TWIN MOUNTAIN CONSTRUCTION LTD.

R.R.1 Waterville, Kings Co., NS
B0P 1V0

ON

PROPOSED BOND ROAD SAND PIT OPERATIONS

Environmental Assessment Registration

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Executive Summary

Twin Mountain Construction Ltd. (the proponent) proposes to reopen a former sand pit to extract sand on property currently owned by the proponent. The proposed operations will begin immediately after Nova Scotia Department of Environment and Labour (NSDEL) project approval. The project is expected to be sustainable for a period of ten years, with the final reclamation occurring in 2014. The normal operating schedule will be based on 15.5 hrs/days, 5 days/week, and 52 weeks/year, environmental conditions permitting (Site will be closed on statutory holidays). The proposed project activities will be in accordance with *Nova Scotia Pit and Quarry Guidelines* (NSDEL 1999). It is expected that the Site will be closed for much of the year due to environment conditions (closed from November to May for the most part).

The estimated production realized by Twin Mountain Construction at the Site will be 300,000 tonnes of sand per year. Of that amount, 100,000 tonnes will be excavated from the Bond Road property, with the balance being hauled in from other sources. At that rate, the project footprint will advance approximately 5.8 hectares per year. The purpose of the proposed sand pit, with access from Highway #1, is to extract sand for asphalt (for local and Halifax markets), and wastewater treatment systems (primarily for the Halifax market). As well, various grades of soil (e.g., landscaping) will be produced and stockpiled on Site until they are sold and/or transported via tandem trucks to various markets within the province of Nova Scotia. No additional facilities are needed on the Site to accommodate proposed project operations.

The proposed sand pit is located on property in Waterville, Kings County, NS. The property borders the east side of the Bond Road; the south side of Highway #1, extending toward the South Mountain. The property on which the proposed sand pit is to be located is 58.7 hectares, more or less. Inasmuch as this proposed sand pit is in excess of eight (8) hectares, Twin Mountain Construction Ltd. is required to register this project as a Class I Undertaking according to Part IV of the *Environment Act* and the *Environmental Assessment Regulations* for the Province of NS before commencing work on the project. Province of NS guidelines that are to be adhered to include the *Nova Scotia Pit and Quarry Guidelines* (NSDEL 1999). No municipal

regulations apply to this project; as an aggregate pit, the activity falls under the authority of the Province of NS.

This environment assessment registration identifies and assesses potential environmental impacts connected to this Undertaking/ project, as well as fitting mitigation and monitoring to minimize any potential effects. This document focuses on those features of the environment that have been identified as being of most concern. The following studies/investigations were carried out to identify and qualify possible project/environment interactions. The environmental components evaluated in this document include:

- agricultural land;
- rare and sensitive flora;
- rare and sensitive fauna;
- freshwater fish and fish habitat;
- ground water and surface water resources;
- geology;
- archaeological and heritage resources;
- air quality; and
- socio-economic environment.

The environmental impact of the proposed project will include a loss of terrestrial habitat within the proposed sand pit footprint. Three species, Meadow Willow, Purple Trillium, and Eastern White Cedar, which are considered rare in Nova Scotia, were found on the Bond Road Property. Yet, no rare or sensitive birds, amphibians, reptiles, or mammals were observed on the property in question during the 2002 and 2003 surveys. However, one species that is considered at risk, the Bobolink, was observed in fields adjacent to the proposed Site. There is also potential for acid rock drainage resulting from extraction activities connected to this project. Assuming that the mitigative and monitoring measures proposed in this document are adhered to and the pit operations follow the applicable federal and provincial regulations and approvals, no significant adverse residual environmental and socio-economic effects are expected.

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1.0 Proponent Description

Name of Undertaking:	Bond Road Sand Pit Operations
Location:	Waterville, Kings County, Nova Scotia
Name of Proponent:	Twin Mountain Construction Ltd.
Postal Address	R.R. 1 Waterville, NS, Canada B4N 3V7

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Company President Name: Robie Carty

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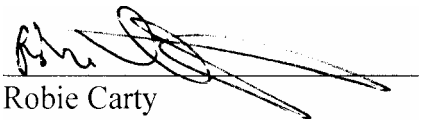

Robie Carty

Signature of President

Date: 2004-07-21

2.0 The Undertaking

2.1 Name

The name of the proposed Undertaking/project is the "Bond Road Sand Pit Operations."

2.2 Location

The location of the proposed Undertaking is on lands currently owned and utilized by Twin Mountain Construction Ltd. (TMC). The property in question, 58.7 hectares more or less, is located in Waterville, Kings County, NS (see Figures 1 & 2, Appendices II, III & IV).

3.0 Scope

3.1 Scope of the Undertaking

The proposing Undertaking will include excavation, screening, mixing, and stockpiling of sand and soils. TMC proposes to advance the face of the sand pit in stages, as required. In the southern portion, each stage of the expansion will take in approximately 5.8 hectares, more or less. As each new section is opened up, the former exhausted pit area will be reforested. Similarly in the northern portion of the property, as the working face moves forward and the sand pit nears depletion, another area will be prepared for excavation. The former will then be reclaimed and put back into agricultural production.

The proposed extraction operations will begin on the forested land in the southern portion of the property and then proceed systematically onto farmland in the southern and northern areas of the property. The proposed working face of the sand pit in the southern portion is approximately 500 metre from the nearest well or foundation of a structure. A 30 metre buffer will be maintained between any active area of the proposed sand pit and the nearest well, foundation or property boundary, in all areas of the property.

Screening, mixing, and stockpiling of sand will take place on a former sand pit roughly in the center of the property, 90 metres from the Rochford Brook to the north and 30 metres from the forested area to the south (see Figure II). The former sand pit, which covers approximately 10.1 hectares, is located on 58.7 hectares of farm- and forest-land (the former accounts for two-thirds

of the property and the latter one-third). The proposed sand pit will extend beyond the existing sand pit to the north and south.

On completion, the sand pit footprint will take in approximately 58.7 hectares (10.1 hectares of existing pit and 48.6 hectares of new pit). The Site is expected to yield 300,000 tonnes of mixed sand per year, with 100,000 tonnes sourced directly from the proposed pit area.

3.1.1 Purpose & Need for the Undertaking

The purpose of the proposed project is to extract sand for asphalt and wastewater treatment systems. The sand to be excavated from this Site is an essential component in the construction of sewage systems (in local and Halifax markets), and hence plays an important role in safeguarding the environment. The sand is also necessary in asphalt production (primarily for local markets). As well, various grades of soil (e.g., landscaping) will be produced and stockpiled on Site using sewage compost (on Site), sand (on and off Site), and silt materials at the site. The sand at this Site is essential to achieving the appropriate product mixture because sand from other pits, which the proponent has access to, is too fine. The final product will be stockpiled on Site until markets are secured and then transported via tandem- and tri-axle trailer-trucks to various locations within the province of Nova Scotia. No additional facilities are required at the Site to accommodate proposed project operations.

3.1.2 Consideration of Project Alternatives

Other methods for carrying out the Undertaking considered include: (1) different access routes to and from the site, (2) location of screening, mixing, and stockpiling area, and (3) purchasing aggregate from other sources. There is a shorter alternate access route leading onto the Bond Road, which connects to Highway #1. However, the Bond Road has seasonal weight restrictions and there are a number of homes along this section of Bond Road. A new access roadway has recently been built by and at a considerable cost to TMC to reduce noise impacts on residents near the Site. The new roadway is more than adequate for proposed pit activities. This roadway leads directly onto Highway #1. Highway #1 is not subject to spring weight restrictions (see

Figure 1). The entrance to the access roadway is highly visible. Visibility is uninterrupted, 500 metres from the west and 300 metres from the east along Highway #1.

The proposed screening, mixing, and stockpiling area is best because location is relatively isolated, compared to the other pits and land owned and operated by TMC. The proposed location is the site of a former sand pit. This area is not subject to muddy conditions or significant runoff and thus ideal for the proposed activities (see Figure II, the light area in the center of the property is the former sand pit, the location of the proposed screening, mixing, and stockpiling operations).

Sourcing aggregate at an alternate location is not a feasible alternative because the proponent would have to lease or buy additional property. The reasons have to do with financial and source constraints. The proposed pit is on property that has undergone considerable disturbance from previous pit activities, farming, and forestry practices. Further, the proponent has made a considerable investment in the property and on roadway improvements at the Site (see construction approval, Appendix I).

Twin Mountain Construction Ltd. anticipates that the sand from the proposed sand pit to be of similar quality to material found in test holes dug at various locations throughout the proposed pit area. As the aggregate pit expansion proceeds, the proponent may carry out additional testing within the proposed pit area to confirm the existence of suitable source material.

4.0 Public Involvement

4.1 Methods of Involvement

Local interest is high regarding the proposed Undertaking. Letters explaining the project and inviting comment were sent to the Annapolis Valley First Nations band chief, Cambridge, Kings Co., NS and to Mr. Donald Cox, the Confederacy of Mainland Mi'kmaq, Truro, NS. To date, individuals from the two representative groups have not responded. In addition, ads were placed in local newspapers announcing the proposed project and the public meeting.

To generate interest, understand the attitudes, concerns, and values of the community, interested individuals and parties, a public meeting was held to involve the public in the TMC assessment process. The meeting was held on October 29th, 2003 in the Waterville Fire Hall, from 7:00 p.m. – 8:30 p.m. The purpose of the meeting was as follows:

- First, to inform the residents of Waterville as to the details of the proposed Undertaking;
- Second, to note the residents' concerns; and
- Lastly, to answer questions, all in a collective and transparent manner.

Initial action steps

To heighten publicity, 95 notices were hand-delivered to most homes within a half-kilometer of the Site. Additionally, announcements promoting the event and its purpose were placed in two local newspapers with good distribution in the community, the Advertiser on October 17, 2003, and the Berwick Registrar on October 22, 2003 (see Appendix XV).

The Event

Twenty-eight people attended the meeting (see Appendix XVI). The first half of the meeting was devoted to introducing the project, a description of the site, and the biophysical assessments conducted. The second half of the meeting was devoted specifically to addressing the participants' concerns, and recording their comments and ideas. A recorder kept notes of comments, questions, and responses throughout the meeting. Of the ten comment forms that were returned by participants, 100% responded that the meeting was "worthwhile."

4.2 Public Comments

Participants at the Event expressed a range of concerns with regards to socio-economic issues and biophysical impacts (see Table 1). Some participants expressed support for the proposed project whereas others rejected it outright. The major issue with respect to the proposed project is trust; specifically, "will the Proponent's activities at the Site be of the sort that secures the respect of the residents of Waterville and Area?"

