5 Species of Conservation Interest and Species at Risk

The following SAR and SOCI (and/or their habitat) were identified within the Study Area:

- One flora SOCI (Hop Sedge)
- No herpetofauna species, although potential habitat to support non-nesting and non-overwintering Snapping Turtle and the Wood Turtle (both SAR) is present in WC2 and Wetland 1;
- No mammals, but potential habitat is present for the Mainland Moose (SAR), the Fisher and Rock Vole (both SOCI); and
- Five SAR, and 11 SOCI birds.

Potential effects to SAR and SOCI are similar to those discussed for Fauna (Section 9.2.3) and Birds (Section 9.2.4) including:

- Sensory disturbance resulting in area avoidance or behaviour changes; and,
- Alteration or loss of habitat/habitat fragmentation.

Table 25 provides a summary of the potential environmental effects resulting from the Project-VEC interactions on SOCI and SAR. The table is divided according to each of the Project phases assessed (Construction, Operation and Maintenance, Decommissioning as well as Accidents, Malfunctions, and Unplanned Events). Interaction and potential effects has been divided into alteration to habitat and sensory disturbance. The discussion following the table provides an analysis of key Project-VEC interactions.

Table 25. Project- VEC Interactions by Project Phase on potential SAR/SOCI

Project Activities and Physical Works	Potential Project Interactions and Environmental Effect	
	Habitat Alteration	**Sensory Disturbance**
Construction		
Site preparation/clearing	X	X
Grubbing	X	X
Watercourse Alteration	X	X
Removal of overburden	X	X
Waste management		
Expansion of storage areas for grubbings and overburden soils	X	X
Operation and Maintenance		
Rock Blasting		X
Rock Transfer		X
Sorting and Crushing		X
Management of surface water	X	
Environmental Monitoring of Surface Water Discharges	X	
Trucking/Transport of product		X
Decommissioning		
Re-grading of rock face	X	X
Reclamation/re-vegetation	X	
Accidents, Malfunctions and Unplanned Events		
Erosion and sediment control failure		X
Fuel spill from machinery/trucks		X
Fire		X

Potential effects to SAR/SOCI are consistent with those discussed for Fauna and Birds. The SAR and SOCI species identified during field evaluations are dominated by birds (16 total). No critical habitat for these species was identified within the Study Area, and suitable habitat is present in surrounding lands and the region in general.

The one SOCI flora identified (Hop Sedge) is designated by ACCDC as S3 and was located within the ravine that WC2 drains through. Most likely potential effects to this species include direct removal/destruction of the species, or indirect effects such as silt and sediment sourced from quarry operations.

No other critical habitat was identified within the Study Area for remaining mammalian and herpetofauna SAR and SOCI, and alternate habitat resource for these species is available during the construction and operational phase of this Project in surrounding areas.

Progressive decommissioning of the quarried areas will result in a positive effect on the habitat available for SAR/SOCI, involving the re-grading of the rock face, reclamation of land and vegetation across the Study Area, and reduction in overall habitat fragmentation associated with the Project.

Fire events, fuel losses, or erosion/sediment control failure during any phase of the Project could remove/destroy/flood significant amounts of vegetation, thereby having an environmental effect on habitat for wildlife including SAR and SOCI and potentially result in their displacement or mortality.

9.2.5.1 Mitigation

Mitigation of effects to SAR/SOCI are consistent with Fauna and Birds (Sections 9.2.3 and 9.2.4). However, the Project EPP will raise awareness of these specific SAR and SOCI to site personnel and provide recommendations for protective measures to be in place.

A setback of minimum 70m will be applied to the boundary of the active construction area from the locations of Hop Sedge (SOCI). Therefore, no direct removal or destruction of this species will occur, and the surface water management plan will ensure that all water draining from the quarry area will be directed into the site settling pond.

Given the lack of critical bird habitat, and taking into consideration the mitigation and monitoring discussed, effects to SAR and SOCI are determined not significant as a result of the proposed MacLellans Mountain Quarry expansion Project.

9.2.6 Watercourses

Table 26 provides a summary of the potential Project interactions and environmental effects resulting from the Project-VEC interactions with watercourses. The table is divided according to each of the Project phases assessed (Construction, Operation and Maintenance, Decommissioning as well as Accidents, Malfunctions, and Unplanned Events). Potential effects to watercourses have been divided into water quality and water quantity effects. The discussion following the table provides an analysis of key Project-VEC interactions.

