DEXTER CONSTRUCTION COMPANY LIMITED
LOCH KATRINE QUARRY EXPANSION,
LOCH KATRINE, GUYSBOROUGH COUNTY, NS

Registration Document for a Class 1 Undertaking Under Section 9 (1)
of the NS Environment Assessment Regulations

October 2016

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1.0 INTRODUCTION

Dexter Construction Company Limited (herein after referred to as "Dexter") of Bedford, Nova Scotia is proposing to expand an existing quarry located at 140 Highway # 316, Loch Katrine, Antigonish County, Nova Scotia. It is noted that the quarry access road is located in Antigonish County, whereas the quarry itself is located in Guysborough County. Property Online lists the property as being located in Antigonish County. The property the quarry is located on is owned by Mr. Lloyd MacHattie. An approval to expand the quarry is required under the Nova Scotia Environmental Assessment Regulations. The registration of this Environmental Assessment is in response to Schedule A of the Environmental Assessment Regulations, Undertaking B.2., "*A pit or quarry that is larger than 4 ha. in area for extracting building or construction stone*."

Dexter is a private Canadian company. It is incorporated under the laws of Nova Scotia and registered to do business in Nova Scotia under the Nova Scotia Corporations Registration Act. Dexter's Registry of Joint Stock Certificate is attached in **Appendix A** "Property Information." It is important to note that Municipal Enterprises Limited is the parent company of Dexter Construction Company Limited, which may be referred to throughout this document and within the supporting appendices.

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Proponent Contact:

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H2O GEO Environmental Services Inc.
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The existing quarry operates under an existing "Approval to Construct and Operate # 2003-035835-R01, as attached to a letter dated July 16, 2013, received by Mr. Gary Rudolph (Dexter Construction Limited) from Mr. Paul Keats; B. Tech (Env), Eng. Tech., CET., District Manager, Nova Scotia Environment. This letter and Approval (NSE File # 92100-30-ANT-2013-035835-R01) is also attached in **Appendix A** "Property Information".

2.0 THE UNDERTAKING

2.1 Name

Dexter proposes to expand the existing Loch Katrine quarry for the production of aggregate, primarily used in the local road and local construction industry. The proposed undertaking is located on a 113 hectare (ha) property owned by Mr. Lloyd MacHattie on which Dexter has a long term lease. The actual Environmental Assessment (EA) study area encompasses

approximately 42.5 hectares and the proposed quarry expansion area is 27.3 hectares. A survey plan showing the dimensions of the existing property, the EA study area and existing quarry is included in **Appendix A,** "Property Information".

2.2 Location

The site is located at 140 Highway # 316, Loch Katrine, Antigonish County, Nova Scotia. It is noted that the quarry access road is located in Antigonish County, whereas the quarry itself is located in Guysborough County. Property Online lists the property as being located in Antigonish County. (PID # 01245588), Nova Scotia, 1:50000 NTS 11F5, 5028160 Northing, 584,120 Easting, UTM Zone 20, NAD83, Air Photos2007 406_067 & 406_138, July 27 2007 (**Figures 1 & 2 (below) and Drawing 1, Appendix B**). The site is positioned within an un-zoned area east of Highway #316 and north of the South River Lake Road. The property that is being expanded has previously been developed as a result of quarrying and construction material processing activities.

The quarry property encompasses a total of approximately 113 hectares; however it is important to note that the EA document study area encompasses an area of approximately 42.5 hectares, and the proposed quarry expansion area is 27.3 hectares.

Figure 1 - Project location shown on NTS 1:50,000 Map 11F5.

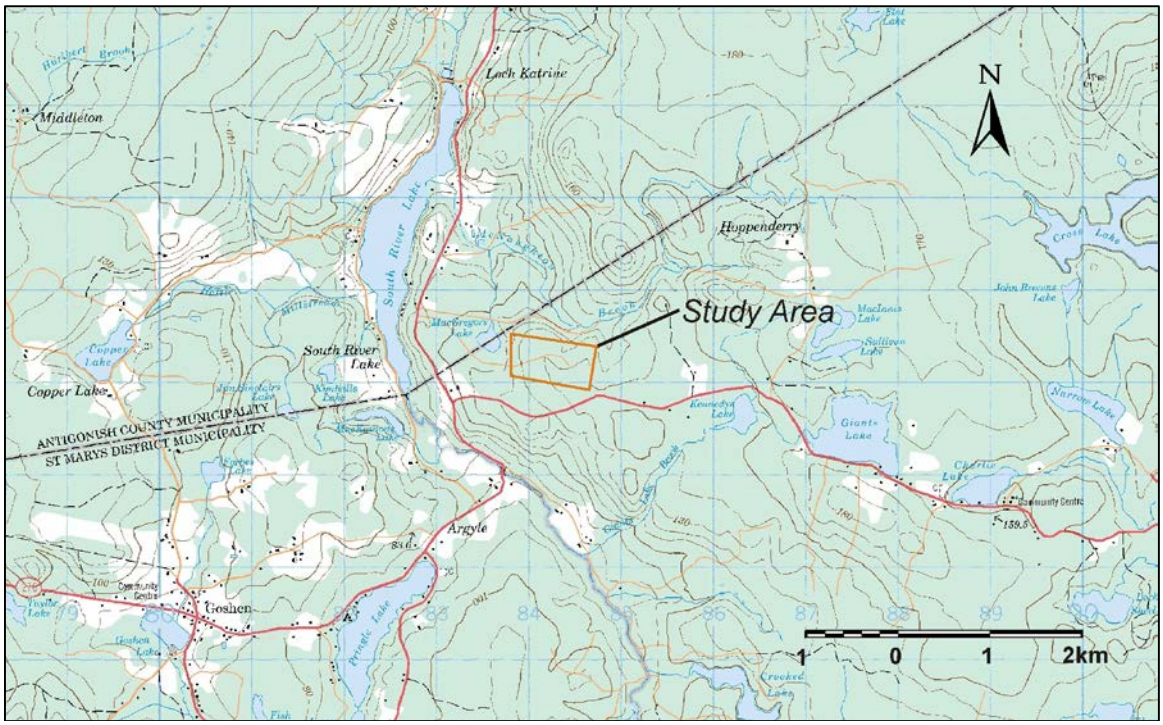
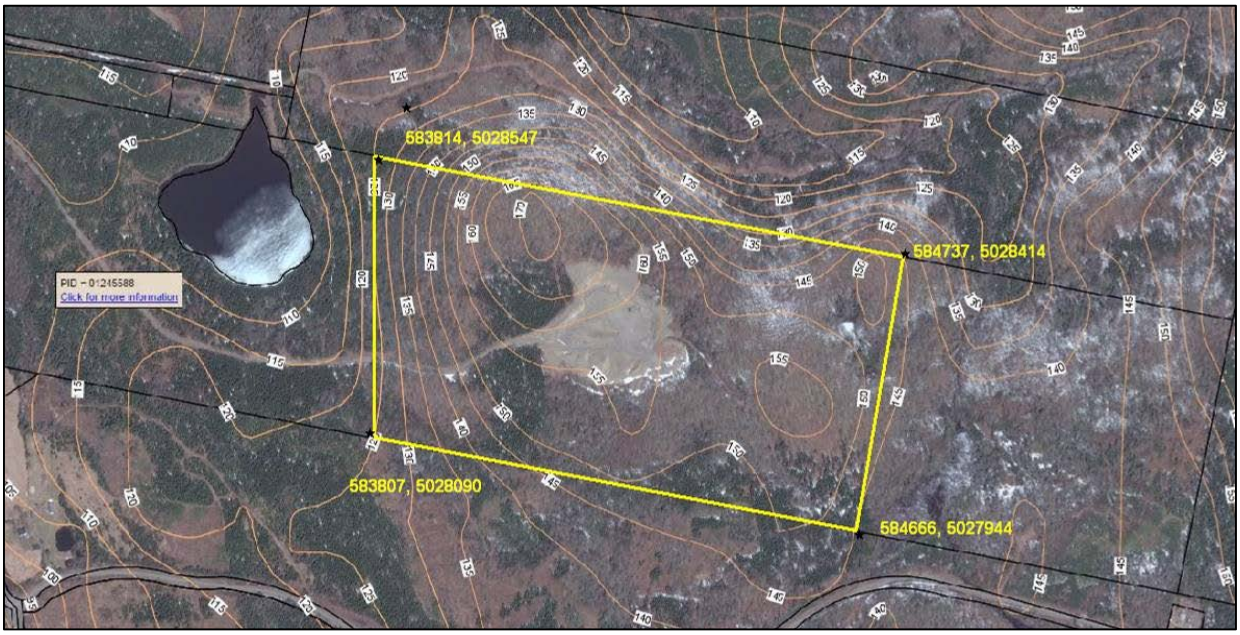


Figure 2 – Study area in relation to local site features in a 2012 air photo.



3.0 SCOPE OF THE UNDERTAKING

As noted previously, Dexter intends to expand the existing Loch Katrine quarry for the continuing purpose of extracting and supplying aggregate for the road and local construction industry. The existing quarry has been in operation since 1995 and encompasses an area of approximately 3.94 hectares. This EA covers a study area of 42.5 hectares, and a proposed expansion area of 27.3 hectares, which includes the existing operational area. The existing quarry face is between approximately 10 and 15 meters (m) in height and the disturbed area includes on-site related facilities including a scale house, sedimentation infrastructure, as well as a portable asphalt plant, crushing, and stockpiling areas. During past operations, Dexter has extracted an average of approximately 25,000 to 50,000 tonnes of aggregate per year from the quarry when active. There are no off-site projects related support facilities, other than the access road (1.5 km) to Highway # 316.