Table 1: Issues identified by the participants

1. Nuisance	2. Socio-economic	3. Biophysical	4. Health	5. Other
Dust	Real estate values	Fish habitat	Content of soil mixture	Completion-date of registration document
Noise	Expand assessment of properties (outside red circle)	Wildlife habitat (not only rare species)	Samples ground/surface water to DOE; 3	Excavation depth
Traffic	Proponent provides onsite office (resident inquiries)	Removal of agricultural land		Project reopening
Location of mixing equipment	Removal of sludge-previous project (permit still held?); 3	Existing orchards		Ownership of proposed site
Buffer zones (property& wells); 2,3		Water table-possible rise		Who determines approval or non-approval
		Pit will fill with water-possible contamination		NSDEL attendance at future meetings
		Ground water-buffer (shallow wells interrupted)		
		Run off (near Rochford Creek)		
		Contingency plan-water contamination ground/surface; 2,4		
		Volume of sludge		
		Quality of sludge		
		Site restoration; 2		

* A number after an issue indicates that it may fall under additional headings/categories.

4.3 Steps taken to address public concerns

Concerns regarding the sewage sludge have generated an atmosphere of controversy and distrust among some residents in proximity to the Site. Residents want the sludge removed from the Site, regardless if the project goes forward. This issue may jeopardise the quality, cost, or schedule of the project, if it cannot be alleviated to the satisfaction of the community. Additionally, participants were concerned over groundwater contamination, truck traffic, and impact on wildlife and wildlife habitats.

It is anticipated that strict adherence to the monitoring and mitigation program outlined in this document will address the residents' concerns. An in-depth assessment of real-estate values in

the Waterville was not undertaken. A real-estate brokers was contacted regarding real-estate values. He suggested that market values for the Bond Road & Area are comparable with other communities in the Kentville to Berwick corridor, with a few exceptions. Further, real-estate values in this area currently are up 10 to 15% percent. It is expected that the proposed project will have a negligible impact on real-estate values, inasmuch as the proposed property has been the site of sand extraction activities for more than twenty years.

As for the sewage sludge, it is expected that removal of the composted materials will foster enhanced levels of trust between the proponent and those members of the community who are currently at odds. TMC seeks to boost its profile as a good corporate citizen by contributing positively to the Community. To achieve that end, the proponent will establish a "Community Liaison Committee" to foster trust and address/alleviate public concerns.

5.0 Description of the Undertaking

5.1 Geographical Location

The proposed Site is located on Bond Road, between two towns (Kentville & Berwick) and two growth areas (Coldbrook-Wolfville & Kingston-Greenwood), approximately ½ kilometre west of the Village of Waterville and approximately 2 kilometres east of the Town of Berwick. Coldbrook is the nearest designated residential growth centre, approximately 6 kilometres from the proposed Undertaking.

Figure 1. Map of Proposed Bond Road Site with coordinates

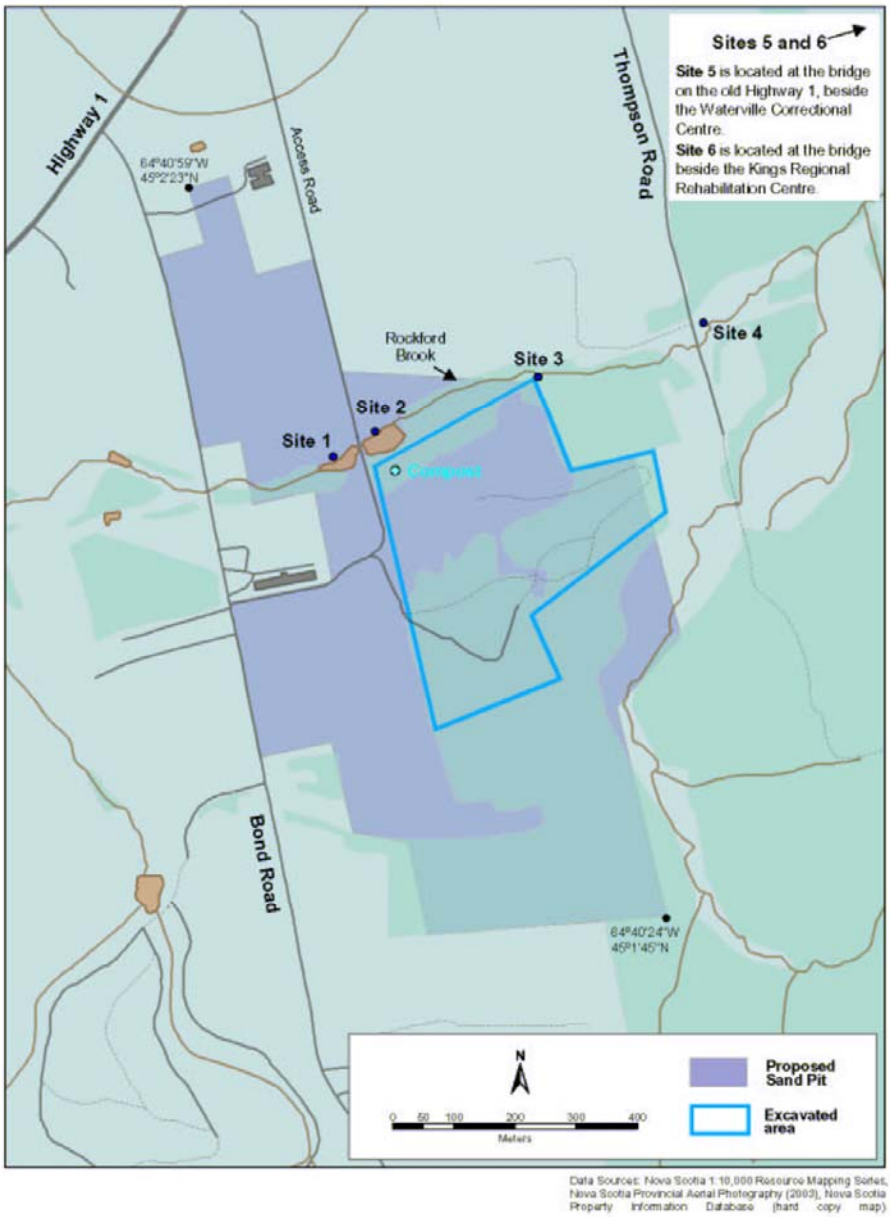

Figure 2. Proposed Bond Road Site (approx. boundary outlined in yellow)

Legend: Green arrows indicate slope of landscape; Violet oval indicates composted sewage sludge; Red triangle points to the nearest well; & Brown oval indicates the area proposed for mixing & stocking piling

5.4 Physical Components

The proposed sand pit will include a former sand pit, farmland, and forested land (see Figure 2). The property is bounded to the south by farmland, to the north by Highway #1 and fallow land, to the west by private property and the Bond Road, and to the east by farmland. Homes that are adjacent to or in the vicinity of the property predominantly border the Bond Road (see Figure 1, grey indicates farmland and residential property, speckled green indicates woodland, and blue indicates watercourses). There is one watercourse on the property, the Rochford Brook, which flows through the property, entering from the west.

5.5 Site Preparation

There are two areas of the Site that need to be prepared before sand can be excavated: agricultural land and a forested area. In preparation for the extraction of sand on the forested land, the merchantable timber on the proposed area will be harvested. The area will then be grubbed and the remaining vegetative materials and topsoil removed using a bulldozer. The overburden and topsoil will be windrowed along the eastern and western edges away from water courses, but within the active area of the proposed pit, close to the reclamation Site. The windrows will be seeded either with a timothy, red and white clover mix or cereal grains (e.g., oats, barley or rye). This procedure is to prevent long-term soil exposure to wind and water, thereby reducing the risk of erosion and sedimentation. The remaining vegetative materials will be left to decay in the windrows. Leaving the vegetative materials in windrows to decay is both cost efficient and environmentally friendly. The decayed vegetative materials (a source of nutrients) and topsoil will be used later in reclamation activities.

In preparation for the extraction of sand on the agricultural land, a bulldozer will be used to remove all existing topsoil, crop residue or weeds from the planned area. The resulting materials will be placed in small piles or windrows along the eastern and western edges, but within the active area of the proposed pit, close to the reclamation Site or used immediately to reclaim an excavated area. The windrows will be seeded either with a timothy, red and white clover mix or cereal grains (e.g., oats, barley or rye). This procedure is to prevent long-term soil exposure to wind and water, thereby reducing the risk of erosion and sedimentation.

5.6 Operation & Maintenance

The operating schedule for the proposed Undertaking will be comparable to current activity at the pit—15.5 hours/day, 5 days/week, primarily from May to November (i.e., subject to environmental conditions). Activity at the site is expected to begin at 4:30 a.m. and draw to a close at 8:00 p.m. At peak times, 50 loads of sand and mixed topsoil will leave the Site daily. On Saturdays there will be a minimal amount of activity. Such occurrences will be rare and only the case where circumstances force construction firms to operate on weekends. Although difficult to predict, the frequency of Saturday activity will involve approximately four (4) loads leaving the Site, which may occur once or twice a month. Site operations will be closed on Sundays and statutory holidays. The proposed project activities will be in accordance with the *Nova Scotia Pit and Quarry Guidelines* (NSDEL 1999).

At the sand pit, the quarried material will be excavated using a John Deere 544H 4WD loader fitted with a 1.9 cubic metre bucket and a JCB 456 4WD loader fitted with a 3.1 cubic metre bucket. The excavated material will be placed into a Finlay 596 Hyrdatrak- Swivel screening machine, fitted with a swivel conveyor, designed for pipelining and filling. Once the excavated material is screened, the endproduct will then be placed on 683 Findlay 30" & 36" wide x 100' long portable radial stacker and stacked within the mixing site (i.e., the old aggregate “Pit Site” Appendix IV, & Figure II). When required, the stockpiled materials will be trucked to various markets.

At all times, excavation at the proposed Site will take place above the water table. It is estimated that the water table is two (2) metres below the floor of the former excavated pit area. In addition, a 100-metre buffer will be maintained between the working face the nearest foundation or base of a structure. Similar to the former pit, it is expected that the working face of the proposed pit will be 3-15 metres in depth.

Some sand will be used in topsoil production. Using one of the 4WD loaders, sand and other materials (e.g., sewage sludge, soils) used in topsoil production will be mixed, in a MCB 516RE trommel designed for topsoil production, in portions necessary to produce the desired end

product. The trommel is fitted with a radial fines stockpiling conveyor and a 24" x 30'fully integrated stockpiling radial conveyor. The endproduct will be stored within the mixing site (i.e., the old aggregate “Pit Site” Appendix IV, & Figure II).

At any time, up to 20,000 tonnes of sand may be stockpiled within the mixing and storage area of the old pit (see Figure 2 for stockpile location). Processing and stockpiling areas will be kept within the active area of the proposed pit.

