9.3.6 Human Health and Wellness and Socio-Cultural Environment

EIS Reference: EIS Volume VII, Chapter 9, Section 9.3.17

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9.3.7 Community Profile

9.3.7.1 Demographic Profile – Include the community of Brier Island in the analysis of population, economy, tourism, etc. Discuss how changes of the population in the Digby Neck and Islands region compare with other rural coastal areas of Nova Scotia over the same period.

RESPONSE

The analysis of population has been updated to include the geographic area of Brier Island. A prior investigation of the population trend for Brier Island had been conducted. It was omitted as part of the original review in order to maintain continuity of geographic representation from the quarry as described in the EIS. However, information specific to Brier Island was incorporated or not excluded from other components of the analysis under the Community Profile section, such as the analysis of education, income, and the economy including the fishery and tourism.

Population statistics for Dissemination Area 37 or Brier Island, reflect a similar pattern of decline in population from 1981 through 2001 to that of other areas within the Digby Neck and Island region. According to Statistics Canada data, the population on Brier Island declined 25.4% or an absolute decline of approximately 90 persons from 1981 to 2001. The following table outlines population change for Digby Neck and Islands inclusive of Brier Island.

Table DP- 1, Population Change 1981-2001, Digby Neck and Islands

	1981 Census			*1991 Census*			*2001 Census*		*Percent Change*
	#	*Total*	%	#	*Total*	%	#	*Total*	%	*'81-'01*
Total Reporting 5 to 10-year age groups		2,205			1,915			1,595		-27.7
0 - 4 yrs	135		6.1	140		7.3	80		5.0	-40.7
5 - 9 yrs	180		8.2	115		6.0	95		6.0	-47.2
10 - 14 yrs	225		10.2	120		6.3	105		6.6	-53.3
15 - 19 yrs	215		9.8	165		8.6	85		5.3	-60.5
20 - 24 yrs	160		7.3	160		8.4	55		3.4	-65.7
25 - 34 yrs	315		14.3	290		15.1	180		11.3	-42.9
35 - 44 yrs	205		9.3	275		14.4	230		14.4	+12.2
45 - 54 yrs	205		9.3	165		8.6	270		16.9	+31.7
55 - 64 yrs	270		12.2	180		9.4	170		10.7	-37.0
65 - 74 yrs	190		8.6	210		11.0	160		10.0	-15.8
75+	110		5.0	125		6.5	215		13.5	+95.5

Source: Statistics Canada Profile Information. EA & DA's 1981-2001

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The inclusion of population data for Brier Island did not reveal any appreciable change in what was originally concluded as the general trend of population decline within the region. The original figure of decline presented in the EIS was 28.4%, the inclusion of population data for Brier Island reduced the percent decline to 27.7%.

There were some minor changes in population distribution across age categories, with possibly the most notable being a reduction in the percentage increase of population in the 75+age category. The inclusion of population data for Brier Island reduced the overall percentage increase from 116.7% to 95.5% for this age category. However, once again, as stated in the EIS, the general trend across age categories reflects a reduction in younger age populations and a growing elderly population.

The following table illustrates the change in population over various classifications.

Table DP-2, Change in Age Categories, Digby Neck & Islands

Classification	*Age Category*	*1981* #	*2001* #	*Percent Change '81 – '01*
Youth -dependent	0 – 14	540	280	-48.1
Young Workforce	15 – 34	690	320	-53.6
Young Family	20 - 44	680	465	-31.6
Primary Workforce	20 - 64	1,155	905	-21.6
Retirement	65+	300	375	+25.0

Source: Statistics Canada Profile Information, EA & DA's 1981-2001

The population decline that has occurred on Digby Neck and Islands appears to be more of a recent phenomenon, within the past 20 to 25 years, than the typical continuous long-term decline experienced in many rural agricultural communities. According to research on the area conducted by Social Anthropologist Anthony Davis (Dire Straits: The Dilemmas of a Fishery – 1991), the area's population was fairly stable, with moderate growth in some communities between 1961 to 1981. Mr. Davis commented that the 1981 Census figures on age and sex distribution of the area attested to the probability of future problems for the Neck and Islands. He compared the contemporary population distribution, which reflected a relatively flat distribution along age categories, to that of the bell shaped distribution of Digby County in 1951. He further commented that there were more people in the older age groups and fewer in the economically active age group, those between the ages of 20 and 64. Moreover, if the pattern of substantial out-migration by young people continued to prevail, it would be safe to predict that the distortions in age structure present at the time would be exaggerated in the future and that the viability question raised in the 1950's Sterling County study may become a serious problem (Davis 1991).