It is Dexter's intent to continue quarry operations on the property, using existing infrastructure. It is anticipated that future operations will involve the extraction of approximately 25,000 to 50,000 tonnes/year for the foreseeable future. However, the annual quantity will vary depending on local demand and associated project requirements. Site activity is expected to remain consistent with past use. The site will be operated as and when needed and be associated with success in bidding local contracts. Depending on the amount of highway work available, the quarry may be active for several months during the construction season, or may sit idle for several years.

3.1 Purpose/Need for the Undertaking

Dexter proposes to expand the existing Loch Katrine quarry for the production of aggregate, primarily used in the road and local construction industry. The primary benefit will be to the people of Nova Scotia via the continued construction and maintenance of the Provincial highway system.

3.2 Consideration of Alternatives

Dexter operates rock quarries throughout Nova Scotia and Atlantic Canada and uses modern industry standard methodologies in all phases of the extraction, processing and delivery processes. Alternative processes are always being considered in terms of their efficiency, cost effectiveness and environmental mitigation advantages. Continuing operations of the Loch Katrine quarry expansion will be assessed on an ongoing basis to ensure that the best available techniques are being utilized in all phases of day-to-day operations.

3.3 Scope of the Environmental Assessment

The scope of the environmental assessment is in keeping with the Nova Scotia Environment document entitled "Guide to Preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia" as well as Dexter's experience with respect to similar projects over the past several decades. The scope also takes into consideration that the quarry has been operational for over 20 years, and is subject to an existing Industrial Approval. The following sections of this document outline the key "Valued Environmental Components" addressed by the EA document, and presents an evaluation and summary of the benefits and potential drawbacks to the environment during all phases of the proposed undertaking.

4.0 PUBLIC INVOLVEMENT

4.1 Methods of Involvement

Dexter has engaged various public entities, as outlined below, and as the EA requirements do not include a direct public involvement program, public notification to date has focussed on notifying local officials of Dexter's intent to file an EA application to expand the existing Loch Katrine quarry. In this regard, the following persons have been briefed regarding the intent of this EA document:

Local Political Representatives

Mr. Lloyd Hines; MLA Guysborough Co.

Warden Russell Boucher; Antigonish Co.

Warden Vernon Pitts; Guysborough Co.

Ms. Shelia Pelly; Councillor, District # 2, Guysborough Co.

The above noted local political representatives have been contacted and meetings were arranged and held to enable Dexter to provide a history of the existing quarry, outline the details of the proposed quarry expansion and provide a timeline for the registration of this EA document. This included proposed dates for upcoming newspaper advertisements and indicating that the EA document is available for public review and the associated viewing locations.

First Nations Representatives

Chief Paul James Prosper, Paq'tnkek First Nation (Afton)

Mr. Roger Hunka, Native Council of Nova Scotia

Twila Gaudet, KMKNO

David Mitchell, Office of Aboriginal Affairs

Initial contact with First Nations representatives was initiated during the Archaeological studies carried out by CRM (See **Appendix E**). During this process CRM contacted the Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO) requesting any information that they may have regarding the proposed quarry expansion study area. KMKNO's ARD indicated that areas within 1 km of the study area have traditionally been used for encampment and that traditional fishing and hunting activities continues to be undertaken within 2 km of the study area.

With respect to the First Nations Community at large, Dexter has followed the Proponent's Guide: The Role of Proponents in Crown Consultation with the Mi'kmaq of Nova Scotia. In this regard Dexter has advised Chief Paul James Prosper of the Paq'tnkek First Nation of Dexter's intent to file the Registration Document for a Class 1 Undertaking Under Section 9 (1) of the NS Environmental Assessment Regulations in a letter dated August 8, 2016 (This letter is included in **Appendix F**). This letter includes all relevant information including:

- the proponents' name and representatives,
- the project location,
- the type of work to be carried out,
- any potential short and long term impacts,
- project and regulatory timelines,
- an offer to provide all relevant reports, studies and reviews, and
- an offer to meet and discuss the project.

Dexter also copied this letter to Twila Gaudet of the KMKNO, Mr. Roger Hunka of the Native Council of Nova Scotia and David Mitchell of the Office of Aboriginal Affairs. As a result of our August 8th, 2016 letter, responses were forthcoming from the Native Council of Nova Scotia and the Office of Aboriginal Affairs and follow up meetings were held with these two groups on October 17. No response was forthcoming from either the Paq'tnkek First Nation or the KMKNO, regarding our invitation to meet and discuss the contents of the draft EA document.

4.2 Public Concerns

No public concerns regarding the project have been received to date. Dexter will document any concerns and provide these to NSE.

4.3 Future Steps

The public liaison process will continue with an advertisement in the Chronicle Herald and the Antigonish Casket on November 2, 2016 announcing the registration of the EA document and identifying where in the local communities the document can be accessed and reviewed. The advertisement also includes the provision of a link to the Nova Scotia Environment (NSE) website where the document can also be viewed. A copy of the newspaper advertisement is included in **Appendix F.** Any public comments forthcoming at this stage of the process are directed to NSE and are addressed by the Department in association with the proponent.

5.0 DESCRIPTION OF THE UNDERTAKING

5.1 Existing Quarry Operations

The existing quarry operations involve blasting, crushing, stockpiling of aggregate and associated trucking on an as required basis. In addition, a permitted portable asphalt plant is occasionally situated on the property. The quarry has operated in accordance with an existing "Industrial Approval #2003-035835-R01, as attached to a letter dated July 16, 2013, received by Mr. Gary Rudolph (Dexter Construction Limited) from Mr. Paul Keats; District Manager, Nova Scotia Environment. This letter and Approval (NSE File # 92100-30-ANT-2013-035835-R01)) is also attached in **Appendix A.** The quarry also operates in accordance with the Nova Scotia Pit and Quarry Guidelines. These Guidelines apply to all pit and quarry operations in the Province and provide separation distances for operations, including blasting, liquid effluent discharge limits, suspended particulate matter limits, sound level limits and requirements for a reclamation plan and security bond. Dexter is committed to the utilization of Best Management Practices in all phases of their operations, including the on-site management of air quality, greenhouse gas emissions, noise, dust, and water quality and will operate in accordance with applicable Federal and Provincial legislation and standards.

Blasting, crushing, and trucking have occurred on an as required basis, however it is noted that blasting has occurred on an average of 1-2 times per year. Surface water management at the site involves the following: Site runoff resulting from precipitation events and spring runoff that does not permeate through the gravelled quarry floor is directed towards a constructed drainage trench established in the north corner of the site. Effort is made to direct offsite surface water around the quarry through the use of strategically placed berms and drainage ditches. Current and expected future monitoring requirements include sampling the site discharge at the request of NSE (IA Permit) for TSS and pH. The results of the surface water monitoring, and regular inspection of the drainage controls will be used to verify if/when site drainage controls need to be upgraded.

Dexter has also initiated surface water sample collection in April 2013, (which is on-going) involving grab sampling for hydrogen ion concentration (pH) and Total Suspended Solids (TSS) at the location of site discharge, the results of which are outlined in **Table 1**.

Table 1 – Loch Katrine Surface Water Sampling Results (2013-16)		
	Site Discharge	
Sampling Date	**pH (units)**	**TSS (mg/L)**
8-Aug.-11	7.58	2.0
6-Oct.-11	7.77	2.0
13-May-12	7.69	4.0
23-Aug.-12	7.98	ND
21-April-13	7.82	ND
25-July-13	7.81	ND
26-April-14	7.23	ND
20-Nov.-14	7.17	ND
4-May-15	7.33	ND
17-Nov.-15	7.62	1.6
27-March-16	7.62	ND
31-May-16	7.73	ND
Site Discharge Limits – Loch Katrine Industrial Approval #2003-035835-R01: • pH Grab Sample 5-9 units/pH Monthly Mean 6-9 units • TSS Short Term Increase 25 mg/L/Long Term Increase 5 mg/L		

In addition to the above noted data, Dexter also arranged for the collection and analysis of a rock sample for sulphur content to determine if the material was sulphide bearing. The results of this analysis yielded a sulphur concentration of 0.18% (5.57 kg H_2SO_4/tonne), which is well below the maximum (0.4% S; 12.51 kg H_2SO_4/tonne) defined by NSE as sulphide bearing material and is therefore not acid producing. The laboratory results of this sample, and an associated lab duplicate, are included in **Appendix C.**

5.2 Future Quarry Operations

Dexter proposes to expand the Loch Katrine quarry for the extraction, storage and removal of aggregate, primarily used in the road and local construction industry. This EA is focussing on current needs, but also future needs; therefore are requesting the EA approval for an expansion area of 27.3 hectares. The active footprint, including all related operational, storage and surface water control facilities, of the quarry will be located within the 27.3 hectare expansion area.

Although totally dependent on local market conditions, it is anticipated, at this time, that future development will involve the production of approximately 25,000 to 50,000 tonnes of aggregate per year, for a period of approximately 40 years. For operational purposes it is important to understand that quarry operations will generally coincide with the road construction season; therefore it would be reasonable to anticipate seasonal operations within a similar timeframe (April – December). The quarry will likely operate 24 hours per day when in operation and may operate as demand requires within the typical 32-week construction season, or as little as zero weeks per year, depending on local demand and project requirements. Dexter is committed to the utilization of Best Management Practices in all phases of their operations, including the on-site management of air quality, greenhouse gas emissions, noise, dust, and water quality and will operate in accordance with applicable Federal and Provincial legislation and standards.