Relevant Considerations

No blasting or wash operations are associated with the proposed project. No additional facilities are required for the proposed Undertaking. No topsoil resident to the Site will be removed from the property.

Transportation

The proponent will transport sand to and from the Site using tarped tri-axle trailer trucks. In rare instances, the customer may transport the product. The trucks will use the access road owned by the proponent to access the project Site and Highway #1. The entrance to the access road is clearly visible along Highway #1, ½ km in either direction. Highway #1 and Highway 101 do not have seasonal weight restrictions (see Figure 2). Transportation routes generally will follow Highway #1 east through the villages of Waterville and Cambridge to Highway 101, and west through the Town of Berwick.

No additional access roads are required for the project.

Separation distances & site-specific conditions

The proposed active area of the Undertaking will adhere to the following separation distances:

a) Twin Mountain Construction Ltd. will not locate the Active Area of the pit within:
 i) 30 metres of the boundary of a public or common highway;
 ii) 30 metres of the bank of any watercourse or ordinary high water mark; and
 iii) 30 metres of the boundary of the pit property.
b) Twin Mountain Construction will not locate the excavation "Working Face" of the pit within:
 i) 30 metres of the boundary of a public or common highway;
 ii) 30 metres of the bank of any watercourse or ordinary high water mark;
 iii) 90 metres of the foundation or base of a structure located off site; and

iv) 15 metres of the property boundary when a structure on the abutting property is not involved.

Twin Mountain Construction Ltd. will adhere to the following site-specific conditions:

a) The boundaries of the Site will be cut out and kept reasonably clear of new growth and the corner boundaries shall be clearly marked with permanent markers no less than 1.2 m high.

b) No topsoil shall be removed from the site. It shall be stockpiled for use in rehabilitating the Site. Topsoil sold for commercial purposes will be produced by TMC with materials from off-and on-Site sources (e.g., sewage sludge).

The proposed the Undertaking is scheduled to begin immediately after receiving NSDEL approval. The project is designed to proceed in stages: after each portion of land is prepared and while being excavated another comparable size of land will be prepared for future excavation. The area being prepared (i.e., grubbed, topsoil removed and stockpiled) in any given year is only warranted if the area being excavated nears resource depletion (see Table 2). During excavation, approximately 20 cm or more of subsoil materials will be left to cover the pit floor to lessen the potential for standing water and muddy working conditions.

Table 2: Project Schedule

Year	Site Preparation	Site Reclamation
2004	5.8 ha	
2005	5.8 ha	Portion of the existing pit
2006	5.8 ha	5.8 ha
2007	5.8 ha	5.8 ha
2008	5.8 ha	5.8 ha
2009	5.8 ha	5.8 ha
2010	5.8 ha	5.8 ha
2011	5.8 ha	5.8 ha
2012	5.8 ha	5.8 ha
2013	5.8 ha	5.8 ha
2014		Final reclamation of Site footprint

The details in the above table columns are approximations only. At proposed extraction levels, operations are expected to be sustainable for 10 years, with final reclamation in 2014. The owner wishes to expand the size of TMC and increase the yearly tonnage of sand excavated on the property. However, the actual tonnage is difficult to predicate as it is dependent on market demand.

Once the Undertaking has been approved by NSDEL, TMC will survey the proposed area to be prepared and excavated. A survey map will be prepared and submitted to NSDEL (i.e., Environmental Monitoring and Compliance Office, NSDEL, Kentville, NS). The map will identify: the overall Site, the location of the planned area, and overburden and topsoil stockpiles.

Special Considerations

Currently there are approximately 2000 tonnes of composted sludge on the Site (NSDEL composting site Approval number 97-IAW-016, see Appendix VI). The source of this material was sewage treatment plants in the Halifax area. The first loads of sludge arrived for composting at the Site in 1997 and the last arrived in 1999. TMC will not accept additional sewage sludge at the Site now or in the future.

The composted material (i.e., the sludge) is being mixed with other soils and sands at the rate of 1%, well below the range of 5 to 12 % set by the "Atlantic Canada Standards and Guidelines Manuel for the Collection, Treatment, and Disposal of Sanitary Sewage Sludge."[1] This mixture is used to produce industrial top-soil for projects such as strip-mine reclamation. It is expected that the sludge will be exhausted in 2006.

The sludge is stockpiled on a clay pad, surrounded by a berm of mixed clay and soil (see Figure II). Water that collects on the clay pad from input events is retained within the berm. The water is taken up by the sludge and evaporates over time. The water does not infiltrate the clay pad. Results from surface water and groundwater testing will be used to monitor, identify and address pathways of potential contamination from the composted sludge.

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[1] CBCL Ltd. Atlantic Canada Standards and Guidelines Manuel for the Collection, Treatment, and Disposal of Sanitary Sewage Sludge. Environment Canada. Accessed on April 2, 2004. Accessed at http://www.gov.ns.ca/enla/water/pdf/AtlCanStdGuideSewage.pdf.

5.7 Decommissioning & Reclamation

As the working face of the sand pit moves forward, the reclamation process at the Site will follow on roughly a one to one basis. To reclaim the excavated area, the excavated area will be graded to a gradual slope of 15 cm every 30 metres. On the former forested area, 30 cm of decayed materials, topsoil and subsoil mixture will be spread over the forested area. The area will be reforested using pine or spruce seedlings, or a combination thereof.

On the agricultural portion of the property, one (1) metre of topsoil/subsoil mixture will be spread over the excavated area. The soil within the footprint of the pit will be tested for compaction before reclamation to determine the extent of the compaction (i.e., if action should be taken) and for nutrients to determine appropriate inputs for optimal plant growth. At any one time, the active area of the proposed pit will include approximately 17.4 hectares. The final footprint of the proposed sand pit will include 58.7 hectares of land.

Final grading and installation of permanent vegetation on disturbed areas will be followed up with a thorough inspection, maintenance, and mitigate measures of the Site. Mitigation and monitoring of the Site, the Rockford Brook, and groundwater will remain in place until all activities associated with the proposed Undertaking have cessed and the Site stabilized.

6.0 Valued Ecosystem Components and Effects Management

6.1 Biophysical Environment

Methodology

For the proposed Undertaking, six (6) environmental assessments of the Site were carried out. Jeff Wentzell, P. Ag., Middleton NS, was engaged to conduct an assessment of the proposed Undertaking and to predict its effects on the future productive potential of the agricultural land. Mr. Wentzell was also asked to make recommendations as to how best reclaim the excavated agricultural land. Ruth Newell, M.Sc., Wolfville NS was engaged to conduct a plant survey, specifically looking for rare and sensitive flora. George Alliston, Ph.D., CWB, Wolfville NS was asked to conduct a wildlife survey, specifically looking for evidence of rare or endangered

wildlife species, and to identify potential impacts of the proposed operations on wildlife at the Site. Derick Fritz, Fish Biologist, was engaged to conduct a survey of the aquatic environment to identify potential impacts of Site activities on fish and fish habitat. Ian Spooner, Ph.D., Wolfville, NS, was asked to conduct an assessment of the geology, geomorphology, and surface water of the Site to identify potential impacts of the proposed project operations on surface water. Terry Hennigar, M.Sc., P.Eng., F.C.S.C.E., Wolfville NS was engaged to conduct an assessment of the hydrogeology of the Site to identify potential impacts of the proposed project operations on groundwater, and to determine an appropriate groundwater monitoring program.

6.1.1 Agricultural Environment

In September 2003, Jeff Wentzell, P.Ag., conducted a survey of the soils and the productive potential of the agricultural and forested land at the Site. Mr. Wentzell has well identified and evaluated the potential impacts on the soils that may be expected with the proposed project. He has made a number of recommendations regarding the eventual reclamation of the agriculture portion of the property (see Appendix VII for complete report).

In the report, Mr. Wentzell tells us that the unexcavated land in both the northern and southern portions of the Site slope toward the brook at the rate of two to five percent (2-5%). He explains that throughout the Site there are several soil types, which include the following:

(1) Cornwallis, which drains well and is comprised of loose sandy glaciofluvial sediments;
(2) Truro, which drains well and is comprised of friable fine sandy glaciofluvial sediments;
(3) Chaswood, which drains poorly and is comprised of friable coarse loamy to loose sandy-gravelly alluvium;
(4) Hebert, which drains rapidly and is comprised of rapid loose sandy-gravelly glaciofluvial sediments; and lastly,
(5) Comeau, which drains imperfectly and is comprised of imperfect loose sandy-gravelly to sandy-skeletal glaciofluvial sediments.

Mr. Wentzell tells us that the productive agricultural potential of the Herbert, Cornwallis and Truro soils, found on this Site, have moderate to severe limitations, hence restricting the range of crops and their potential. Agricultural production on these soils is possible, but only with large amounts of water provided by irrigation and the application of high levels of fertilizer. However,

the soils' high permeability allows the rapid transfer of water, including fertilizers/nutrients, to surface water and groundwater resources. The problem on the Chaswood and Comeau soils is quite the opposite; inasmuch as, they drain poorly, which severely limits the potential for agricultural production.

Mr. Wentzell has made a number of recommendations to minimize the impacts of the proposed undertaking on the agricultural potential of the reclaimed land area. His recommendations are captured in the *Site Preparation & Reclamation Procedures* section of his report and in the following section.

Potential Effects and Proposed Mitigation

The impacts of the activities associated with this project on agricultural resources have been identified and evaluated. They include:

- soil erosion by both wind and water;
- soil compaction; and
- soil degradation.

To maintain the productive potential of the agriculture land at the Site, the planned procedure is to restrict excavation to the Cornwallis, Truro and Hebert soil types. To maintain and to return the soils within the proposed pit footprint back to their present productive capability, the topsoil will be removed and either used immediately in Site reclamation or stockpiled within the prepared pit area for later use in reclamation. During excavation, the proponent will leave approximately one metre (1 m) of the subsoil layer to provide adequate depth for a root zone for most crops after the topsoil is returned to this area. The subsoils will be mixed with topsoil resourced from the Site and spread over the excavated area. The excavated area will be graded to have a gentle slope of 15 cm to every 30 metres to minimize the potential for soil erosion from precipitation or surface water and then prepared for timely return to agricultural production. The proponent will carry out soil testing for compaction and nutrients. If the soil is compacted, the proponent will use a tractor-mounted implement specifically designed for loosening the soil. Based on soil tests, the proponent will apply appropriate nutrients for crops to be grown.