Table 26. Project- VEC Interactions by Project Phase on Watercourses

Project Activities and Physical Works	Potential Project Interactions and Environmental Effect	
	Change in Water Quantity	Change in Water Quality
Construction		
Site preparation/clearing		X
Grubbing	X	X
Watercourse Alteration	X	X
Removal of overburden		
Waste management		
Expansion of storage areas for grubbings and overburden soils		
Operation and Maintenance		
Rock Blasting	X	
Rock Transfer		
Sorting and Crushing		
Management of surface water	X	X
Environmental Monitoring of Surface Water Discharges	X	X
Trucking/Transport of product		
Decommissioning		
Re-grading of rock face		
Reclamation/re-vegetation		
Accidents, Malfunctions and Unplanned Events		
Erosion and sediment control failure	X	X
Fuel spill from machinery/trucks	X	X
Fire	X	X

The highest likelihood of Project interactions with watercourses will occur during the construction/expansion phase during clearing, grubbing, and removal of overburden. On-going interactions with adjacent watercourse habitat surrounding the quarry during operations of the quarry are possible if surface water discharge is not well managed and erosion and sediment control measures are not well implemented, or during an accident, malfunction or unplanned event.

Through field surveys, three watercourses were identified within the Study Area (Section 5.5.2). WC1, located in the northwestern corner of the Study Area, exhibited seasonal rearing and foraging fish habitat. WC2, which drains through central portions of the Study Area in a low-lying ravine also provides fish rearing and foraging habitat, although its northern extent (above Wetland 1) was observed to lack any flow during the majority of site visits. WC3 exists a small headwater feeder stream to WC2 and also exhibits seasonal flow characteristics. No spawning habitat was identified in the on-site watercourses.

Quarry expansion is not expected to directly alter any of the watercourses present across the Study Area. However, should expansion occur within Development Area C (West of WC2) in the future, an access road will be constructed across WC2 from the existing quarry to the Development Area C expansion area. Should the bed or the banks of WC2 be altered as part of the potential access road, a provincial permit through NSE regional offices will be required. A watercourse alteration permit application will be submitted to NSE and approval granted prior to commencement of alteration to WC2. The alteration process will involve commitment to ensuring mitigation measures and best management practices are implemented in line with the regulatory approval process.

In-direct impacts to watercourses are possible during quarry expansion, especially from accidents, erosion and sediment control failure or unplanned events. Indirect effects to on-site watercourses could include siltation from quarry operations (i.e. run-off from exposed surfaces, crushing activities, and lack of vegetation), and water quality issues associated with the blasting and quarrying practices (i.e. chemical composition of water, increase in dissolved metals, acid-rock drainage etc). Water quality sampling was completed within up-stream and downstream watercourses, as described in Section 5.5.3.

9.2.6.1 Mitigation

As part of the development plan for the MacLellans Mountain Quarry, direct impact to watercourses has been avoided, and a minimum 50m setback has been incorporated between future quarrying areas and field identified watercourses. No effect to fish habitat is expected.

Monitoring of water quality discharged from the quarry area will be completed as per NSE IA requirements. In addition, management of surface water, and monitoring for siltation at discharge points from the active quarry will continue to be undertaken as part of the existing Project IA. Erosion and sediment control systems will be monitored regularly to ensure they are in working order and effectively managing site run off. A series of on-site settling ponds and rock lined drainage ditches are currently present in the quarry and surface water is engineered to drain into them. However, the majority of surface water run-off sourced from the existing quarry drains through existing fractures into the sub-grade prior to reaching the on-site settling ponds. Water drains from the settling ponds into the unnamed watercourse south of the Study Area as indicated on Figure 5, Appendix A). As the quarry expands, so too will the infrastructure required to direct water into the settling pond. However, due to the consistency of bedrock in the area, drainage of surface water into the sub-grade is still expected to occur as the quarry expands.

Should alteration to WC2 be planned for the purposes of access road construction, mitigation and best management practices in line with the provincial permitting process will be followed (i.e. maintaining fish passage and preventing adverse effect).