Aggregate production would commence with drilling and blasting and is consistent with current operations. A qualified blasting contractor would conduct this work. The blasting contractor

would be responsible for blast designs and methods in accordance with the General Blasting Regulations contained in the Nova Scotia Occupational Health and Safety Act, 1996. Blasting would also be conducted in accordance with the Pit and Quarry Guidelines. Blasting and noise level guidelines respecting the time of day/day of the week will be followed and blast monitoring will be conducted for every blast event and submitted to NSE upon request. The existing Industrial Approval stipulates blasting control and monitoring requirements.

It is anticipated that aggregate excavation will not take place below the deep bedrock water table. A minimal amount of unconsolidated material and upper fractured bedrock water may be encountered as in previous operations, however this water, if encountered, will be directed to a surface water and sedimentation control system for treatment and controlled release.

The blasted rock will be excavated with an on-site excavator and processed by on-site portable crushing equipment. The various aggregate products will be stockpiled in designated areas within the quarry. Material, within the quarry, will be hauled and moved with a front end loader. Products will be transported from the quarry via tandem and tractor trailer trucks to location of the local project. The number of trucks hauling aggregate will be determined on a job by job basis, but currently averages approximately 2500 per year. Employment numbers are expected to remain consistent throughout the on-going operation. Drilling, blasting and trucking will require additional resources; however these activities are generally subcontracted on a job-by-job basis.

6.0 DESCRIPTION OF THE ENVIRONMENT

6.1 Human Uses of the Environment

6.1.1 Mi'kmaq

The Mi'kmaq maintain aboriginal claim to all of the landmass of Nova Scotia and the Province of Nova Scotia maintains a policy that proponents of industrial development projects consult with the Mi'kmaq concerning their activities. Dexter Construction has contacted First Nations representatives concerning the present Loch Katrine Quarry expansion project. The nearest Mi'kmaq community to Loch Katrine is Paqtnkek Mi'kmaq Nation, located 24 kilometres east of Antigonish in Antigonish County and approximately 26 kilometers from the existing quarry. The early Paqtnkek held the local bay (St Georges Bay) and its resources in high regard and value to their way of life. The Loch Katrine quarry study area was once part of a Mi'kmaq territory called Eskikewa'kik[1] that was traditionally used by the Mi'kmaq for encampment. The valley in which South River lies, and joins Antigonish and Guysborough Counties, may have been an important transportation route (Cultural Resource Management Group, 2016). Presently, no specific cultural events or traditions are documented to occur in or around the study area, although traditional fishing and hunting continues in the general area.

Two tribal councils exist in Nova Scotia: the Confederacy of Mainland Mi'kmaq (CMM) and Union of Nova Scotia Indians (UNSI), which represent the 13 Mi'kmaq bands in Nova Scotia. CMM is a not-for-profit organization incorporated in 1986 that represents seven of the Mi'kmaq communities (Bear River, Annapolis Valley, Glooscap, Millbrook, Paqtnkek, Pictou Landing, and Sipekne'katik First Nations). The UNSI, created in 1969, was formed to provide a cohesive political voice for the Mi'kmaq and represents the five communities of Cape Breton,

[1] Eskikewa'kik means, "skin dressers territory".

We'koqma'q, Wagmatcook, Membertou, Eskasoni, and Chapel Island First Nations, as well as the Acadia First Nation community. The Native Council of Nova Scotia (NCNS), a self-governing agency located in Truro, represents Mi'kmaq living off-reserve. According to Aboriginal Affairs and Northern Development Canada Indian Registry System, approximately 36% of Mi'kmaq live off-reserve (Office of Aboriginal Affairs online 2016). The goal of NCNS is "to operate and administer a strong and effective Aboriginal Peoples Representative Organization that serves, advocates and represents our community" (Native Council of Nova Scotia online 2016).

The Mi'kmaq Rights Initiative (Kwilmu'kw Maw-klusuaqn; KMK) also represents the Mi'kmaq as the negotiating body for the Assembly of Nova Scotia Mi'kmaq Chiefs, made up of the 13 Mi'kmaq Chiefs. This is the highest level of decision-making in the negotiation and consultation process in Nova Scotia The mission of the KMK—whose name means, "we are seeking consensus."— is "to address the historic and current imbalances in the relationship between Mi'kmaq and non-Mi'kmaq people in Nova Scotia and secure the basis for an improved quality of Mi'kmaq life." The KMK's objective is to negotiate between the Mi'kmaq of Nova Scotia, the province, and the Government of Canada. The KMK operates from its main office in Millbrook.

6.1.2 Population and Economy

Local economies in both Antigonish and Guysborough counties, which share a boundary immediately north of the quarry, are tied to farming and forestry, and their communities face some of the same challenges as elsewhere in rural Nova Scotia, including lack of economic growth and an aging population (Nova Scotia Open Data Portal 2016). Both Guysborough and Antigonish Counties have predominantly rural populations with low population densities—approximately 14 and two per square kilometre respectively. The population in Guysborough continues to decline, while Antigonish County shows an increasing trend over the past half-decade (Statistics Canada 2011 Census)(Nova Scotia Federation of Agriculture 2011). Agriculture is the major contributing sector to the economy overall. However, in both counties, employment in health care, education and construction are important sources of income in addition to the resource industries that include agriculture, forestry, fishing and hunting (Nova Scotia Open Data Portal 2016). A local resident indicated that most permanent residents commuted to larger centres such as Antigonish and Guysborough for work and services (C. Kennedy, 2016, personal communication). Median gross household income for Antigonish County is approximately $75,850, and $53,000 for Guysborough County—comparable and lower, respectively, than the median family income for Nova Scotia ($72,300) (Statistics Canada Online 2016; Nova Scotia Open Data Portal 2016).

6.1.3 Water Supply and Residential Wells

There are no drilled or dug wells documented in the Nova Scotia well log database occurring within one kilometre of the study site (Kennedy and Fisher 2013). However, both dug wells and water withdrawn by lakeshore residents from South River Lake are the most likely main water sources for residences in the area. The South River watershed, in which Loch Katrine Quarry is situated, is not part of a municipal water supply system. South River is the water source for Fraser's Mills Hatchery, and also likely would be used from time to time for agriculture (e.g. livestock watering, irrigation).

6.1.4 Land Use

Land in the vicinity of the quarry is predominantly rural residential but includes forestry, agricultural, commercial use (e.g. quarries) as well as home-operated businesses. Population

density is not high in the area, and most of the homes are located around lakes (e.g. South River Lake). A handful of residences are also located along Highway 316 and South River Lake Road, both of which are corridors for rural residential and commercial development and main travel routes between Antigonish and Guysborough counties. Activities and establishments along Highway 316 in the vicinity of the quarry include farms (hay, grain and livestock), a lumber mill, a fish hatchery (Fraser's Mills Hatchery), a cemetery, and industrial services business establishments (e.g. Maritime Directional Limited). The majority of the land in the vicinity is privately owned with several parcels of Crown land in the general vicinity (Appendix D, Map A-3).

6.1.5 Hunting and Trapping

The Loch Katrine study area is expected to support wildlife species characteristic of Antigonish and Guysborough Counties, and Nova Scotia in general. The study area may experience hunting or trapping activity, which takes place generally in the vicinity of the quarry, and in particular a deer-wintering area has been identified surrounding the property (M. Pulsifer, Department of Natural Resources, personal communication 2016; NS Significant Species & Habitats Database 2016). A summary of reported harvests for Black Bear, deer, upland game, and furbearer species in both counties is presented in the following Table.

Snowshoe Hare, Ruffed Grouse, muskrat and beaver are among the most trapped or hunted upland game and furbearers for both counties. Deer hunting is common for both Guysborough and Antigonish Counties; however reported deer harvests are low compared to other counties, with Guysborough ranking # 13, followed by Antigonish at # 14 out of eighteen. Black Bear harvest is also relatively low for both counties, making up less than one percent of harvests for Nova Scotia as a whole, with Antigonish County ranked # 11 and Guysborough County # 13, as outlined in Table 2.

Table 2 - Summary of combined wildlife harvested in Guysborough and Antigonish Counties, Nova Scotia.

Animal	Total Reported Harvest by County		Percentage (%) of Total Provincial Harvest		Total Reported Harvest for Nova Scotia
	Guysborough	Antigonish	Guysborough	Antigonish	
Large Mammals (2010-2015)					
Deer	2018	1400	3.5	2.4	58,119
Upland Game (2009-2015)					
Snowshoe Hare	30,833	13,753	0.1	3.2	428,682
Ruffed Grouse	26,958	8757	0.1	3.7	236,153
Ring-necked Pheasant	1038	237	0.03	0.8	30,771

Fur Harvest (2009-2015)					
Beaver	872	1,084	3.2	4.0	27,260
Muskrat	1,064	7,912	1.1	8.4	94,441
Otter	356	104	12.5	3.7	2,842
Mink	180	326	1.8	3.3	9,873
Bobcat	309	319	5.5	5.7	5,615
Fox	55	117	1.6	3.4	3,454
Racoon	140	757	0.9	5.0	15,209
Skunk	3	24	0.9	7.1	337
Squirrel	174	475	1.6	4.4	10,910
Weasel	256	596	4.7	10.9	5,487
Coyote	497	734	3.6	5.4	13,634
Lynx	1	0	1.7	0.0	60
Marten	0	1	0.0	2.2	46
Fisher	29	51	2.8	5.0	1,020
Bear Harvest (2010-2015)					
Black Bear	62	91	0.04	0.05	1,763

Source: Nova Scotia Department of Natural Resources, Wildlife Division, Harvest Statistics. http://novascotia.ca/natr/hunt/stats-index.asp; Accessed June 2016.