6.1.2 Flora Species & Habitat

Description of existing environment

A plant survey was conducted on June 8th and 15th, 2002 on a property located on Bond Road. A follow-up survey was conducted on September 29, 2002. The surveys focused primarily on the various waterways, wetlands and tree stands present on the property, but an inactive pit area was also surveyed. During the floral surveys, Ms. Newell found three plant species on the property, considered rare in Nova Scotia. One large shrub of Meadow Willow (Salix petiolaris) was located beside the brook in the northern half of the property. A clump of twenty to thirty, young Eastern White Cedar (Thuja occidentalis) and two small clumps of Purple Trillium (Trillium erectum) were found in the forested section at the south end of the property. (See Appendix VIII for complete report).

Potential Effects and Proposed Mitigation

The large shrub of Meadow Willow (Salix petiolaris) located beside the brook lies well beyond (30 m or more) the active area of the proposed Undertaking. To protect the clump of twenty to thirty young Eastern White Cedar (Thuja occidentalis) and two small clumps of Purple Trillium (Trillium erectum) in the forested section at the south end of the property, the proponent will leave these sites undisturbed by maintaining a setback area of 30 metres or more. Additionally, the proponent will mark off the area with florescent tape to identify the sensitive area for machine operators.

6.1.3 Fauna/Wildlife Species & Habitat

Description of Existing Environment

Dr. George Alliston visited the proposed project Site on four occasions between May 02, 2002 and June 23, 2002, and on November 17, 2003. While conducting his faunal survey, Dr. Allison did not find any amphibian, reptilian or bird species at risk on the property. Yet, one mammal species at risk, the Little Brown Bat, was found on the property and one bird species at risk, the Bobolink was heard on properties adjoining the north boundary (See Appendix IX for complete report). The expected potential impacts of the proposed Undertaking on wildlife are: (1) the

direct removal of habitat, and (2) the disturbance of wildlife in adjacent habitats resulting from increased noise levels.

Potential Effects and Proposed Mitigation

While a search of the periphery of the proposed pit area and the interface between the woodland and agricultural land did not reveal any evidence of nesting Long-eared Owls, the site does contain marginal habitat for this species. To eliminate potential impacts on Long-eared Owls during nesting on or adjacent to the site, the proponent will invite Mr. Bernard Forsythe and Dr. Alliston to carry a yearly survey during the nesting period (i.e., April and May). Based on Dr. Alliston's recommendations, the proponent will take steps to mitigate potential impact of pit activities if Long-eared Owls are found to be nesting on or adjacent to the site. As for the Bobolinks, Dr. Alliston tells us that it is unlikely that activities at the project site will have any impact on Bobolinks for the reason that none were found on the Site.

The proponent will mitigate, lessen or eliminate all potential impacts connected with the proposed project on streams and wetlands and their inhabitants by maintaining setbacks of 30 metres or more between watercourses and high water marks and the active area of the proposed pit (see the *Separation distances & site-specific conditions* section of this document). To protect the vegetative cover and the wildlife and bird-nesting habitat it supports, Site preparation and the removal of vegetative cover will only take place from August through to March, a time when birds are not nesting. Moreover, the proponent will not remove aggregate from pit embankments, which may be used for nesting. To avoid destroying nests of ground-nesting species, which are sometimes attracted to aggregate pits, the proponent will carry out a visual survey of the Site by walking over the area before it is prepared for excavation.

Although no Wood Turtles were found on the property, the stream and ponds on the property may provide marginal habitat for this species. Strict adherence to recommended setbacks and containment of runoff from stockpiled materials and "industrial topsoil" should address concerns surrounding the integrity of the aquatic habitats required by the Wood Turtle. It might also be

necessary to monitor or temporarily close the road that passes over the stream should Wood Turtles be found to use the road for basking (late April and early May). Adherence to a 30 metre setback will be maintained on either side of the Rochford Brook, and around ponds and wet areas (which might serve as a habitat) to ensure the preservation of an adequate nesting habitat for the Wood Turtles (or other species at risk). Impacts on nesting turtles should not pose a significant concern as the pit activities will not begin until May. In the event that a Wood Turtle is found on the Site, the proponent will contact the Department of Natural Resources and comply with any and all recommended procedures for the conservation of Wood Turtles.

While only one Little Brown Bat was observed on the property, it is possible that the Northern Long-eared Bat and the Eastern Pipistrelle, both considered at risk, might also frequent the area during nocturnal foraging. Yet, there are no known caves on the property that could provide roosts or hibernacula for these species. In the unlikely event that these bat species were to occur here, alternate roost sites would probably be found easily and the potential for impact on these species is expected to be minimal.

To assure that all toxic materials (petroleum-based fuels and fluids, antifreeze, etc.) used at the Site are not accessible to birds and other wildlife, the materials and containers in which they are stored will be removed from the property immediately after use. Any accidental spills of toxic materials will be dealt with expeditiously using protocols described in the *Hazardous Materials and Contingency Planning* section of this document.

6.1.4 Fish & Fish Habitat

Description of Existing Environment

On October 15th and 30th, 2003, Ocean Valley Aquatics carried out a survey of water quality, fish habitat, and the presence of fish in Rochford Brook and its tributaries on or in proximity to the proposed Undertaking. Ocean Valley Aquatics reported the presence of a “good” fish habitat within the Rochford Brook system. Yet, the number of species, their diversity, and the health of the ecology within the Rochford Brook remain indefinite without an investigative fish and/or

invertebrate study of the brook. The results of the water quality tests and fish habitat survey are included in Tables 3 and 4 (See Appendix X, for complete report).

Table 3: Results of Fish Habitat Survey and Water Quality Tests

Site#	UTM coordinates	Canopy Cover (%)	Riparian Edge (%)	Stream Run	Stream width (m)/depth (m)
1	0367704 / 4988346	0	95	Pond area	25 / 0.5-1.5
2	0367661 / 4988300	0	100	Pond area	20 / 0.5-2.5
3	0367800 / 4988391	10	95	Riffles	2 / 0.5-0.9
4	0368251 / 4988491	60	100	Riffle	2 - 4 / 0.5-0.9
5	0368678 / 4990097	20	90	Straight run	3-4.5 / 0.5-1.5
6	0368242 / 4990532	70	70	Pool	3-4.5 / 0.5-2

Site#	DO (mgl/%)	pH	Conductivity (µ)	Flow (m/s)	Water Temp (ºC)	Visual Observations of Aquatic Fauna
1	7.1 / 60	8.6	70	0.3	7.6	Minnows present
2	7.3 / 62	7.5	80	N/A	7.5	
3	8.1 / 70	7.0	80	0.6	8.0	Minnows present
4	8.4 / 73	7.8	120	0.8	7.8	Minnows & Salmonids (trout) present
5	9.4 / 78	8.0	130	1.0	7.5	Minnows & Salmonids (trout) present
6	9.6 / 82	7.5	100	0.8	8.0	Minnows & Salmonids (trout) present

Site#	1st Dominant Substrate	2nd Dominant Substrate	Visual Habitat Observations
1	Gravel	Cobble	Good fish along edges of pond
2	Pebble	Sand	Excessive amounts of macrophyte growth
3	Gravel	Cobble	Adequate for spawning
4	Gravel	Cobble	Sites 4, 5 & 6 all have very good riparian overgrowth that is good for fish cover and other aquatic species to thrive.
5	Sand	Gravel	
6	Gravel	Pebble	

Table 4: Substrate Sizes

Silt	<0.1cm
Sand	0.1-0.6cm
Pebble	0.6-2.0cm
Gravel	2.0-6.4cm
Cobble	6.4-25cm
Boulder	>25cm

Potential Effects and Proposed Mitigation

Although the formally worked pit area is located close to the headwaters or recharging areas of Rochford Brook, it seems to have had minimal effects on the fish and aquatic habitat of Rochford Brook. There is potential that the fish and fish habitat may be affected by activity

associated with this project. Acid rock drainage and sedimentation of watercourses can have a negative impact on surface water, groundwater, and both the fish and fish habitat. It is anticipated that the water monitoring program and runoff, erosion, and sedimentation control measures outlined in this document will limit that potential. Visual inspection of the watercourses and monitoring of surface water and groundwater as explained in this document will help reduce the potential for disaster. If evidence suggests that acid rock drainage, sedimentation of surface water, or dewatering of the Rochford Brook is occurring, excavation activities will come to a halt, and the origin of the problem identified and the problem rectified using accepted industry measures suited to the concern.

Keen monitoring of the Rochford Brook (see surface water monitoring) will be carried out to identify potential reduction in water quality and quantity. The proposed Undertaking is not likely to result in dewatering of the Rochford Brook and its tributaries because TMC will not be intersecting the water table during excavation. In the event that the Rochford Brook becomes contaminated, the source of contamination will be promptly contained and/or rectified. NSDEL, NSDOE, and the Department Fisheries and Oceans will be informed immediately after the event. Under their advisement, TMC will remedy the impact on the Rochford Brook or its tributaries.

6.1.5 Geology, Geomorphology, Surface Water

Description of Existing Environment

In November 2003, an assessment of the geology, geomorphology, and surface water of the Site was carried out by Dr. Ian Spooner. In Dr. Spooner's report, he explains that the Twin Mountain–Bond Road Aggregate Site lies within the Annapolis-Cornwallis Valley (Triassic-Jurassic) physiographic region, characterised by gently rolling topography, with highly variable surface drainage. The Site is not susceptible to either mass movement or excessive erosion. Surficial sediment cover at the site is characterized by a thin soil (< 50 cm) that overlies both outwash sands and gravel and lacustrine sand which in turn overlie Wisconsin (Lawrencetown) Till. At depth similar stratigraphy may be repeated. Till does not outcrop at the Site but exposures at nearby locations indicate that it is compact, clay-rich, and has low hydraulic

conductivity. The Site is underlain by either highly fractured Meguma Group slate (southern end) or the Wolfville Formation sandstone (northern end), which are both porous and permeable. Precise control on this contact does not exist due to limited exposure.

Dr. Spooner tells us that the Bond Road Site contains three distinct soils. The northern portion of the study area is covered by Cornwallis soils which are water deposited loose, weakly stratified yellowish red sands and gravels. The southern portion is covered by the Berwick soils which are derived primarily from the Lawrencetown Tills. There are no natural lakes or ponds evident on the property.

Dr. Spooner reports that deposits of glacial and interglacial origin may comprise till, gravel, sand, and possibly soils, and though they are probably highly anisotropic may form locally, and in some cases regionally, significant aquifers due to the extremely high porosity and hydraulic conductivity of the gravel units. Dr. Spooner explains that the distribution and thickness of these sediments is speculative; their presence is only inferred through the interpretation of drill logs and by inference. He suggests that it is likely that these deposits, if in fact present, are thicker towards the north and are thin to non-existent in the higher gradient southern ¼ of the study area. Dr. Spooner suggests that the gravel is of limited economic utility due to its coarseness, variable thickness and textural immaturity. The underlying sands, on the other hand, appear to be adequate for specialized use (silt/clay < 7%), but grading appears to be variable.