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The Panel requested a comparison of population decline with other rural coastal areas of Nova Scotia over the same period. This would be rather difficult to do given the changes in boundaries of Census agglomeration areas that occurred from 1981-2001 and the constraints of access to concordance information and cost of acquiring this data. In light of this, a comparison of population change among coastal communities from 1991-2001 only, has been conducted in order to provide a comparison of change along community lines. The following section draws heavily upon research and analysis contained in a document entitled "Between the Land and the Sea", a study completed in 2004 by PRAXIS Research and Consulting Inc., commissioned by the Coastal Communities Network of Nova Scotia.

The study's primary objectives was to assess the role marine harbors and infrastructure played in the economic health of coastal communities, demonstrate the extent to which the stability of coastal communities were dependent on this infrastructure and whether rationalization initiatives by government were justified when comparing net savings to potential social costs to the communities. As a part of their assessment, PRAXIS developed various database tools to estimate and monitor demographic and other economic changes occurring in coastal communities.

Section 3.1 of the PRAXIS study outlined demographic trends and settlement patterns for coastal rural, non-coastal rural and urban zones within Nova Scotia. Coastal rural was defined as all the areas of the province that bordered the coast, with the exception of urban areas. The coastal rural zone was divided into 77 harbour clusters based on one or more identifiable communities. For example, instead of identifying a single area cluster such as Tatmagouche an area range was used to identify the cluster such as Prospect to Peggy's Cove, NS.

The study's general findings established a figure for rural coastal population of 268,095 and that the coastal rural zones had a 6.10% loss in population from 1991-2001 and the loss that occurred between census years 1996 and 2001 was 3.90%. Non coastal rural zones had a population loss of 13.1% from 1991-2001, however only a slight loss of 0.65% occurred between 1996 and 2001. Population change was presented for each identified community cluster as well. According to the findings, 10.4% of the coastal harbour clusters experienced significant growth (greater than a 5% increase), 11.7% had slight to moderate growth (0.1 to 5% growth), 20.8% had a slight to moderate decline (-0.1 to -5%), 32.5% had a significant decline (-5.1% to -10%), 15.6% a very significant decline (-10.1% to -15%) and approximately 9% of the clusters were categorized as having a severe population loss (-15% or greater). Digby Neck and Islands fell into this latter category of severe population loss.

As a complement to the PRAXIS study, an analysis of population change was also conducted using Nova Scotia Community Counts data for population change between 1991 to 2001. The geographic boundaries outlined by NS Community Counts are somewhat different from those defined in the PRAXIS study in that the geographic boundaries do not necessarily

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follow Census dissemination area boundaries. However, the geographic boundaries used to define Digby Neck are the same in both instances.

One hundred and seventy-one communities identified as having a coastal influence (i.e. abutting or adjacent to a coastline) were analyzed. **Maps 32 and 33** reflect the change in population that occurred within these communities from 1991 to 2001. A further refinement was conducted to exclude those communities with urban influence and population densities greater than 150 persons/km^2, consistent with the definition of rural population measure by the Organization for Economic Cooperation & Development, in order to establish a proximate for rural coastal.

The population estimate was generally similar to that expressed in the PRAXIS study. Rural coastal population, using Coastal Community data, was estimated at 270,143. However, the difference in the change or decline in population was appreciably lower, with a decline of only 3.58% from 1991 to 2001 and a loss of 2.57% between Census years 1996 and 2001 compared with 6.10% and 3.90% respectively. However, regardless of which figures are truly more reflective of the actual change, it is probably safe to say that Digby Neck and Islands is experiencing a greater level of population loss in comparison to the average for coastal communities. Moreover, while most rural coastal communities (76%) are experiencing some level of population decline, there are only a few (15 communities) experiencing a population decline similar to or greater than Digby Neck and Islands.

9.3.7.1.1 Describe the population and distribution of seasonal residents.

RESPONSE

Non-resident land ownership in Nova Scotia, especially in coastal communities, was investigated in 2001 by the Voluntary Planning Task Force (2001). This study indicated that non-residents own more than 16% of coastal property in Nova Scotia. Non-resident ownership of coastal properties is particularly high in Annapolis and Digby counties (more than 25%). Also, the counties of Queens (24.1%), Shelburne (21.5%), and Richmond (17.3%) have high non-resident coastal property ownership.

Digby county in particular has the highest non-resident land ownership in Nova Scotia (http://www.gov.ns.ca/vp/nonres/snsmr/ProvincialMap.htm). Non-resident ownership in Digby county amounts to 75,318.8 hectares or 28.3% of the total county area (http://www.gov.ns.ca/vp/nonres/snsmr/DigbyMap.htm). As shown on the above referenced map, Digby Neck and Islands accounts for a significant portion of coastal properties in non-resident ownership. It should be noted that the non-resident ownership was derived from analysis of the Mailing Address component of the Nova Scotia Property Records Data Base as of May 2000. Since not all non-resident landowners use their permanent residence

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address for assessment notice purposes, the non-resident ownership displayed on these maps is probably a conservative number.