6.1.6 Forestry

Forestry is one of the main land uses in Antigonish and Guysborough Counties and has been, and is presently important in the Loch Katrine area. Roughly 18% of Guysborough County's workforce is in natural resources (including forestry) with between 250 and 300 full-time jobs in the forest industry. Typical activities include harvesting, trucking, road building, and silviculture. The natural resources sector is comparatively less important in Antigonish County, with a workforce participation of 7.2% (Nova Scotia Open Data Portal 2016) but the local importance (i.e. in the Loch Katrine area) is probably similar. A significant amount of Nova Scotia's forestry products are sourced from the north-eastern region of Nova Scotia, which includes Antigonish and Guysborough Counties (pulpwood ~50%; lumber ~41%; and whole tree chips ~74%). Approximately 30% of the wood received by Nova Scotia's pulp and paper mills comes from Guysborough County; over half of which is softwood, and the remainder is mixed and

hardwood. (Municipality of the District of Guysborough, Accessed Online, 2016). Approximately 67% of the land comprising Antigonish County is designated forest.

6.1.7 Recreational, Commercial and Mi'kmaq Fishing

Recreational fishing provides an important resource and pastime for residents of Guysborough and Antigonish counties. South River and South River Lake, which are less than two kilometres west of the quarry, are used for recreational fishing for the area, and Mi'kmaq individuals may use the resource as well. South River is stocked with trout, and supports Brown, Speckled and Rainbow Trout, and recreational fishing is permitted all along South River downstream of the bridge at the outlet of South River Lake. There are no commercial fisheries in the vicinity of Loch Katrine Quarry.

6.1.8 Historical, Archaeological and Paleontological Resources

Mi'kmaq originally occupied the area (2500 years ago) before the first French settlers (in the mid to late 1600's) with Europeans entering the area in the late-1700s to early 1800s. Historical use of the area by Mi'kmaq consisted of hunting for moose and other resources as well as serving as a transportation route to and from shorelines. With the exception of a screening of the site done for the quarry (Cultural Resource Management (CRM) Group Ltd. 2016), no historical/cultural studies have been done in the area, and there are no records of archaeological sites or historical structures in the vicinity of the study area (S. Weseloh-Mckeane, Coordinator, Special Places, personnel communication, 2015; CRM 2016). CRM (2016) determined, based on site reconnaissance, topography and other features of the Loch Katrine quarry site, that the study area has low potential for either Native (both pre-contact and historic) or Euro-Canadian archaeological resources. Plant fossils have been found in the area in Devonian-aged rocks of the Hoppenderry Formation located about 10 kilometres northeast of the quarry (S. Weseloh-Mckeane, Coordinator, Special Places, personnel communication, 2015).

6.1.9 Parks and Protected Areas

Local residents and visitors of the Antigonish and Guysborough Counties access lakes, rivers and forest areas within the vicinity of the quarry study site for outdoor recreation such as boating (e.g. kayaking and canoeing), camping, hiking and snowshoeing, swimming, as well as hunting and fishing (Nova Scotia Department of Environment, Online, 2016). There are wilderness or protected areas within the general area of the quarry site including: Ogden Round Lake Wilderness Area (designated); Giants Lake Wilderness Area (pending designation); South River Nature Reserve (pending designation); Lochiel Lake Provincial Park (designated); and Lochaber Provincial Park and Park Reserve (designated).

Ogden Round Lake Wilderness Area is located in Guysborough County approximately 15 kilometres east of the quarry site. The area covers 5,490 hectares and provides protection for local watersheds including portions of eight tertiary watersheds; a mixture of young and mature soft- and hardwood undisturbed forest on rich soil; and a variety of unique landforms and valuable habitat for local species in the Mulgrave Hills natural landscape. This regionally significant wilderness area provides good opportunities for recreational use such as hiking, fishing and paddling the larger lakes. Presently, on the northwest boundary of the existing wilderness area, an additional 134-hectare study area is pending designation.

Giants Lake Wilderness Area is a 3,644-hectare area currently pending designation as a protected area. The west boundary of the area is approximately three kilometres east of the Loch Katrine quarry site. The area surrounds a large area of rare old-growth tolerant hardwood forest and a former sugar bush (maple syrup) site. This area is considered important recreationally as it is frequently accessed year-round for camping, hiking, picnicking, canoeing, swimming, hunting and trapping.

The South River Nature Reserve consists of three areas located on the floodplain of South River and is pending designation as a protected area. The areas are approximately six, twelve and thirteen kilometres north of the quarry site along the west side of South River. The floodplain is a productive and rich area providing important habitat for plant and animal species of conservation concern including Black Ash, White Spruce (and intolerant hardwood), and Wood Turtle.

Approximately 12 kilometres west of the study site is a small day-use provincial park located on Lochiel Lake. Lochiel Lake Provincial Park is a recreationally valuable area used by residents and visitors for outdoor activities including nature-walks, lake access and carry-in boating, fishing, and snowshoeing. Another small day-use provincial park called Lochaber Provincial Park and Park Reserve is located on the east side of Lochaber Lake, approximately seven kilometres west of the quarry study site.

6.1.10 Recreational/Cultural Activities

Local residents and visitors of the Antigonish and Guysborough Counties access the surrounding forest, lakes and rivers within the vicinity of the quarry study site for outdoor recreation such as boating (e.g. kayaking and canoeing), camping, hiking and snowshoeing, swimming, as well as hunting and fishing (Nova Scotia Department of Environment, Online, 2016). Existing woods roads and other small side roads allow woodland access, and designated park reserves provide outdoor recreation opportunities (Appendix D, Figure 25). One local resident indicated that walking is a frequent activity (C. Kennedy, personal communication, 2016). There are no notable recreation or cultural businesses in the area, with the exception of Fraser's Mills Hatchery visitor centre, which emphasizes the importance of recreational fishing as a popular pastime for the area and in Nova Scotia.

6.1.11 Residential Use

Residences are present in an overall low density, either spread along main roads; concentrated in recreational areas such as around South River Lake; or in communities (e.g. Goshen, Argyle) having a relatively higher density of homes. One residence (a summer cottage at 154 Highway 316, PID 01280965) is located within 800 meters of the existing quarry (Appendix D, Map A-3) and an agreement to allow for blasting within 800 meters has been previously established with the owners. One other residence exists within 800 meters of the planned expansion area (437 South River Lake Road, PID 35079805) and an agreement to allow for blasting within 800 meters has been established with the home owner. In addition, other residential properties in the broader surrounding area are used for small businesses, such as MacDonald's Convenience Store (3899 Highway 316, St. Andrews). The nearest communities – Goshen, Argyle and Loch Katrine – have limited amenities, and consequently residents typically travel to Antigonish for shopping and other activities, or to St. Andrews for convenience purchases.

6.1.12 Commercial/Industrial Development

Commercial establishments in the vicinity of the study area and neighbouring areas include Fraser Mills Hatchery (3593 Highway 316, Saint Andrews), Maritime Directional Ltd (4475 Highway 316), and Scotia Pallets (21101 Highway 316). Industrial development in the area is minimal. A competing road builder operates a wayside quarry located about one kilometre north/northeast of the Loch Katrine Quarry and two unidentified sand and gravel pits are located approximately three kilometres east of the site. No other industrial developments are noted for the neighbouring area.

6.1.13 Tourism and Viewscape

Highway 316 and South River Lake Road are important—though minor—travel routes for tourists, and lake properties in the general vicinity are owned by summer residents from elsewhere in Nova Scotia or around the world. Loch Katrine Quarry is not visible from either Highway 316 or South River Lake Road, and access roads are inconspicuous. The general vicinity of the site is expected to be visited by low numbers of tourist's enroute to parks and wilderness areas, and to the Frasers Mills Fish Hatchery.

6.1.14 Transportation

Highway 316 is a connector highway that runs through Antigonish County from Upper South River, to Half Island Cove, Guysborough County. The sections of highway that include Loch Katrine Quarry have an annual average daily traffic (AADT) of between 430 and 470 vehicles (Nova Scotia Open Data Portal 2016). Traffic is expected to be generally local; however Highway 316 is promoted as a travel route for tourists to explore the interior regions of Antigonish and Guysborough Counties. When in operation, the quarry will contribute truck traffic and some heavy equipment traffic (e.g. crushers, asphalt trucks etc.) in the vicinity of the site, typically in the summer / fall construction season, consistent with previous operational traffic activity. Access to the quarry from Highway 316 is open with good sight lines and is not expected to create safety concerns. The same quarry access has been used for over 20 years with no known issues.

6.2 Biophysical Environment

The biophysical environment includes all the features of the environment either physical or biological, that are in the vicinity of the Loch Katrine Quarry, and which are potentially impacted by it. Also included are impacts that physical and biological conditions can have on the project. The Biophysical Environment is summarized in the Biophysical Environment of the Loch Katrine Quarry Expansion (Envirosphere 2016) found in **Appendix D**. The potential interactions of the project with the biophysical environment are outlined in Sections 7.0 and 8.0, which follow.