Dr. Spooner suggests that aggregate removal to date has probably had very minor impact on the quantity and quality of water in upper Rochford Creek. The removal of this material sand effectively reduces the storage time for input events. In mid-summer and early fall (traditionally low input months) this could lead to reduced flow in Rochford Creek. However, the level of reduction due to removal may be very minor. This is because sand and gravel are common locally and significant unexploited deposits exist up gradient from the site and thus storage potential in the region remains high.

Dr. Spooner tells us that there is no indication that the proposed excavation, if it remains at or above the present elevation will result in surface exposure of bedrock. Though no direct data exists, nearby wells indicate that bedrock is > 10m below the floor of the present excavation. Dr. Spooner found no evidence that appreciable mass wasting has occurred in the past. Failure is possible along stream valley side as slopes can be locally significant and soil is poorly developed but the excessively well-drained nature of these soils is a limiting factor (See Appendix XI, for complete report).

Surface water assessment

To identify and evaluate potential surface water quality concerns, Dr. Spooner sampled water in the Rochford Creek at sites 1, 2, 3 and 4 (see Table 5 for results, Figure 1 for sampling site location, and Appendix XI for complete report). Testing of the tributary that intersects the Rochford Brook on the south east side of the property will not be tested because it is situated on private property. Further, this tributary is 150 metres beyond any proposed Site activity.

Table 5: Surface Water Chemistry Results for the Rochford Creek System

Site	pH	Conductivity (mmohs)	Nitrate NO_3-N (ppm)	Phosphate PO_4 (PPM)
1	5.9	.034	0.12	non-detect
2	6.1	.021	0.11	non-detect
3	6.3	.024	<0.01	non-detect
4	6.0	.031	0.03	non-detect

* Note that the water analysis results reported in Table 5 (and in Appendix XI) differ from those taken and reported in Appendix XII. The difference is due to the source of the water samples. The above results represent surface water and those reported in Appendix XII represent ground water.

Potential Effects and Proposed Mitigation

Surface Water Quality

Three potential areas of concern regarding surface water have been identified during the preparation of this document: removal of sand may effectively reduces the storage time for input events, sedimentation of watercourses from runoff and erosion, and acid rock drainage from exposure of slates. In the event that a large significant amount of surface water occurs due to input events, surface water from the southern portion of the property is unlikely to affect the

Rochford Brook. In the southern portion of the property, the floor of the former sand pit is lower than the surrounding property, thus creating a natural catchment area. All surface water, including significant input events, will be kept within the pit floor and allowed to permeate through the pit floor or evaporate. Further, a natural barrier, three metres in height, separates the former excavated sand pit and the proposed pit face from the Rochford Brook. In the northern portion of the property, the proposed excavation will begin to the north and move southerly toward the Rochford Brook. This will inhibit potential surface water drainage from flowing toward the Rochford Brook.

One of the concerns with respect to surface water quality and the extraction activities in this area is the potential for acid rock drainage from slate particles encountered as clasts, or components, in the gravel deposits. The proximity to the Halifax Formation give rise to this concern (see Appendices XI & XII). The potential is only identified for the aggregate pit portion of the operation in the southern portion of the site. Comments from the geologist and hydrologist suggest that potential environmental impact from acid rock drainage is highly unlikely as the proponent will not be excavating scale or exposing scale formations (i.e., Halifax formation slates). These formations are found at depths greater than the 3-15 metres to which the proponent will be excavating. Recently, the proponent dug 5 random test holes roughly 10 metres deep within the proposed pit area—slate formations were not evident in the test holes, nor was the water table intersected. Occasionally, slate particles are found intermixed in the sand near where the sand and scale formations intersect. Stratigraphic logs are not available for these test holes as they were dug with an excavator.

In the event that a slate formation is exposed, the proponent will cover the exposed formation with soil and move out of the immediate area. Further, excavation will not take place where slate participles significant. To mitigate the potential for acid rock drainage into and sedimentation of watercourses, the proponent will maintain a 30 metre buffer between the working face of the proposed pit, surrounding property, and the bank of any watercourse or ordinary high water

mark. To protect surface water from potential impacts, the proponent will follow the guidelines and principles outlined earlier in this document (see Erosion and Sediment Impacts section).

Surface Water sampling protocols & procedures

When collecting samples from monitoring wells for chemical analyses, protocols developed and used in the industry will be followed to ensure that representative samples of surface water are obtained. Water samples will be collected using approved equipment. For this project, samples will be collected in clean plastic bottles, as supplied by an approved Laboratory. These bottles will be of sufficient quantity for the desired suite of parameters for RCAP, TSS, low level nutrients, and metal scan. Samples will be stored in a controlled cool environment and delivered to a NSDEL approved analytical laboratory for analyses within 24 hours of collection. The results will be used to serve as benchmarks for assessing the risk of priority substances to aquatic and terrestrial organisms, environmental control measures, pollution prevention efforts, and to help evaluate, track and/or improve upon the effectiveness of existing or proposed management measures. All surface water sampling will take place at site #3 on the Rochford Brook where the Brook flows from the property, from May until October in any one year (see Figure 1).

After NSDEL approval, the first sample with be collected and analysed before the proposed pit activities begin. In 2004, surface water sampling will take place on a monthly basis (these can serve as a benchmark). In the following years, until the project is decommissioned, surface water sampling will occur, and the depth and temperature of the Rochford Brook measured, at site # 3 using industry methodology, and reported to NSDEL. All sampling and measurement will be carried out by competent specialists.

The proponent will follow the “Canadian Environmental Quality Guidelines” for water, sediment, soil or tissue, and the “Guidelines For Canadian Drinking Water Quality” for contaminants in drinking water for comparisons.

Monitoring Schedule

To determine the chemical characteristics of surface water in the vicinity of the Site a suite of parameters and frequency of sampling, and analyses is required. This information will be used for future comparisons of surface water quality within the area of influence of activities associated with this Undertaking. The water quality parameters of interest include those of general chemical, metals, and physical nature. Analyses for these samples will include the following parameters: calcium; magnesium; sodium; potassium, chloride; sulphate; iron; arsenic, uranium, manganese; copper; nitrate; nitrite; ammonia; alkalinity; pH; total hardness; total dissolved solids; specific conductance; a metal scan, and temperature. In the interim, a schedule of monitoring requirements is presented in Table 6.

Table 6. Proposed Surface Water Monitoring

	Parameter	**Source**	**Frequency**	**Reporting**
Quantity	Water level	Rochford Brook	Monthly in 1st yr.	Quarterly
Quality/field measurements	Conductance Temperature pH	″ ″ ″	″ ″ ″	″ ″ ″
Lab. analysis	RCAP	″	Annual	Annual
	Iron	″	Quarterly	Quarterly
	Manganese	″	″	″
	Calcium	″	″	″
	Magnesium	″	″	″
	Potassium	″	″	″
	Chloride	″	″	″
	Total hardness	″	″	″
	Alkalinity	″	″	″
	pH	″	″	″
	Sulphate	″	″	″
	Specific conductance	″	″	″
	Copper	″	″	″
	Zinc	″	″	″
	Nitrate-N	″	″	″
	Sodium	″	″	″
	Ammonia	″	″	″
	Arsenic	″	″	″
	Uranium	″	″	″
	Total Dissolved solids	″	″	″

As a guide for future seamless planning and operation of the surface water monitoring program for the TMC Undertaking at the Waterville Site, a schedule of monitoring is being proposed and outlined in Table 6. This schedule will assist future work and allow for a continuity of sampling and analyses of the water conditions of the Rochford Brook. Reports will be submitted to NSDEL (i.e., Environmental Monitoring and Compliance Office, Kentville, NS).

Surface water quality monitoring in the vicinity of the mixing, stockpiling, and extraction activities will serve four main purposes. The first objective is to determine the background quality of water in Rochford Brook. The second objective is to assess whether surface water contamination is occurring from Site activities. The third objective is to assess and characterize potential migration pathways of potential contaminants off the Site. The fourth objective is to determine presence of, and risk to, receptors of contamination, if it does exist. The surface water monitoring program planned for the proposed Undertaking is scheduled to be fully implemented shortly after approval of this Proposal.

6.1.6 Hydrogeology

In December of 2003, an assessment of the hydrology of the Site was carried out by Terry Hennigar, M.Sc., P.Eng., F.C.S.C.E. Field work included a reconnaissance of the area, a review of groundwater data available, and selection of sites for future monitoring wells. In addition to the assessment, Mr. Hennigar was asked to make recommendations for a water monitoring program for the proposed Undertaking. Mr. Hennigar's findings and recommendations in this document are Phase I of a three phase water monitoring program. Phase II & III will be carried out when the project receives initial NSDEL approval (see Appendix XI). Phase II represents identifying the exact location and construction of water monitoring wells and Phase III will be the actual carrying out of water well testing. Reports will be submitted to NSDEL (i.e., Environmental Monitoring and Compliance Office, Kentville, NS).

In the report, Mr. Hennigar tells us that groundwater hydrograph records in the general area of Waterville indicate periods of recession during the summer months followed by recovery during

the autumn over a 16 year period from 1965 – 1981. The groundwater level monitoring wells were constructed in different hydrostratigraphic units in the Valley. Water level fluctuations of approximately 3.0 m were documented, in the Coldbrook area, where water levels fluctuated between 12.2 and 15.2 m above mean sea level. Mr. Hennigar explains that during the ten year period of record at the Prospect site water level fluctuations of approximately 2.6 m were documented, where water levels in that well fluctuated between 131.1and 133.7 m above mean sea level. The maximum water level recorded was 133.7 m ASL on 29 January 1979.

As for the bedrock aquifers that underlie the Waterville area, Mr. Hennigar explains that they are located in Triassic sediments of the Wolfville Formation. He tells us that the most reliable and complete information on the characteristics of these aquifers comes from water well and pumping test records maintained by the NSDEL. Records were found for 20 wells in the water well records database within the four map reference grids in which the study area lies.

Mr. Hennigar reports that the average depth of wells constructed in the Wolfville Hydrostratigraphic Unit is 38.4 m, with a range of 16.8 to 110 m. The deepest reported well is 110 m deep and was rated at 1.0 igpm based on a preliminary air lift test. The bedrock well with the highest reported yield is 53.3 m deep and has an estimated preliminary yield of 45 igpm.

Mr. Hennigar tells us that groundwater quality can change significantly over a very short horizontal and or vertical distance because of the influence of minerals in the host bedrock or overburden materials. Mr. Hennigar has also identified the potential for acid rock drainage from slate particles encountered as clasts, or components, in the gravel deposits in the southern portion of the Site. The nature of the proposed sand and gravel extraction at the Bond Road Site, and the proximity of the contact to the Halifax Formation create a potential for groundwater contamination because of sulphide mineral components that underlie Halifax Formation. The main chemicals of concern include: pH, iron, manganese, sulphate, arsenic, cadmium, uranium, and total dissolved solids. Mr. Hennigar explains that these components in an acidified groundwater flow system are very mobile and can move down gradient in the groundwater flow

system. Acid rock drainage is of concern with respect to groundwater and surface water quality, and fish habitat.