Although direct impact to watercourses and fish habitat from quarrying is not expected, residual environmental effects on watercourses (water quality, quantity and potential access road alteration) is

possible. However, once all appropriate mitigation and monitoring (as per Project EPP, and IA requirements) has been implemented and completed, these residual environmental effects have been determined to be not significant.

9.2.7 Wetlands

Table 27 provides a summary of the potential project interactions and environmental effects resulting from the Project-VEC interactions with wetlands. The table is divided according to each of the Project phases assessed (Construction, Operation and Maintenance, Decommissioning as well as Accidents, Malfunctions, and Unplanned Events). No wetlands are proposed to be altered as part of the MacLellans Quarry expansion Project, therefore, the table only outlines potential water quality and water quantity effects to wetlands. The discussion following the table provides an analysis of key Project-VEC interactions.

Table 27. Project- VEC Interactions by Project Phase on Wetlands

Project Activities and Physical Works	Potential Project Interactions and Environmental Effect	
	Change in Water Quantity	Change in Water Quality
Construction		
Site preparation/clearing		X
Grubbing	X	X
Watercourse Alteration	X	X
Removal of overburden		
Waste management		
Expansion of storage areas for grubbings and overburden soils		
Operation and Maintenance		
Rock Blasting	X	
Rock Transfer		
Sorting and Crushing		
Management of surface water	X	X
Environmental Monitoring of Surface Water Discharges	X	X
Trucking/Transport of product		
Decommissioning		
Re-grading of rock face		
Reclamation/re-vegetation		
Accidents, Malfunctions and Unplanned Events		
Erosion and sediment control failure	X	X
Fuel spill from machinery/trucks	X	X
Fire	X	X

Potential effects to the on-site wetland are consistent with those described for watercourses (Section 9.2.6). Direct impact to wetland habitat has been avoided, but due to its contiguity with WC2, potential for water quality and water quantity effects in Wetland 1 could occur as a result of up-gradient quarry activities. These effects include siltation, dissolved solids and metals, ARD and water quantity effects (i.e. altered flows in and out of the wetland as a result of up-gradient land alteration and water management methods). As well, wildlife utilizing the habitat provided in Wetland 1 could be affected by all Project phases as described in Sections 9.2.3, 9.2.4 and 9.2.5). In addition, accidents and malfunctions or unplanned events could affect the water quality conditions of Wetland 1 as well.

9.2.7.1 Mitigation

There is no direct alteration planned to wetlands as part of the proposed quarry expansion, and proposed quarry areas have been setback a minimum of 48m from the boundary of Wetland 1.

However, in order to ensure that in-direct effects are not occurring to Wetland 1, results of IA monitoring requirements can be used as a pre-cursor to identifying potential water quality effects within Wetland 1.

As discussed in Section 9.2.6, surface water drainage will be generally directed into the site settling pond or will drain into rock fractures in upon the quarry floor. As the quarry expands so too will the on-site water management techniques. As such, water will be directed from the quarry area towards aquatic features that would have naturally received it (i.e. wetlands or watercourses), hence reducing the potential effect of water supply being sourced to Wetland 1.

The residual environmental effects to Wetland 1 after the mitigation measures have been implemented, have been determined not significant.

10 CONCLUSIONS

S.W. Weeks Construction Ltd. (S.W. Weeks) currently owns and operates the MacLellans Mountain Quarry, operating under an NSE IA (NSE Approval #2016-097967). S.W. Weeks plans to expand the existing MacLellans Mountain Quarry, which requires a Provincial EA registration (Class I undertaking). The purpose of the proposed quarry expansion is to continue to have quarry reserves available to serve the local market.

The current quarry footprint exists within a portion of a property (PID 00888537), owned by S.W. Weeks Construction Ltd and located 2km south of McLellans Brook, NS. The current IA encompasses quarry operations within this property. The proposed expansion of the quarry will occur within the same property, and an additional property located adjacent (north). The additional property (PID 65165748), is also owned by S.W. Weeks Construction Ltd. Expansion of the quarry will take place within three Development Areas (known as Development Areas A, B and C), over a 50 + year time period. This

Project encompasses a total proposed expansion area of 32.8 hectares over the 50 + year time period. A broader 86ha Study Area was identified for the purposes of the provincial EA process.