7.0 ENVIRONMENTAL IMPACTS, SIGNIFICANCE, AND MITIGATION

7.1 Assessment Approach and Methods

Information for the assessment was obtained from consultants' personal knowledge, from reviews of available information, and knowledge of the purpose and proposed design of the project. The environmental assessment follows *Guide to Preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia (*NSE September 2009) and uses assessment methodology typical for environmental assessment screenings of this kind. For this

assessment a list of valued environmental components (VECs)[2], and project activities and outcomes for the expansion of the existing quarry were developed, and the potential for interactions of these activities with VECs was identified. Where interactions were identified, and there was potential for significant impacts if mitigation was not undertaken, mitigating actions or activities have been suggested that will avoid the impact or reduce it to acceptable levels before the project proceeds. The process ensures that all potentially significant impacts on VECs are identified and all potential impacts on them have been considered, and sufficient mitigation planned.

7.2 Valued Environmental Components

The list of Valued Environmental Components considered for the assessment, and interactions with project components, are presented in Table 3. The environmental effects and potential impacts of the project along with their significance and suggested mitigations are outlined in the following and are summarized in Tables 4 & 5.

Table 3 - Valued Environmental Components (VECs) for Loch Katrine Quarry Expansion.

Biophysical	Socio-economic
Air Quality, Noise and Light	Mi'kmaq
Groundwater	Recreation, Tourism & Viewscape
Hydrology	Recreational, Commercial & Mi'kmaq Fishing
Water Quality	Archaeological, Cultural and Historical
Freshwater Aquatic Environments	Land Use and Value
Wetlands	Transportation
Fish & Fish Habitat	Residential Use
Flora & Fauna & Habitat	Commercial /Industrial Use
Species at Risk	Water Supplies & Residential Wells
Natural Areas & Wilderness	Parks & Protected Areas
	Forestry, Hunting & Trapping

[2] Valued Environmental Components (VECs) are features or things in the environment, which are important either ecologically, socially, economically or culturally. The environmental assessment addresses potential impacts of the project on each VEC identified. To do so involves identifying all the activities or outcomes of the project which interact with each VEC, and then determining and rating the magnitude of the impact in a standard way, in this case in a manner guided by standard approaches that have been developed for environmental assessments.

7.3 Impacts on Human Uses

7.3.1 Mi'kmaq

The Mi'kmaq maintain a general interest in all lands in Nova Scotia and claim they have never surrendered, ceded or sold the Aboriginal title, and that they claim all of Nova Scotia. As co-owners of the land and its resources, they expect that any potential impacts to rights and title be addressed (T. Gaudet, KMKNO, personal communication 2014). Mi'kmaq occupied much of Nova Scotia prior to European contact, and lands were used to varying degrees for habitation, hunting and fishing, as noted in Sections 6.1.1 and 6.1.8. In more recent times, treaties made with the British and continued through Canadian law have maintained their rights. The location of the quarry, which is inland in Guysborough County and bordering the Antigonish-Guysborough County line on Highway 316, would have been used for encampment and a likely transportation route as Mi'kmaq migrated between areas seasonally; however there is low potential for occurrence of archaeological resources at the site (Cultural Resource Management Group 2016).

Operation of the Loch Katrine Quarry will use land that would otherwise be occupied by terrestrial ecosystems and not likely used for Mi'kmaq activities or by other residents for activities such as nature-walks, and hunting or fishing (either recreationally or for subsistence). Best management practices shall be used to reduce any potential impacts quarry activities may have on water quality and quantity. The land area affected is small in relation to the available wildlife habitat in the area, and there are no likely cumulative effects of other activities in the area; consequently none of these effects are considered significant.

7.3.2 Recreational Activities

Recreational use and nature appreciation of the environment in the vicinity of the site consists principally of walking/hiking, camping, hunting, fishing, and general enjoyment of home-based recreation (e.g. gardening). Operations at the quarry would be cyclic, likely occupying several weeks during the construction season during the years in which the site is active, and the facilities are well maintained. Although quarry operations could likely be heard and residents would experience truck traffic and other effects of quarry operations, the frequency and scope of the quarry is not expected to increase from past use, and any impact on normal activities of residents as a result of the proposed quarry expansion are expected to be negligible.

7.3.3 Tourism and Viewscape

The quarry would have little influence on tourism and viewscape. The property is located approximately one kilometre from Highway 316, and is not currently visible from the highway or from South River Lake Road, and the access road is nondescript and similar to other minor roads in the area. Truck and equipment traffic accessing and exiting onto Highway 316 is expected to be the main interaction with tourists. This traffic is expected be occasional, will be similar now, as it was in the past and as in the future, and would likely be only a minor impediment to tourist vehicle traffic in the area. The quarry access road entrance on Highway 316 has good sightlines and is well maintained. During periods of site activity, signage is provided to alert travellers of the entrance on Highway 316. Overall the impacts on viewscape and tourism are expected to be negligible.

7.3.4 Recreational, Commercial and Mi'kmaq Fishing

Fishing by visitors and local residents, including from Mi'kmaq communities in the area, may occur from time to time in South River and South River Lake. As the Loch Katrine quarry has been in operation for many years, and the future scope of activities are not expected to change, no changes in flow regime or water quality in these waterways are expected as a result of the quarry operation. Water quality of the runoff from the quarry is likely to be good for salmonids (versus the low pH found normally in surface waters at the site), including low turbidity and neutral pH, which would lead to good quality of waters downstream for fish. Overall a negligible impact of the quarry on fishing is expected.

7.3.5 Archaeological/Cultural/Historical

The land proposed for the quarry expansion has low potential for pre-contact and/or early historic native or European archaeological resources. The area was not settled by Europeans until late in the 17th century and not intensely settled until more recently. Consequently the project is not likely to discover or disturb cultural/historical/archaeological features (**Appendix E**, Cultural Resource Management Group 2015).

7.3.6 Land Use and Value

Forestry, mixed agriculture, hunting and trapping, as well as small rural-residential properties, are the major land uses in the vicinity of the site and study area, as well as adjacent lands. The land on the site is not suitable for agriculture or subsurface mining, and aggregate production and forestry are among the only potential commercial uses of the area. The area has a low to moderate value for wind energy extraction. Areas not required for the quarry will be preserved if possible to assist in maintaining forest ecosystems for forestry production, and to buffer adjacent areas from quarry activities. Quarry activities are not expected to impact existing residential, agricultural, industrial or conservation and scientific use of nearby areas. As the quarry has been in operation for many years and the scope and frequency of activities are not expected to change from past use, residential property values in the Loch Katrine area are not expected to change significantly. The existing quarry has been operating at the site with little to no impact on the local residential and farm community, while providing economic development and a source of aggregate for local construction projects.

7.3.7 Transportation

The quarry generates a low level of truck traffic on the highways in the area, but activity levels are not expected to increase significantly, and consequently the quarry is not expected to change the existing traffic volumes significantly. Suitable signage for truck and equipment operators, as well as the surrounding communities, would help avoid dangerous situations at the intersection, particularly on South River Lake Road. Overall the impact of the project on transportation and safety is expected to be minimal.

7.3.8 Residential Use

Quarry activities can potentially interfere with normal use and enjoyment of nearby residential properties by creating background noise and through truck and equipment traffic, which some residents may find objectionable. The quarry is located approximately one kilometre from Highway 316 and is not visible from the highway. Normal traffic noise on Highway 316 would likely exceed any noise coming from the quarry for homes located nearby. Residents of homes

along Highway 316 in the vicinity of the quarry have indicated that there were no problems associated with the quarry. Activities at the quarry would be limited in time seasonally (approximately March to November) and during the day, although night-time operations, but not blasting, will be required under some circumstances. Traffic volumes from the site would be moderate, and high frequency of truck traffic would be an irregular occurrence, depending on the supply requirements for particular projects. Dust from operations is unlikely to reach residential areas. Dust generation could be moderate due to the exposed high location of the site, but measures to control dust will be implemented and the adjoining forest areas would act as a buffer between the quarry and offsite receptors. Quarry activities such as blasting, are not expected to impact residential wells, as they are located at a significant distance from the site. Most operations at the site occur during daylight hours. On rare circumstances when they are undertaken at night, activities will involve minimal additional lighting and noise, and is unlikely to be a serious disturbance to local residents. The quarry currently has entrance signage with phone numbers and contact persons should any members of the community wish to register complaints or concerns. A complaint resolution procedure is currently in place by Dexter Construction Company Limited to address complaints and concerns.

7.3.9 Commercial/Industrial Use

There are no major commercial operations in the area with the exception of Fraser's Mill Hatchery and some small businesses (e.g. Scotia Pallets). Blasting at the quarry site will not likely affect the operations of these businesses and the quarry contributes to net economic benefit in the community through supporting local trucking operations and providing access to aggregate and other quarry products.

7.3.10 Water Supplies and Residential Wells

Residents of the adjacent communities use wells or lake water for water supply. Quarry activities are not expected to impact residential wells, as they are located at a sufficient distance to avoid impacts from quarry operations, in particular occasional blasting events. A groundwater monitoring program will be established to verify if there are any changes in the water quality or quantity in the area. Groundwater recharge generated by the quarry is of high quality (low conductivity and dissolved solids and neutral in pH). Best management practices for operations will be undertaken to eliminate the potential for any contamination of aquifers at the site. There are no municipal water supplies in the area.

7.3.11 Parks and Protected Areas

The quarry site is not expected to be visible from the proposed Giants Lake Wilderness Area (approximately three kilometres distant) or from Lochiel Provincial Park, South River Nature Reserve or Lochaber Provincial Park Reserve. Occasional blasting could likely be heard from those sites, but the occurrence is brief, and distant, and not likely to be a significant concern to visitors/users of those areas.