Potential Effects and Proposed Monitoring Program

Potential Effects

The proposed Undertaking is not expected to have an effect on groundwater inside and outside the Site. The hydrologist and geologist suggest that groundwater and well water, as well as groundwater-surface water interactions will not be significantly adversely impacted by activities connected to this Undertaking because the proponent will not be intersecting the water table during excavation. For the same reason, they suggest that recharge to local aquifers will not be effected by the excavation of soils and sand at the Site. The nearest drinking water well is 100 metres from the soil mixing and proposed excavation area (see Figure 2, for the nearest drinking water well, represented by a red triangle).

Proposed Groundwater Monitoring Program

To maintain the quality and quantity of the surface water and groundwater at the Site, TMC will facilitate a water monitoring program as proposed by Mr. Hennigar (see Appendix XII). The water quality monitoring in the vicinity of the sand and gravel extraction operation will serve the following four main purposes:

1. To determine the background quality of groundwater in the area upgradient of the extraction operation.
2. To assess whether groundwater contamination is occurring from the sand and gravel extraction operations.
3. To assess and characterize potential migration pathways of potential contaminants off the site.
4. To determine presence of, and risk to, receptors of contamination if it does exist.

Once this Undertaking receives approval, TMC will implement Phase II which will include constructing a minimum of six (6) groundwater monitoring wells, preparing a log of the stratigraphy under the site, determining groundwater levels, sampling groundwater for initial water quality characteristics, determining groundwater flow patterns and gradients, and identifying potential down gradient receptors. A report will then be prepared and submitted to

the NSDEL for their review and information. This work will include the drilling of boreholes, construction of monitoring wells, collecting water samples from the monitoring wells for chemical analyses, making and recording water level observations, determining groundwater flow patterns, and determining vertical field hydraulic gradients in strategic areas of the site. Based on the recorded data and observations, a report will be prepared and submitted to NSDEL reporting the progress, results, and interpretation of the data over the first quarter for water quality and water level data.

Monitoring Wells

After consideration of local hydrogeological conditions of the site, traffic patterns in the area, and sensitive environmental components identified in this report, TMC will construct monitoring wells for the purpose of monitoring the quantity and quality of groundwater at the Site. The location, design, and construction of monitoring wells will follow approved methods adopted as standard operating procedures for the industry and are appropriate for the site and nature of groundwater monitoring planned for the site. Basic criteria for the location, design, and construction of the monitoring wells include the following:

- Separation distances in compliance with well construction regulations.
- Location and number of monitoring wells based on consideration of the hydrogeological framework of the site and sensitive area identified in the environmental assessment report.
- Depths of wells determined by the stratigraphic sequence encountered during drilling, depth to water table, and expected annual and seasonal groundwater level range of fluctuations.
- Minimum diameter of wells to be 50 mm inside diameter.
- Use of PVC schedule 40 flush joint pipe and screens with a minimum 50 mm thick gravel pack and bentonite grout in the appropriate sections of the borehole surrounding the well casing and screen.
- An approved plug on the bottom and an approved cap on the top of the casing will be placed to ensure the integrity of the monitoring well from the intrusion of surface water.
- The selection of screened sections will be based on the hydrogeologic conditions encountered and the stratigraphic section penetrated.
- Groundwater and well head elevations, and horizontal references for the well head, will be determined and documented as part of the record of the monitoring well construction.

- Wells will be constructed using casing, screens, sand, and grout to ensure integrity of the sample source.
- Well heads will be protected from traffic in the area by use of locking plugs in above grade steel casing serving as manholes to provide protective cover and security. (See Appendix XI for complete report).

For planning purposes at this point in the environmental assessment process, three areas of the proposed operation have been identified as being areas of potential concern for impacting on groundwater supplies adjacent to the site. They are:

- Area A, which is located immediately northwest of the proposed aggregate pit near Highway 1 and east of the intersection with Bond Road.
- Area B, which is located immediately west of the existing aggregate pit and east of Bond Road.
- Area C, which is located in the southern portion of the site and east of Bond Road (see Figure 2).

Once Phase II has been completed, TMC will carry out Phase III of the water monitoring program by sampling well water.

Water sampling protocols & procedures

All monitoring wells will be constructed with pumping rates varying between 4.5 and 9.1 litres per minute. Protocols developed and used in the industry will be followed to ensure that representative samples of groundwater are obtained (see Appendix XI). Water samples will be collected in clean plastic bottles, as supplied by an approved Laboratory, with sufficient quantity for the desired suite of parameters for RCAP-MS analyses. Samples will be stored in a controlled cool environment and delivered to a NSDEL approved analytical laboratory within 24 hours of sample collection for analyses. During Phase II of the program, or the first month of monitoring, TMC will collect a water sample from each of the monitoring wells. Analyses for these samples will include the following parameters: calcium; magnesium; sodium; potassium; chloride; sulphate; iron; arsenic, uranium; manganese; copper; nitrate; nitrite; ammonia; alkalinity; pH; total hardness; total dissolved solids; specific conductance; a metal scan; and temperature.

Monitoring Schedule

Based on Mr. Hennigar's recommendations, TMC will facilitate the following suite of parameters and frequency of sampling and analyses to determine the chemical characteristics of groundwater in the vicinity of the site. This information will be used for future comparisons of groundwater quality within the area of influence of the sand and gravel extraction operation and the quality of groundwater in the immediate vicinity outside the area of influence of the aggregate extraction operations. The water quality parameters of interest include those of general chemical, metals, and physical nature.

Table 7: Proposed Monitoring Requirements during Extraction Operations

Parameter	Source	Frequency	Reporting
Quantity			
Water level	MWs	Quarterly	Quarterly
Water level	BRs	Quarterly	Quarterly
Quality			
Field Measurements			
Conductance	All MWs	Quarterly	Quarterly
Temperature	All MWs	Quarterly	Quarterly
pH	All MWs	Quarterly	Quarterly
Laboratory Analyses			
RcAP-MS	All MWs	Annual	Annual
Iron	All MWS	Quarterly	Quarterly
Manganese	All MWs	Quarterly	Quarterly
Calcium	All MWS	Quarterly	Quarterly
Magnesium	All MWs	Quarterly	Quarterly
Potassium	All MWS	Quarterly	Quarterly
Chloride	All MWs	Quarterly	Quarterly
Total hardness	All MWS	Quarterly	Quarterly
Alkalinity	All MWs	Quarterly	Quarterly
pH	All MWS	Quarterly	Quarterly
Sulphate	All MWs	Quarterly	Quarterly
Specific conductance	All MWS	Quarterly	Quarterly
Copper	All MWs	Quarterly	Quarterly
Zinc	All MWS	Quarterly	Quarterly
Nitrate-N	All MWs	Quarterly	Quarterly
Sodium	All MWS	Quarterly	Quarterly
Ammonia	All MWs	Quarterly	Quarterly
Arsenic	All MWS	Quarterly	Quarterly
Uranium	All MWs	Quarterly	Quarterly
Total dissolved solids	All MWS	Quarterly	Quarterly

Note: MW denotes monitoring well, BR denotes Rochford Brook

As a guide for future seamless planning and operation of the groundwater monitoring program for the proposed Undertaking, the following monitoring schedule is being proposed is outlined in Table 7. This schedule will assist future work and allow for a continuity of sampling and analyses of the environmental groundwater conditions of the site. The sampling frequency, wells to be sampled, and parameters of interest during phase III, the first year of monitoring, will be determined on the basis of results obtained during phase II and discussions with staff of the NSDEL. In the interim, a schedule of monitoring requirements is presented in Table 7.

Phase III - During the first year of sand and gravel extraction operations, June 2004 to June 2005, samples would be collected from the monitoring wells for chemical analyses. A report will be prepared and submitted to NSDEL reporting progress, results, and trends in data over the one year period for water quality and water level data. At no time will Twin Mountain Construction Ltd. be excavating sand below the water table or blasting at the Site.

6.1.7 Air Quality

The Nova Scotia Department of Environment (NSDOE) monitors air quality at ten locations in Nova Scotia. Generally, air quality in Nova Scotia meets or exceeds national standards in most communities. The common air pollutants monitored regularly are sulphur dioxide, suspended particulate, carbon monoxide, ground level ozone, nitrogen dioxide and hydrogen sulphide. Exceedances for these contaminants are generally small and infrequent in Nova Scotia. The nearest NSDOE monitoring site is located at Alyesford, approximately 6 km from the project Site (NSDOE 1998).

Nuisance dust generated by truck traffic at the Site is a potential concern. It is anticipated that nuisance dust from these operations will be minimal as screening, mixing, and loading will take place ½ km from the nearest residence. Under no circumstances will used-oil be used for dust suppression. Dust on the access roadways will be suppressed by maintaining road surface quality and occasionally with calcium chloride. Calcium chloride is widely used as a dust suppressant, but the proponent recognizes that the product is a toxic substance. Accordingly, calcium chloride will not be used where is may impact watercourses and only when indispensable.

The proponent will maintain all natural barriers that currently exist to reduce the potential for nuisance dust and noise impacts. The existing barriers include a mixture of native plants and trees, which line the roadway to the Site, around the Site with the exception of approximately 500 meters along the southern eastern portion, and approximately 500 meters along the north eastern portion and across the northern portion of the property (see Figure 2).

The proponent will adhere to the follow suspended particulate levels as outlined in "Guidelines for Pits and Quarries" (see Table 8).

Table 8. Suspended particulate levels

Parameter	Max. Limit
Suspended Particulate Matter	60-70 ug/m^3 annual geometric mean
	120 ug/m^3 average concentration over a 24 hr. period

Source: NSDEL

6.1.8 Noise Levels

The potential for noise impacts on residents and wildlife in and adjacent to the Site is a real concern to TMC. Although noise connected with this project is not expected to be significant, the sources of noise will be trucks traveling to and from the Site, and equipment working at the Site. To mitigate noise levels from pit operations the proponent will maintain road quality and keep all equipment used at the Site in good operating order. More importantly, the proponent will adhere to the follow sound level exposure limits outlined in "Guidelines for Pits and Quarries" (see Table 9).