The field data, regulatory consultation, and subsequent conclusions of this assessment indicate there are no expected significant residual environmental effects resulting from the MacLellans Mountain Quarry Expansion Project once all appropriate mitigation and monitoring has been implemented and completed. Standard construction mitigation methods will be implemented to ensure there are no significant impacts of the Project on VECs.

One wetland and three watercourses are present within the Study Area. WC1 and 2 provide fish rearing and foraging habitat (although flow of water in both features is very seasonal). WC3 is a headwater stream but observed to be dry during all site surveys and as such no viable fish access is provided within this feature. None of the watercourses provide potential spawning habitat for fish. The wetland (which is contiguous with WC2), provides potential fish access and rearing/foraging habitat, but only seasonally, and in wetter areas of the wetland which exhibit standing water. Apart from a potential access road crossing (50 + years into the quarry expansion), a minimum setback of ~50m will be applied between future quarrying areas and watercourses. A watercourse alteration permit will be obtained prior to crossing the watercourse. The current quarry footprint abuts the wetland, but future alteration of the wetland will not occur.

Species at Risk inventories within the Project Study Area revealed that no flora or fauna SAR were identified across the Study Area. One flora SOCI, Hop Sedge (S3) was identified twice within the Study Area. Both locations are within the ravine which WC2 drains through. A setback of minimum 70m will be applied to the boundary of the active construction area from the locations of Hop Sedge, therefore, no direct removal or destruction of this species will occur.

Watercourse 2 and Wetland 1 provide potential low-quality habitat (access) for Snapping Turtle and the Wood Turtle (both SAR), however limited water depths and substrate types within each feature limits the ability for them to provide suitable overwintering and nesting habitat. No Snapping Turtle or Wood Turtles were observed during field surveys.

Potential habitat is present for the Mainland Moose (SAR), the Fisher and Rock Vole (both SOCI) within the Study Area. None of the habitat present is considered critical for these species however, and additional habitat is provided within adjacent forested land, and the region in general.

As per communication with NSDNR, a bat hibernaculum exists approximately 2.2 km southwest from the southern Study Area boundary. In consultation with NSNDR and through review of other literature, it was determined that effects to bats as a result of blasting within quarries can be realised up to 1km away during hibernation periods. As such, the bat hibernaculum located 2.2km away in not considered at potential risk form blasting activities proposed during future quarry operations. No provincial government

records of AMOs were located within the Study Area and field studies completed within the Study Area confirmed no suitable bat hibernacula exists (i.e. caves, abandoned mines or wells).

Bird usage within the natural areas of the Study Area (i.e. un-quarried portion) was determined to comprise a varied array of species (59 in total), and activity levels across all seasons studied indicated a healthy population of birds utilizing on-site habitat. Survey results indicted that the highest activity for birds appeared to be during the Fall (although an additional survey was completed in Fall versus breeding and Spring, which is observed within these results). The natural portions of the Study Area comprise a good intermix of natural forested land, cleared areas, and old pasture habitat which has created edge habitat suitable for bird foraging. However, no critical habitat for any birds identified during surveys is present within the Study Area. Across all survey seasons, a total of 16 priority species were observed either during dedicated survey periods or incidentally. Of these priority birds, five species at risk (SAR) were observed, the Bobolink, Canada Warbler, Chimney Swift, Eastern Wood-Peewee and Evening Grosbeak. Based on the mitigation measures for birds discussed in this document, and that adjacent lands and the regional area in general provide similar habitat for birds, it has been determined that residual environmental effects on birds are low, post-mitigation.

Seventy-one (71) residential properties (comprising a buildings) have been identified within 1km of the Project Study Area. All residential receptors are assumed to comprise a drilled potable water well. The closest residential building is located ~140m to the west of the existing MacLellans Mountain Quarry footprint, in close proximity to the quarry access road on MMG Road. In its 37 year history, the MacLellans Mountain Quarry has never interacted with the groundwater table (no observed seepages through the exposed rock face of build up of water on the quarry floor). S.W. Weeks does not intend to work below the water table during quarry expansion. Quarry expansion is planned to move away from the closest residence, but closer to residential receptors located on MacLellans Mountain Road (east of the Study Area and within ~500m) during quarrying within Development Areas A and B. Quarrying would move within 420m of a residential receptor located to the West of MMG Road should Development Area C be worked in the future (50 years +). To date, there have been no reports of negative effect to residential properties surrounding the existing quarry, however, potential effects as a result of quarrying activity (including blasting) on groundwater, water quantity and water quality has been discussed in this document. Mitigation including a water well replacement policy for wells potentially damaged by quarry activities, commitments to monitor water quantity and quality as per the Project IA, and to investigate potential quarry related issues will be implemented.