7.3.12 Resource Use – Forestry, Hunting & Trapping

Use of the land for a quarry will remove the potential for logging the site for a long time, at least until after the quarry is closed and rehabilitated in future; however the area occupied by the quarry is relatively small in relation to the available forest resources in the area, and the overall impact on economic return from logging in the area is expected to be small. The quarry will

occupy a relatively small area of habitat for furbearing and game species, and will not have a significant impact on hunting and trapping in the Loch Katrine area.

7.4 Biophysical Impacts – Impacts of the Project on the Environment

7.4.1 Air Quality, Noise and Light

Quarry activities are not expected to change from the previous scope of operations; however various project activities have the potential to generate dust, combustion emissions, noise, and light. In particular, operation of heavy equipment (e.g. earth movers, crushers), rock drilling and blasting, operation of an asphalt plant, as well as onsite routine operations contribute to increased dust and particulate levels. Noise levels can impact human use and enjoyment of the environment. Dust emissions during the construction phase will be localized and short term, and are expected to be minimal from routine operations. Dust management will be undertaken, including use of water spray and covering working and lay down areas with blasted rock. Monitoring of airborne particulate emissions will be conducted at the request of NSE and in accordance with the Pit and Quarry Guidelines and the Nova Scotia Air Quality Regulations. An environmental protection plan is in place for current quarry operations and will continue during all phases of future operations.

Exhaust emissions will be generated from the operation of vehicles and equipment. An asphalt plant may generate air-borne odours that can be detected at a distance from the site; however prevailing winds are generally from the southwest to northwest and the general direction of travel of such emissions would be into unpopulated areas. Given the scope of the planned operations, these emissions will be minimal (i.e. restricted to several pieces of heavy equipment, earth movers, trucks etc. as well as operation of crushers and asphalt plant), and will be localized and similar in type and amount to those produced during previous operations. Ambient air quality monitoring will be conducted at the request of NSE.

Noise levels from the expanded quarry are expected to be similar to those already produced at the site, since the operations are expected to be similar in size at a given time, and the company will ensure that they do not exceed those specified in the Nova Scotia Pit and Quarry Guidelines. Blasting is expected to occur infrequently (1-2 times per year).

Light during night time operations particularly during times of low-hanging cloud and fog, and can attract migrating birds travelling overland towards the Eastern Shore of Nova Scotia. Measures can be taken to ensure use of directional lighting, which minimizes emanation of light upward and laterally over the horizon.

7.4.2 Groundwater

Activities associated with the project including forest clearing, grubbing and removal of overburden, and blasting, influence groundwater flow locally in the vicinity of the quarry, but are not expected to influence groundwater aquifers elsewhere on the property, or in adjacent areas. The amount of recharge area involved in project activities is extremely small in relation to the overall size of the aquifers in the Loch Katrine area; and for the same reason, the effect on overall groundwater flow patterns will be small. The overall impact on hydrogeology at the site is therefore expected to be negligible.

7.4.3 Hydrology

Expansion of the quarry will result in an artificial and managed regime of surface water movement and runoff at the site, mainly near the quarry and entering the watershed of McNaughton's Brook north of the site. Runoff from the quarry will be managed to ensure that it meets acceptable environmental standards. Exposed surfaces on the quarry and on access roads lead to more sudden, 'flashy' runoff patterns during rainfall events. A berm at the foot of the slope on the north side has been in place for some time to reduce the impact of sudden runoff from the quarry. The flow management system in place appears to be adequate to manage the flow in a natural way and minimize damage to the local landscape.

7.4.4 Water Quality

Water quality downstream of the site is important for fish habitat in the lower watersheds, which includes MacNaughton's Brook and South River. Quality of water leaving the site and entering surface or groundwater is high, due both to the onsite flow management and the low-contaminant characteristics of the bedrock, which is mainly conglomerate, metamorphic rocks, and basalt. Quarry rock is within acceptable limits for sulphur and acid-generating potential. Blasting is not expected to result in groundwater quality changes, particularly with efforts to reduce releases of other chemicals such as nitrates used in blasting. Forest clearing and grubbing activities can lead to releases of fines from the soil, resulting locally in elevated suspended sediment levels but slopes in the area are gradual. Release of other contaminants such as oils and lubricants from operating equipment, as well as contaminants which may be found in material, such as recycled asphalt, which may be stored at the site, will also be moderated by the lack of abrupt slopes, but is also expected to be mitigated by normal precautions on equipment operations and fuelling locations, and measures to reduce runoff from storage piles. Contaminants arising from operations of the quarry are expected to be exceedingly low. All activities will conform to the Nova Scotia Erosion and Sedimentation Control Handbook (NSE 1988) and the Nova Scotia Pit & Quarry Guidelines (NSE 1999). Impact of the quarry on water quality in adjacent streams and other waters is expected to be negligible.

7.4.5 Freshwater Aquatic Environments

The only permanent streams at the site are located outside of the study area to the north and east. Presently the quarry diverts some runoff towards the north, which formerly ran more gradually as surface runoff and groundwater flow to the south. As the quarry develops, the main operating area may move over the study area, and potentially surface runoff may be diverted into the stream to the east. In either case, the quantities of runoff arising from the site in future will be approximately the same as at present, and will remain in the same watershed. The quarry is unlikely to generate significant quantities of contaminants or suspended sediments that could impact any downstream habitat.

7.4.6 Wetlands

Two small artificial wetlands created by the surface drainage from the present pit will continue to be present until the flow patterns change as the quarry grows. As these are man-made wetlands that have been created as a result of quarry development, they are not expected to require an approval if they are disturbed in the future. The northeastern pond/marsh wetland (0.1 ha) is outside the proposed expansion area, but may be affected as quarry development approaches and the source of recharge (which is assumed to be surface runoff into a depression in the

area) is reduced. A 30-meter buffer will be maintained. This pond/wetland has also been recently affected by the logging of the surroundings, likely leading at least temporarily to changes due to increased sedimentation and nutrient input, as well as drying, compared to its earlier condition. Swamp wetlands along and outside the property boundary to the south may experience a reduction in surface water flow as the quarry develops, due to diversion of surface flow to other areas. The reduction in water supply; as well the permanent change in temperature and hydrological conditions in the vicinity of the active quarry, have the potential to change the plant and ecosystem characteristics through changes to nutrient input, dust, emissions, temperature regime etc. These wetlands are not pristine, and have been impacted by logging, and show rutting caused by heavy equipment. Long term gradual changes to plant communities are difficult to detect and monitor. Measures can be taken to maintain the hydrological regime, reduce nutrient inputs, and adequately buffer the wetlands, to attempt to maintain the existing wetlands.

7.4.7 Fish and Fish Habitat

None of the proposed project activities will physically impact potentially fish bearing streams on the north or east sides of the project site. Forested buffers will be left in place to help to maintain temperatures, inputs of nutrients, and provide a source of leaves and woody debris. Blasting occurs infrequently at the site and is sufficiently separated from streams leaving the site to eliminate harm to fish. Water quality typically in runoff from the quarry will be monitored and is expected to meet guidelines for maintenance of Freshwater Aquatic Life. All guidelines for activities and timing of blasting in the quarry will be followed. Overall the effects of the quarry construction and operations are expected to be negligible.

7.4.8 Flora, Fauna and Habitat

The existing terrestrial ecosystem (plants and animals) will be removed in areas covered by the footprint of the expanded quarry. With time, areas no longer suitable for quarry operations will be remediated as per Nova Scotia Environment approved reclamation plans as a condition of quarry approval. Plant and animal communities that arise in remediated areas will likely differ to some degree from those at present; however a goal of remediation will be to ensure that conditions (e.g. soil types and topography) are reasonably restored to pre-existing conditions. During recovery and revegetation of abandoned areas, the forest succession will provide habitat for a moderate diversity of species. Removal of forest cover is a feature that quarry development shares with logging activities, which affects local ecosystems to a moderate degree, and is allowed in Nova Scotia. Several species of migratory birds are in decline in Nova Scotia, in particular interior forest birds, which rely on large expanses and continuity of intact forest. Other wildlife species need large areas of undisturbed forest to live and reproduce naturally. Occurrence of logging activity in past and the network of woods roads and trails, not associated with the project, already influence movement patterns of wildlife. Expansion of the Loch Katrine Quarry will result in only a comparatively small change in the coverage of natural and mature forest stands in the area and is expected to have comparatively small impact on interior forest birds and wildlife. During operations, modified areas of the quarry offer potential nesting sites for certain species of birds and other wildlife, including hunting spaces for species such as owls; employees should be educated on the need to check areas for activity and nests before undertaking activities which would disturb established surfaces. Night operations and use of lights have various effects, including attracting insects which otherwise would need darkness to mate and reproduce; light pollution is considered to be an important factor globally in decline of songbird populations, through declines in populations of some insects. Night operation lighting during migration periods (August-September) would attract migrating birds. If possible,

24-hour operations in August to early September should be avoided and lighting used at the site should focus downward and below the normal horizon, to limit visibility by birds and insects from a distance.