Table 9: Sound Level Limits

Leq. Sound Level Limits		
"Night "	"Evening"	"Day"
55dBA	60dBA	65dBA
Night	23:00 – 07:00	
Evening	19:00 – 23:00	
Day	07:00 – 19:00	

Source: NSDEL

6.1.9 Erosion and Sediment Impacts

With the disruption of the soils and grubbing and clearing activities, the potential for soil erosion and sedimentation of watercourses is a genuine concern. TMC will rely on three basic rules for erosion and sediment control:

a) soil stabilization;
b) runoff control; and
c) sediment control.

Runoff at the Site, from precipitation and surface water, is not expected to be a significant issue. Nonetheless, the Nova Scotia Department of the Environment Erosion and Sedimentation Control Handbook for Construction Sites will serve as the reference document for all erosion control measures. TMC will adhere to the following site design, management, and maintenance principles:

- Site activities will be coordinated with seasonal constraints (e.g., clearing, grubbing activities to avoid heavy participation; periods sensitive of fish and wildlife; and, shut down before freezing to stabilize soils before freeze-up).
- Maintain natural vegetative buffers.
- Maintain a undistributed 30 metre buffer of native vegetation between all watercourses, ponds, swamps/wetlands, and any rare and sensitive vegetation (e.g., Eastern Cedar).
- Keep infill material free of contaminants (i.e., for reclamation).
- Slope stockpiles appropriately to guard against runoff and sedimentation.
- Monitor receiving watercourses on the Site.
- Preserve and protect areas of natural vegetation on the site.
- Take special precautions to prevent damages that could result from project activity adjacent to watercourses, and wetlands/swamps by maintaining a30 metre buffer between the active area of the proposed pit and the bank of any watercourse or ordinary high water mark.
- Minimize the extent and duration of the area exposed at one time by reclaiming the excavated Site in a timely manner.
- Implement erosion control measures to stabilize exposed soils and prevent on-site damage such as sediment basins or traps, filter barriers, and diversions, and perimeter control practices prior to Site clearing, grubbing, excavation and grading to protect the disturbed area from off-site and onsite runoff and to prevent sedimentation damage to areas below the development site.
- Keep runoff velocities low and retain runoff within the active area of the site, as much as possible.

- Prevent sediment from being tracked onto public or private roadways by maintaining road quality with gravel.
- Maintain sediment control measures.
- Implement final grading and install permanent vegetation on disturbed areas as soon as possible after excavation.
- Follow up with a thorough inspection, maintenance, and mitigate measures of the Site during and upon decommissioning.[2]

Runoff at the Site will be controlled and contained within the active area of the proposed pits using the aforementioned erosion and sedimentation control measures. Runoff will be, for the most part, allowed to evaporate and infiltrate into the ground. The soil at the Site has low water holding capacity, thus allowing water to move rapidly. Properly installed silt fences and areas for runoff will be constructed and properly maintained to control runoff prior to commencement of Site preparation and excavation activities. Standing water will be controlled by leaving enough sand within the pit areas and in the containment areas to take up excess water.

At the Site, the forested area and farmland slopes two to five percent (2-5%) toward the Rochford Brook (see Figure 2, green arrows indicate direction of slope). In the southern portion of the Site (i.e., south of the Brook), the old pit and a three-metre embankment along the brook serve as a containment area for runoff and constraining sedimentation. In the northern portion of the Site (i.e., north of the Brook), the working face of the pit will proceed in a southerly direction, hence keeping runoff from any sensitive areas. When the area north of the Rochford Brook is being prepared for excavation, the proponent will properly install silt fences and any other measures necessary to mitigate potential runoff from the proposed active area of the Site and sedimentation of the Brook.

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[2] Cf. Natural Resources Conservation Service (1995). Accessed on November 20, 2004. Accessed at http://www.il.nrcs.usda.gov/engineer/urban/index.html.

Hazardous Materials and Contingency Planning

Any accidental spills of toxic materials will be dealt with expeditiously. Diesel fuel and petroleum products are not, nor will they be, stored on Site. Diesel fuel and petroleum products used in the machinery will be delivered only as required by the proponent. Refuelling of equipment will take within the mixing area of the Site, 150 metres south of the Rochford Brook (consistent with NS Watercourse alteration specifications). Should an accidental spillage occur, the contaminants will be contained using sand and absorbent pads. Once contained, the contaminated sand and materials will be scooped up, placed in appropriate barrels, placed on a truck, and then transported without delay to the Envirosoil recycling facility in Bedford, NS for processing.

As a component of this contingency plan, operators will have access to mobile- radios or -phones on Site. Shovels, absorbent materials, appropriate barrels (i.e., for holding contaminated soil before disposal, etc.) will be kept at the Site. All refuse (e.g., oil containers, waste materials) associated with this Undertaking will be placed in refuse containers, which will be kept on the service vehicle, and removed immediately from the Site after use and disposed of properly. All spills and releases will be promptly contained, cleaned up and reported to the 24-hour emergency reporting system (1-800-565-1633).

The forested area in the southern portion of the Site is an extra concern because of its potential for fire. Recognizing this concern, TMC will promote safety and conscientiousness among its staff and customers. In the event of a fire, the local fire authority and the Department of Natural Resources will be contacted immediately. Further, TMC will adhere to the following:

- No deleterious substances will be deposited in watercourses or left at the Site.
- No water will be removed from any watercourse on the Site
- No watercourse be diverted on the Site.
- No equipment will enter any watercourse on the Site.

6.2 Socio-economic Conditions

6.2.1 Economy

From 1991 to 1996, the Waterville area (Subdivision A, County of Kings, NS) experienced a 6.8% increase in its population, from 21,245 in 1991 to 22,700 in 1996.3 The subsequent five years saw a 1.2% reduction in the number of persons living in the Waterville area, from 22,700 in 1996 to 22,430 in 2001 (Table 7). In 2001, the population density in the Waterville area was 18.2 persons per square kilometre compared with 17.2 persons per square kilometre in Nova Scotia. The average age of the population in Waterville is 37.2 years compared with 38.8 in Nova Scotia. The percentage of the population who are ages 15 and over is 78.5% compared with 81.8% in Nova Scotia.

Of those persons reporting income in Waterville, the average total income is $18,320 compared with $18,735 in Nova Scotia. In 2001, the unemployment rate in Waterville was 8.4 % compared with 10.9 % in Nova Scotia. In 2001, of the 10,780 persons employed in the Waterville area, 1,755 were employed in secondary manufacturing and construction industries, whereas 9,030 were employed in tertiary service industries.

In the Waterville area, for persons 20-64 years of age, the percentage of the population with less than a high school certificate is 27.3 % compared with 25.3 % in Nova Scotia. For those aged 20-64 years holding a trade or college certificate or diploma, the percentage is 37.2% compared with 34.1% in Nova Scotia. The percentage of the population 20-64 years of age with a university certificate, diploma or degree is 13.0% compared with 20.0% in Nova Scotia (see Table 10, for socio-economic information).

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[3] The source for the socio-economic data was Statistics Canada. Accessed from http://www.statcan.ca. Accessed on April 18, 2003.

Table 10: Socio-economic Information for Waterville, NS

Socio-economic Information	Waterville (Kings County, Subdivision A)	Nova Scotia
General Population Information		
Population Count 2001	22,430	908,007
Population Count 1996	22,700	909,282
Population Change 1996-2001 (%)	-1.2	-0.1
Population Density per Square Kilometre	18.2	17.2
Population 15 Years and Over	78.5	81.8
Median age of the population	37.2	38.8
Languages First Learned and Still Understood:		
Total - All persons	22,185	897,565
English	20,855	832,655
French	795	34,025
Both English and French	45	2,560
Other Languages	495	28,330
Immigration Characteristics		
Total - All persons	22,190	897,570
Canadian-born Population	21,295	853,655
Foreign-born Population	870	41,320
Immigrated Before 1991	670	31,030
Immigrated Between 1991 and 2001	200	10,285
Non-permanent Residents	20	2,595
Education		
Total Population 15 Years and Over Attending School Full Time	1,665	82,685
% Population Aged 20-64 with Less than High School Graduation Certificate	27.29	25.31
% Population Aged 20-64 with a Trades Certificate, Diploma or College Certificate, Diploma	37.19	34.06
% Population Aged 20-64 with a University Certificate, Diploma or Degree	12.95	19.97
Income		
Median Total Income of Persons 15 Years of Age and Over ($)	18,320	18,735
Labour Force Indicators		
Participation Rate	63.40%	61.60%
Employment Rate	58%	54.90%
Unemployment Rate	8.40%	10.90%
Industry (Number of People Working in Each Sector)		
Total - Experienced labour force	10,780	442,425
Agriculture and other resource-based industries	975	29,000
Manufacturing and construction industries	1,755	70,955
Wholesale and retail trade	1,645	71,085
Finance and real estate	295	20,620
Health and education	1,685	80,700
Business services	1,105	70,270
Other services	3,325	99,790

Twin Mountain Construction Ltd. contributes to the economy of Waterville and Area as it currently employs 45-50 people. The employees work in different sectors of the operation. They will be employed in the proposed Undertaking. If market conditions allow for increased production, the proponent may require additional employees. However, further employment at TMC is dependent on the proponent's ability to source additional sand. TMC does intend to increase its yearly production. If so, it is likely that the proposed pit operation will add to the socio-economic impact beyond what TMC currently contributes. TMC has recently purchased and added five (5) additional trucks to its fleet. Not only will current employees of TMC benefit (economically, socially) from the proposed project, so too will others that work in tertiary service industries in the Waterville & Area.

6.2.2 Land Use & Value

The Site of the proposed Undertaking is located south of the Waterville Growth Centre. Land use in the area of the Waterville Growth Centre is a mix of residential, commercial, open space, and institutional developments. The area surrounding the TMC proposed Undertaking is Agricultural. The Site is located entirely within an area zoned as A1, which permits topsoil and aggregate extraction operations. Appendix II shows the mix of land use and urban zoning in the area as mapped by the Municipality of the County of Kings. Properties immediately adjacent to the site are zoned as follows:

- ⇒ East side: Zoning is A1, Agricultural district.
- ⇒ North side: Zoning is A1, Agricultural district.
- ⇒ West side: Zoning is A1, Agricultural district.
- ⇒ South side: Zoning is A1, Agricultural district.

While the property in question is classed as agriculture land, the area in which the property is located has experienced significant housing construction.

Municipal Planning Strategy

The primary aim of the Municipal Planning Strategy for the County of Kings is the protection of the agricultural land-base.[4] The nearest residential growth area to the proposed Undertaking is in Cambridge/Coldbrook area, which is approximately 8 km from the Site. Responsibility for the aggregate in the County of Kings falls under the authority of the Province of Nova Scotia. The proposed sand pit activities fall within municipal resource extraction policies as the land-base on which the project will be located is zoned Agricultural. The municipal council for the County of Kings has enacted policies and regulations that prohibit the removal of topsoil for commercial purposes on areas that are zoned Agricultural. Accordingly, TMC will not remove any topsoil or overburden from lands at the Site.