As future blasting locations extend to within 800m of residential receptors for which permission has not previously been granted, permission will be obtained as per IA requirements.

Viewplane from local residential receptors is not expected to alter significantly as a result of the Project. Some residential receptors located ~1.8km northwest of the Study Area can see a portion of the existing quarry wall, and future expansion within Development Areas A and B will potentially increase this, albeit

over a long period of time. Vegetation will be remain in place across the Development Areas to within two years of proposed quarrying, and vegetation will also be left in place adjacent to the MMG Road to reduce visual impacts should quarrying within Development Area C occur in the future.

Increases in quarry operations and sales are not proposed as part of the expansion plan. As such, potential noise and dust levels are not expected to increase, blasting frequency and extent and truck traffic visiting the quarry is expected to remain consistent. There have been no health-related effects associated with the MacLellans Mountain Quarry to date, and as such none are expected as part of the proposed Project. No significant archaeological features were identified within the Study Area during the field reconnaissance study. Evidence of field clearing, overgrown pasture, and a stone wall were observed within the Study Area. In addition, there is no evidence of significant historic or precontact land use by Mi'kmaq or European settlers within the Study Area and no concerns were received by KMKNO, OAA or Pictou Landing First Nation regarding the proposed Project.

The magnitude of disturbance and risk associated with the Project are all considered minimal given the size of the Project and the mitigation techniques and technologies currently available. Furthermore, this assessment concludes there are no significant environmental concerns and no significant impacts expected that cannot be effectively mitigated through well established and acceptable practices, or ongoing monitoring and response. Residual environmental effects have been determined to be minimal or low for identified VECs.

11 LIMITATIONS

Constraints Analysis

- On some maps, land use or land cover is defined everywhere to form a complete mosaic of polygons. On topographic maps landuse/landcover is depicted only in certain areas. The source data in some cases may need to be conditioned to allow the second type of depiction if it is a mosaic, and certain constraints will operate differently in each case, and,
- Conflicts that might exist between objects in a database are typically of a logical nature, such as topological inconsistencies or duplicate identifiers. We attempted to ensure that our database has addressed any potential inconsistencies, however inconsistencies may still occur. In map generalization, the vast majority of conflicts are physical, spatial consequences of reducing map scale. The greater the degree of scale change, the more cluttered an un-generalized map will be, and this signals the extents of potential conflicts in presentation of the data.

Limitations incurred at the time of the assessment include:

- McCallum Environmental Ltd. has relied in good faith upon the evaluation and conclusions in all third-party assessments. MEL relies upon these representations and information provided but can make no warranty as to accuracy of information provided;

- There are a potentially infinite number of methods in which human activity can influence wildlife behaviors and populations and merely demonstrating that one factor is not operative does not negate the influence of the remainder of possible factors;
- The EA provides an inventory based on acceptable industry methodologies. A single assessment may not define the absolute status of site conditions;
- Effects of impacts separated in time and space that may affect the areas in question, have not been not been included in this assessment.

General Limitations incurred include:

- Classification and identification of soils, vegetation, wildlife, and general environmental characteristics (*i.e.*, vegetation concentrations, and wildlife usage) have been based upon commonly accepted practices in environmental consulting. Classification and identification of these factors are judgmental and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may not identify all factors;
- All reasonable assessment programs will involve an inherent risk that some conditions will not be detected and all reports summarizing such investigations will be based on assumptions of what characteristics may exist between the sample points.

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13 CERTIFICATION

This Report has considered relevant factors and influences pertinent within the scope of the assessment and has completed and provided relevant information in accordance with the methodologies described.

The undersigned has considered relevant factors and influences pertinent within the scope of the assessment and written, and combined and referenced the report accordingly.

Andy Walter
Project Manager
McCallum Environmental Ltd.