7.4.9 Species at Risk

The local occurrence of Yellow-listed Large Round-Leaf Orchid immediately north of the present pit area is an immediate concern. This species is considered rare; however the status may be due to insufficient surveys having been done in this type of habitat. Expansion of the quarry into this part of the study area should not be undertaken until a survey is conducted to determine the distribution of the species at the site and in similar conditions both on-site and nearby. Common Nighthawk, a ground-nesting endangered bird species, potentially could nest in grubbed and marginal but open areas of the quarry; employees should be made aware of the need to check areas for activity and nests before undertaking activities which would disturb established surfaces. Lights during night operations during migration periods (May-June, August-September) would attract various bird species and insects, which could include species at risk. If possible, 24-hour operations during migrations should be avoided and lighting used at the site should focus downward and below the normal horizon, to limit visibility from a distance.

7.4.10 Natural Areas and Wilderness

Natural areas at the site are appreciated by locals and tourists alike, while regenerating forests at the site are important in supporting wildlife populations, and nearby undeveloped areas are appreciated by society as a whole, evidenced by their designation for parks and protected areas. The immediate vicinity of the Loch Katrine Quarry is not pristine, having been used repeatedly for resource extraction—in particular for forestry, but aggregate extraction and agriculture have also been a part in the mix of activities in the area. South River Lake is an important natural area in the immediate vicinity, for local residents. Several natural areas are located in relatively close by and in particular the Giants Lake Wilderness Area is proposed about 10 km east of the site; Ogden Round Lake Wilderness Area (designated); Giants Lake Wilderness Area (pending designation); South River Nature Reserve (pending designation); Lochiel Lake Provincial Park (designated); and Lochaber Provincial Park and Park Reserve (designated). The quarry has a small footprint in the landscape and will not affect naturalness and character of the forest landscape in these natural areas or in the adjacent South River Lake and South River watershed. Efforts should be made to minimize the footprint and effects of the quarry, in particular to reduce traffic, noise, dust and light from quarry operations. Activities at the quarry will be carried out with a view to minimizing impacts of the quarry and associated infrastructure, such as roads, on the adjacent natural environment at the site and ensuring that as much as possible of the quarry is restored in future. Restoration should also consider values important in conservation of biological communities and ecosystems, as well as changes in physical conditions that could affect those communities. Normal procedures such as dust control and light management will help to minimize impacts on natural and wilderness values at the site.

8.0 IMPACTS OF THE ENVIRONMENT ON THE PROJECT

The operating quarry will not be impacted in general by weather, including high rainfall and precipitation, through its nature and design, which includes site water management. Aggregate and other rock products stored at the site are stable under varying conditions of rainfall and wind. Integrity of any runoff management structures at the site must be maintained and appropriately designed to remove the possibility of catastrophic failure. Changing climate may

increase the operating season for transportation projects, and the need for aggregates produced by the quarry.

Table 4. Potential interactions between project activities and operations and Valued Environmental Components (VECs) for Loch Katrine Quarry expansion.

General Category of VEC	Biophysical								Socioeconomic										
Project Component (potential interactions shown by ✓)	Air Quality, Noise and Light	Groundwater & Hydrology	Water Quality	Aquatic Environments & Wetlands	Natural Areas & Wilderness	Fish and Fish Habitat	Flora & Fauna Species & Habitat	Species at Risk	Mi'kmaq	Cultural/Historical	Recreation, Tourism & Viewscape	Residential Use	Recreational, Commercial & Mi'kmaq Fishing	Water Supplies/ Residential Wells	Land Use and Value	Transportation	Commercial /Industrial Use	Parks & Protected Areas	Forestry Hunting /Trapping
Construction																			
Site Acquisition, Use/Removal of Resources	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓
Site Clearing/Grubbing	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓		✓				✓	✓
Drilling	✓	✓			✓			✓			✓	✓		✓				✓	
Blasting	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓		✓				✓	
Lights	✓				✓		✓	✓			✓	✓						✓	
Operation																			
Moving/Transporting Rock and Product	✓				✓		✓				✓	✓			✓	✓	✓	✓	
Crushing	✓				✓						✓	✓						✓	
Washing		✓	✓	✓		✓													
Lights	✓				✓		✓	✓			✓	✓						✓	
Site Runoff Management		✓	✓	✓		✓							✓	✓					
Portable Asphalt Plant	✓				✓		✓				✓	✓						✓	
Onsite Materials Storage			✓	✓										✓					
Accidents (Fires/Oil & Fuel Spills)	✓	✓	✓	✓	✓	✓	✓				✓	✓		✓				✓	✓

Table 5. Summary of impacts and mitigation on Valued Environmental Components, Loch Katrine Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
BIOPHYSICAL COMPONENTS						
Air Quality, Noise & Light	Construction	Noise and dust from heavy equipment during logging and grubbing.	Significant	Negative	Schedule activity to avoid peak periods of use by residents in the local community. Take steps to reduce noise sources such as engine braking.	Not significant.
		Drilling and blasting.	Significant	Negative	Monitor noise levels and undertake to avoid exceedences of regulatory levels.	Not significant.
		Light from the quarry can be seen in neighbouring areas.	Significant	Negative	Use directional lighting with downward and lateral focus to minimize light leaving the quarry during night operations.	Not significant.
	Operation	Drilling and blasting; equipment for moving rock; crusher; heavy equipment operation; air-borne emissions from asphalt plant.	Significant	Negative	Monitor noise levels and undertake to avoid exceedences of regulatory levels. Institute measures for dust control. Monitor and maintain asphalt plant to minimize emissions.	Not significant.
		Light from the quarry can be seen in neighbouring areas.	Significant	Negative	Use directional lighting with downward and lateral focus to minimize light leaving the quarry at night.	Not significant.
Groundwater/ Hydrology	Construction	Forest and soil removal changes surface and ground water flow levels and patterns.	Negligible	Negative	Use site runoff management to minimize impacts. Likely changes in groundwater and runoff patterns will be small.	Not significant.
	Operation	Blasting fractures bedrock, disturbs till, and changes groundwater flow patterns.	Significant	Negative	Drilled wells in bedrock and surface wells can be disturbed. Monitor groundwater quality and movement to determine changes.	Not significant.

Table 5. Summary of impacts and mitigation on Valued Environmental Components, Loch Katrine Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
	Operation	Quarry and work areas change surface water flows. Increased peak stormwater flows. Washing product creates silt-laden surface flows.	Significant	Negative	Onsite water management to moderate extreme surface water runoff and suspended sediment levels; measures to maintain normal flow regime.	Not significant.
	Operation	Accidental hydrocarbon spills and blasting residues contaminate groundwater.	Significant	Negative	Measures to minimize danger of spills; onsite emergency numbers, spill kits etc. Avoid refueling near watercourses.	Not significant.
Water Quality	Construction	Altered surface water flows and turbidity in watershed flowages.	Negligible	Negative	Erosion and sedimentation controls in work areas. Onsite water management to moderate surface water runoff and suspended sediment levels.	Not significant.
	Operation	Dust & suspended sediment from operations potentially enters local watershed. Chemicals (e.g. nitrates) from explosives entering runoff.	Significant	Negative	Onsite dust control and water management to moderate surface water runoff and suspended sediment levels. Erosion & sedimentation controls. Closely monitor chemical residues after blasting.	Not significant.
	Operation	Water chemistry changes in runoff from materials stored on site.	Negligible	Negative	Best management practice allows leaving piles exposed to the environment. Monitor settling ponds; storm-water management.	Not significant.

Table 5. Summary of impacts and mitigation on Valued Environmental Components, Loch Katrine Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
Natural Areas & Wilderness	Construction & Operation	Presence of quarry, emissions, dust etc, detracts from public perception of wild quality of area.	Negligible	Negative	Area affected is small in relation to remaining natural areas, and previous development has occurred in the area, diminishing value of natural areas and wilderness. Attempt to minimize footprint and avoid damage to areas that contribute most to supporting the natural ecosystem and enhancing values. Manage releases of dust and light, and control noise.	Not significant.
Freshwater Aquatic Environments	Construction	Occurrences of high suspended sediments and nutrient levels from grubbings, road construction, and locally diverted flows.	Negligible	Negative	Preserve wooded buffer areas adjacent to wetlands and watercourses. Onsite water management and sedimentation controls to moderate surface water runoff and suspended sediment levels.	Not significant.
	Operation	Retention of runoff for aggregate washing. Evaporation from pit floor and exposed surfaces. Lower normal flows in watercourses adjacent to site.	Negligible	Negative	Maintain forested buffers. Onsite water management to store additional wash water during off peak season. Minimize unvegetated areas.	Not significant.
	Operation	Higher peak flows and suspended sediment during activities.	Significant	Negative	Onsite water management to store wash water during off peak season. Preserve woodland in buffer areas of quarry.	Not significant.
	Operation	Runoff from access roads.	Negligible	Negative	Use of ditching and artificial channels, to carry peak flows and additional site runoff. Sedimentation controls.	Not significant.

Table 5. Summary of impacts and mitigation on Valued Environmental Components, Loch Katrine Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
	Operation	Releases of chemicals from blasting and runoff from materials stored on site.	Negligible	Negative	Isolate and treat runoff from work areas and stored materials piles.	Not significant.
	Construction & Operation	Routine releases and accidental spills of hydrocarbons on site.	Significant	Negative	Provide pollution prevention and emergency measures.	Not significant.
Wetlands	Construction	Grubbing, road construction, pit preparation	Significant	Negative	Avoid work and/or development near northeast pond wetland and maintain buffer on south boundary. If unavoidable, delineate wetlands and compensate for loss. Maintain natural hydrological regime of wetlands during construction.	Not significant.
	Operation	Dust, nutrient inputs from runoff, changes to hydrology, changes to forest communities.	Negligible	Negative.	Maintain a significant forest buffer; maintain hydrological regime. Maintain wetlands created by quarry runoff to improve quality of water leaving the site.	Not significant.
Fish & Fish Habitat	Construction	Change runoff patterns at site in local and adjacent watersheds.	Negligible	Negative	Avoid the major wetlands and associated watercourses. Maintain forested buffer around wetlands and streams.	Not significant.
	Operation	Site runoff management and water use affects hydrological and groundwater regime.	Negligible	Negative	Ensure the runoff from the site is managed to maintain a supply wetlands and watercourses.	Not significant.
	Construction & Operation	Nominal releases of oils, hydraulic fluids etc. from operating equipment. Accidental spills of hydrocarbons on site.	Negligible	Negative	Maintain equipment to minimize loss of lubricants and fuels. Provide pollution prevention and emergency measures.	Not significant.