6.2.3 Human Health

The health of residents in the Waterville area is similar to that of other Nova Scotians. In some categories, such as infant morality, and lung cancer, Waterville residents are below the provincial and national average (See Table 11, for health data on residents for Waterville and area).

Table 11: Health Information for Waterville, Nova Scotia

Health Information	Kings County	Nova Scotia	Canada
Life Expectancy at Birth for Both Sexes in Years (1997)	78.7	77.7	78.5
Life Expectancy at Birth for Males in Years (1997)	76.3	74.9	75.7
Life Expectancy at Birth for Females in Years (1997)	81.2	80.4	81.3
Average Rate of Infant Mortality per 1,000 Live Birth (1997)	3.9	4.9	5.5
Total Incidence of Cancer per 100,000 for Both Sexes (1997-1998)	374	420.2	384.2
Total Incidence of Cancer per 100,000 Males (1997-1998)	429.8	498.8	449.6
Total Incidence of Cancer per 100,000 Females (1997-1998)	332.1	368.4	340.7
Incidence of Lung Cancer per 100,000 for Both Sexes (1997-1998)	65.1	67.1	58.7
Incidence of Lung Cancer per 100,000 Males (1997-1998)	95.7	90.9	80.5
Incidence of Lung Cancer per 100,000 Females (1997-1998)	40.1	95.7	42.4
% Population Aged 12 and Over with Asthma for Both Sexes (2000/01)	9.1	9.1	8.4

[4] Municipal Planning Strategy. Municipality of the County of Kings. Accessed at http://www.county.kings.ns.ca/. Accessed on April 23, 2004.

% Population Aged 12 and Over with Asthma for Males (2000/01)	7.3	7.5	6.9
% Population Aged 12 and Over with Asthma for Females (2000/01)	10.9	10.7	9.9
Rate of Death due to Lung Cancer per 100,000 for Both Sexes (1997)	52.8	57.7	49.3
Rate of Death due to Lung Cancer per 100,000 Males (1997)	78.3	80.5	70.9
Rate of Death due to Lung Cancer per 100,000 Females (1997)	33	41.1	33.5
Rate of Death due to Respiratory Disease per 100,000 for Both Sexes (1997)	83.5	76.3	61
Rate of Death due to Respiratory Disease per 100,000 Males (1997)	122.7	108.5	87
Rate of Death due to Respiratory Disease per 100,000 Females (1997)	60.7	57.7	45.7
Rate of Death due to Pneumonia and Influenza per 100,000 for Both Sexes (1997)	41.5	33.1	24.3
Rate of Death due to Pneumonia and Influenza per 100,000 Males (1997)	51.1	42.6	32
Rate of Death due to Pneumonia and Influenza per 100,000 Females (1997)	36	27.7	19.9
Rate of Death due to Bronchitis, Asthma, and Emphysema per 100,000 for Both Sexes (1997)	6.6	5.8	6.1
Rate of Death due to Bronchitis, Asthma, and Emphysema per 100,000 Males (1997)	12.3	8.2	8.4
Rate of Death due to Bronchitis, Asthma, and Emphysema per 100,000 Females (1997)	3	4.5	4.7
Rate of Death due to Circulatory Disease per 100,000 for Both Sexes (1997)	231.7	252	239.2
Rate of Death due to Circulatory Disease per 100,000 Males (1997)	295.9	334.9	307.9
Rate of Death due to Circulatory Disease per 100,000 Females (1997)	185.6	191.1	187.6

6.3 Archaeological and Heritage Resources

On September 11, 2003, a discussion was held with Stephen Powell of the Nova Scotia Museum of Natural History (NSMNH) regarding the existence of potential archaeological and heritage resources on or within the vicinity of the proposed project. Mr. Powell advised that NSMNH is not aware of any existing or potential archaeological or heritage resources on or in the vicinity of the proposed Undertaking. In addition, research of maps and other documents was carried out at the Nova Scotia Archives, University Avenue, Halifax NS. Documentation of archaeological and heritage resources that may be associated with the Site were not found. The nearest site of archaeological significance is an aboriginal burial ground unearthed in Kentville, NS (see Appendices XIII & XIV).

Although no existing or potential archaeological or heritage resources were identified on or in the vicinity of the proposed Site, if artefacts or physical evidence are found during extraction activities, TMC will contact the NSMNH immediately to preserve, protect, or recover any features of socio-economic, cultural, or archaeological value.

6.4 Other Undertakings in the area

There are approximately nine (9) other pit and quarries operating or licensed to operate in a 16.1 km radius of the proposed Site. Although these Undertakings add to the traffic flow through Valley corridor, TMC does not expect its activities at the Site to significantly increase the traffic flow.

7.0 Effects of the Undertaking on the Environment

As with most projects, there are advantages and disadvantages associated with this project. Understandably, some adverse environmental effects connected to this project are anticipated. Firstly, it is anticipated that the project described in this document will result in some loss of terrestrial habitat within the expanded pit footprint. The loss of habit is not expected to be significant. The impacts which may result from the Undertaking will likely be short-term. There will, as well, be some loss of agricultural production for the short-term when the footprint of the pit moves onto agricultural land. It is expected that the project will not result in a loss in the productive potential of soils at the Site. Alternatively, this project provides opportunities for removing rapidly draining soils and shaping the slope of land in a way that improves the productive potential of the soils.

Secondly, the impact of activities connected with this project on flora and fauna are not expected to be significant. The Site does not appear to be a unique habitat for rare or sensitive species. Three rare species of birds have been identified at the Site, but it is anticipated that the proposed project will have no more impact on these birds than do current Site and farming activities.

Thirdly, the removal of surface aggregate in the quantities indicated in this study is expected to have little effect on both the quality and the quantity of the surface water and groundwater on or adjacent to the Site. Close attention to water monitoring should identify potential impacts of excavation at the Site before impacts occur or become significant. Potential disadvantages connected with this project are nuisance dust and noise arising from activities connected with this Undertaking (e.g. trucks and activities at Site).

Fourthly, there is always the safety concern with vehicular traffic. A significant increase in truck traffic to and from the Site is not anticipated. Lastly, there is the potential for sedimentation and contamination arising from pit activities that may afterward spoil the aquatic habitat of the watercourses on and off the Site. Vigilant monitoring of all Site activities is crucial.

The advantages of the project are mostly in the from of socio-economic benefit. The project will provide continued employment opportunities for those individuals employed in activities closely related with the project (e.g., individuals who work for TMC). There are also those who work in tertiary industries that service individuals and organizations associated with the project. The sand excavated from this Site also plays an important role in safeguarding the environment, as it is a component in the construction of waste water treatment systems.

As one specialist stated during the development of this document, removing a layer of sand from the Site may well enhance agricultural production. It is expected that the benefits from this project will far outweigh its disadvantages. The aim here is to service the needs of society without significantly adversely affecting the environment. With careful application of the monitoring and mitigative measures outlined in this document, TMC believes that potential adverse effects, identified and evaluated in this document, can be avoided, lessened or ameliorated.

8.0 Effects of the Environment on the Undertaking

The environment may affect this Undertaking primarily by way of climatic conditions. Input events (e.g., precipitation) or runoff may hold up the timely preparation, excavation, and

reclamation of land within the active area of the proposed project. Further, wet weather or snow may limit when aggregate can be hauled from the Site. If the environmental conditions are not conducive to the relevant activity, the activity will have to be postponed until conditions are more amenable.

9.0 Regulatory Compliance & Approvals

Approval for this project will be sought in accordance with the requirements of the following provincial legislation and the regulations made pursuant to them:

- Nova Scotia Environment Act; and;
- Industrial Approval for Pit and Quarry Development under the Activities Designation Regulations.

The proposed Bond Road Sand Operations will adhere to the most recent versions of the relevant NSDEL guidelines and specifications including: Pit and Quarry Guidelines; Erosion and Sedimentation Control Handbook for Construction Sites, and Guideline for Environmental Noise Measurement and Assessment. In addition, the following joint provincial guidelines and specifications may apply: Guidelines for Development on Slates in Nova Scotia. All work at the Site will be carried out in accordance with the Nova Scotia Occupational Safety General Regulations, or the relevant legislation in force at the time of construction.

Approvals for this project may not be required in accordance with the following federal and provincial legislation and the regulations made pursuant to them; nonetheless, the activities associated with this project must comply with the following:

- Canadian Environmental Protection Act;
- Canadian Fisheries Act;
- Canadian Migratory Birds Conservation Act;
- Nova Scotia Dangerous Goods Transportation Act;
- Nova Scotia Environment Act;
- Nova Scotia Special Places Act; and
- Nova Scotia Wildlife Act.

10.0 Funding

This Undertaking will be 100 percent privately funded. A copy of the Deed for this property is included (see Appendix V).

11.0 Conclusions

The studies captured in this document identify and assess the potential environmental impacts of activities connected to the proposed *Bond Road Sand Pit Operations*. In addition, this study identifies appropriate mitigation and monitoring measures to eliminate, lesson and mitigate any potential effects. Part of TMC's Site management strategy is to carry out a monitoring and mitigation program, as proposed herein, to ameliorate, lesson or eliminate any potential impacts connected to project activities on surface water, groundwater, flora, fauna, and residents in proximity to the Site. Further, the aim is to rid the community of the sewage sludge currently stored at the Site. Once TMC has exhausted sand at the Site, the long-term goal is to re-establish the Site to a productive forested and agricultural area. Toward this end, TMC will employ an adaptive management strategy "with the central tenant that management involves a continual learning process that cannot conveniently be separated into functions like…ongoing regulatory activities" (Walters, 1986, p. 8; see also Gunderson, Holling, & Light, 1995). The strategy here is to envision the biophysical and socio-economic environments as dynamic entities that are interrelated and interconnected, which require from TMC appropriate responses.

The proponent views the proposed *Bond Road Sand Pit Operations* as an important and necessary contribution to the future economic stability of TMC, the needs and well being of the owner, the employees and Nova Scotians. Travel to and from the Site will follow the established route. Treed areas along property borders will be maintained to serve as a noise and dust screen. It is acknowledged that the Undertaking will result in a short-term loss of terrestrial habitat within the proposed active area of the Site, but these impacts are not expected to be significant. TMC will not remove overburden or topsoil (sourced from the Site) for commercial purposes from the Site. Reclamation will occur at the Site as soon as it is physically possible.

Lastly, TMC will strive to improve its relationship with the residents and community of Waterville. For that reason, removing the sludge from the Site is a priority for TMC. Assuming that the monitoring and mitigative measures outlined in this report are implemented, and the pit is operated according to existing provincial guidelines and approvals, it is expected that no significant adverse residual environmental effects will be apparent.

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