Table 5. Summary of impacts and mitigation on Valued Environmental Components, Loch Katrine Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
	Operation	Accidental spills into watercourses in Loch Katrine area from truck highway accidents.	Negligible	Negative	Recommend truck traffic use safe driving practices and reduce speed in vicinity of quarry and intersection on Highway 316 & South River Lake Road. Provide pollution prevention and emergency measures.	Not significant.
Terrestrial Flora & Fauna & Habitat	Construction	Removal of Existing Communities	Negligible	Negative	Restore damaged and unused parts of the site (e.g. grubbings and waste rock piles) as soon as possible. Long-term site rehabilitation plan developed with NSE. Cut forest short term only as needed to expand quarry.	Not significant.
	Construction & Operation	Accidental releases, contamination of habitat.	Significant	Negative	Provide pollution prevention and emergency measures & response capability. Remediate any permanent areas affected by spills.	Not significant.
		Artificial light from operations influences movements of birds and insects.	Significant	Negative	Use directional lighting with downward focus to minimize light leaving the quarry.	Not significant.
		Removal of potential forest and wildlife resource (i.e. wildlife habitat)	Negligible	Negative	Small area affected relative to total available. Minimize footprint of quarry. Restore and rehabilitate areas not used. Leave mature standing trees where possible as nest cavities.	Not significant.
		Quarry affects wildlife movement patterns and connectivity of habitats.	Significant	Negative.	Restoration should include consideration for wildlife movement through the restored site.	Not significant.

Table 5. Summary of impacts and mitigation on Valued Environmental Components, Loch Katrine Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
Species at Risk	Construction	Plant species at risk (Large Round-Leaved Orchid) in the proposed footprint of the quarry.	Significant	Negative	Survey for additional occurrences of species. Develop management plan. Minimize footprint and maintain as much natural (uncut) natural vegetation as possible.	Not significant.
	Operation	Sound from blasting can harm bats and birds.	Negligible	Negative	Minimize blasting activity and concentrate in spring and fall (outside breeding and migratory periods) when species are absent.	Not significant.
		Light influences movements of species at risk birds migrating overland.	Significant	Negative	Use directional lighting with downward and lateral focus to minimize light leaving the quarry.	Not significant.
		Open areas and grubbings piles occupied by nesting species such as nighthawks.	Significant	Negative	Educate personnel to look for bird life prior to activities; periodically conduct nesting bird survey at site to identify bird issues.	Not significant.
SOCIOECONOMIC COMPONENTS						
Mi'kmaq	Construction & Operation	Any land use conflicts with Mi'kmaq Right to Use Land	Significant	Neutral	Consult with Mi'kmaq in developing quarry.	Not significant.
		Contamination and alteration of flow regime of streams may affect fish populations potentially used by Mi'kmaq.	Negligible	Negative	Employ surface water monitoring program. Use Best Management Practices for quarries. Avoid accidental releases of contaminants. Avoid vehicle accidents.	Not significant.
Archaeological, Cultural and Historical Significance	Construction	Expansion may affect undiscovered artifacts.	Not significant	Negligible	Unlikely that artifacts occur at site. Minimize project footprint.	Not significant.
Recreation	Construction & Operation	Quarry traffic & activities affects local light recreation (e.g. walking and cycling).	Not significant	Negative	Users will be aware of activity at quarry but will not be otherwise impacted by it. Access roads gated to prevent unauthorized use.	Not significant.

Table 5. Summary of impacts and mitigation on Valued Environmental Components, Loch Katrine Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
Tourism & Viewscape	Construction & Operation	Presence of quarry affects public perception of wilderness values.	Negligible	Negative	Quarry cannot be seen from road. Maintain a clean operation. Rehabilitate areas no longer needed for activity and future development.	Not significant.
Residential Use	Construction & Operation	Noise; light pollution; dust; odours; operation of trucks and transportation of heavy equipment.	Significant	Negative	Use best management practices to reduce disturbance to nearby residents. Inform residents about quarry operations. Provide community with safety information for truck traffic on Highway 316 and South River Lake Road.	Not significant.
Recreational & Mi'kmaq Hunting & Fishing	Construction & Operation	Accidental hydrocarbon spills and blasting residues contaminate surface waters.	Negligible	Negative	Provide pollution prevention, emergency measures & response capability. Identify and control contaminant releases.	Not significant.
	Construction	Loss of forested area under quarry footprint.	Not significant	Negative	Rehabilitate areas no longer needed for activity and future development. Minimize cutting outside quarry footprint.	Not significant.
Water Supplies & Residential Wells	Construction and Operation	Blasting potentially impacts local aquifers.	Not significant	Negative	Develop groundwater-monitoring plan in consultation with NSE.	Not significant.
Land Use and Value	Construction & Operation	Removal of potential forest and wildlife resource (e.g. forestry & trapping).	Not significant	Negative	Small area affected relative to total land available. Minimize footprint of quarry. Restore and rehabilitate areas not used.	Not significant.
Transportation	Operation	Wear on highway	Negligible	Negative	Current levels low and will not increase.	Not significant.
	Operation	Collisions with trucks and equipment on Highway 316.	Not significant	No change	Use good directional signs for slow moving vehicles, and speed policy in vicinity of quarry. Safety training for truck drivers.	Not significant

Table 5. Summary of impacts and mitigation on Valued Environmental Components, Loch Katrine Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
Industrial & Commercial Use	Operation	Competition with other Quarries	Negligible	Neutral	Quarry operations are in a competitive environment; cooperate if possible.	Not significant.
Resource Use Forestry, Hunting & Trapping	Construction & Operation	Removes woodland; game habitat.	Not significant	Negative	Relatively small area is used.	Not significant.
Parks and Protected areas	Construction & Operation	Giants Lake Wilderness Area, Ogden Round Lake Wilderness Area, Lochaber Provincial Park Reserve, Lochiel Lake Provincial Park	Not significant	Neutral	Employ best management practices for all aspects of quarry operation, in particular control of light, dust and particulate emissions, and odours leaving the site.	Not significant.

9.0 CUMULATIVE EFFECTS

All the potential impacts of the quarry operation (dust, noise, lights, blasting, traffic volume) may be compounded by the operations of the smaller competitor-operated wayside quarry to the north, however since site operations are not expected to increase in frequency or scope from past use, the cumulative effect of both quarries is not expected to increase from past levels. Additionally, it is unlikely that both quarries would be operating at the same time, as there are unlikely to be multiple large construction projects occurring concurrently in the area that would necessitate both sites being active. The two quarries are comparatively small, and produce relatively small aggregate volumes annually, and the expected rate of production is expected to remain at current levels.

10.0 MONITORING

Monitoring of hydrological conditions at the site, as well as water quality monitoring, may be conducted to ensure conditions have been maintained by quarry operations. Routine monitoring of noise levels will be done if required by NS Environment. On-site groundwater monitoring may be conducted, at the request of NSE.

Dexter is committed to the utilization of Best Management Practices in all phases of their operations, including the on-site management of air quality, greenhouse gas emissions, noise, dust and water quality and will operate in accordance with applicable Federal and Provincial legislation and standards.

11.0 PUBLIC CONSULTATION

The Proponent has not held public consultations in the area about the proposed expansion of the Loch Katrine quarry—public meetings are not required for the EA registration. However, it is important to note that Dexter has been in contact with various Government and First Nations groups and individuals, as noted earlier in this document. Dexter will continue this dialogue, to the best of our abilities, to ensure any concerns that may be raised are addressed in a timely manner. All communication will be documented and made available for NSE review.

12.0 PROJECT CLOSURE

Remediation of the affected environment during the closure or decommissioning phase of the quarry will involve the execution of a Rehabilitation Plan developed in consultation with the NSE.

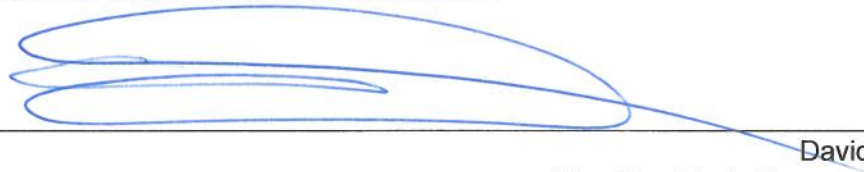
13.0 APPROVAL OF UNDERTAKING

Dexter will comply with all provisions of the Nova Scotia Environment Act and Regulations. An application for Industrial Approval will be submitted to the Antigonish District office of Nova Scotia Environment following EA approval.

14.0 FUNDING

No public or other government funding is involved in the execution of this undertaking. All costs are borne by Dexter.

15.0 SIGNATURE OF VICE PRESIDENT AND DATE



OCT 20/16

Date

David Pangman
Vice President, Finance & Treasury
Dexter Construction Company Limited