To more accurately determine the non-resident (seasonal) population distribution of seasonal residents in proximity to the proposed Whites Point Quarry and Marine Terminal, a similar, updated data analysis as above was used for continuity. Current (2006) mailing addresses were reviewed using the address component of the Nova Scotia Property Records Data Base. These addresses with their corresponding property identification number were then crossed referenced with Service Nova Scotia and Municipal Relations property identification mapping. Non-resident properties with buildings shown on the property maps, were then identified as non-resident (seasonal) residences. Non-resident properties without building shown on the property maps, were identified as simply non-resident properties. These latter properties have the potential for future residential development or subdivision. The extent of this investigation extended somewhat beyond the 4 km primary area of influence of the proposed quarry. This area of influence is similar in extent to the 4 km study zone as inventoried for the "Buildings by Type" – Maps 3A – 3E contained in the EIS.

Following are the results of this investigation with distribution of non-resident (seasonal) residences shown on **Maps 34 and 35**. Approximately 76 seasonal residences were identified. Assuming 2.3 persons per household, a total seasonal population within this particular study area would be approximately 175 seasonal residents. This probably represents a conservative estimate as some seasonal residents may choose to maintain a local mailing address for assessment purposes and not their permanent non-resident address. Also, seasonal residents may rent or vacation seasonally at residences owned by family members which have local mailing addresses. Also shown on **Maps 34 and 35** is the non-resident land area with potential for future residential or subdivision development.

Sandy Cove, the major population centre on Digby Neck, historically has been an area preferred by seasonal residents. Traditional knowledge contends the population of Sandy Cove increases 50% during the summer months. In addition to the influx of seasonal residents, real estate speculation by non-residents is evident. Of the total 2,442 acres investigated within the Sandy Cove area, a significant amount (91%) or 2,217 acres were identified as being in non-resident ownership. For the purpose of this study, non-resident ownership was determined from the property records database as properties other than those with a Sandy Cove mailing address. One can assume that non-resident speculation has effectively inflated real estate prices to the point where local residents cannot afford to purchase land in this area. The amount of land, including coastal properties, in non-resident ownership will likely influence a transition from traditional socio/cultural/development patterns.

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References

Voluntary Planning Task Force (2001). "Non-Resident Land Ownership in Nova Scotia". http://www.gov.ns.ca/vp/nonres/fr.pdf

Voluntary Planning Task Force (2002). "Maps and Statistics". http://www.gov.ns.ca/vp/nonres/back.htm

Coastal Communities Network, Atlantic Health Promotion Research Centre, and Dalhousie University. "Painting the Landscape of Rural Nova Scotia" October 2003.

Service Nova Scotia and Municipal Relations, Land Information Centre – Western Region, Registry and Information Management Services Division, "Property Identification Map and Parcel Historic Listing Report" 2006.

The Proponent has committed to focusing its hiring efforts on women in the local area, yet it provides no evidence or argument in 9.3 that would lead to this strategy. Provide evidence or otherwise explain the Proponent's proposed hiring strategy to target women.

RESPONSE

Bilcon will:

- provide full and fair employment opportunities for women during all project phases;
- ensure that potential women candidates are reached through special communications' initiatives;
- ensure that any recruitment effort focuses equally on women and men;
- actively seek the advice and participation of women's groups in any community–based initiative;
- promote female candidates in a range of skilled, unskilled, technical and professional job classifications and provide opportunities for advancement on the basis of qualifications and performance;
- provide ongoing support for women by providing a workplace where all individuals are treated in a fair, equitable and respectful manner while working on the project and ensure that zero tolerance for sexual harassment occurs in the workplace; and
- have the workplace reviewed by a gender specialist to ensure that no barriers to women's participation at the workplace are readily apparent.

9.3.7.1.7 The EIS states that "The area appears to be a community in decline." Describe the evidence, apart from population loss, used to draw this conclusion.

RESPONSE

The statement, "the area appears to be a community in decline", was a reference to population loss only and was not used or intended to be construed as a summation of the

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stability of the community in general. However, as was discussed in the EIS, there are inherent difficulties in maintaining community infrastructure when a community continues to lose population over time and eventually, if this situation is not reversed or some form of economic development does not occur, the community will experience a decline.

Consider evidence from traditional community knowledge or public consultation in drawing conclusions about community character, function and viability.

RESPONSE

Throughout the Traditional Knowledge report, numerous anecdotal examples of an area in decline were expressed by residents. However, Digby Neck, in many ways, is no different than many rural areas of Canada. These rural areas are experiencing declining fertility rates, out-migration of both young and old and limited economic opportunities, all of which contribute to a decline in such social institutions and infrastructure such as schools, churches, health facilities, businesses and recreational facilities. In the individual consultation report, of the more than 50 individuals who expressed an opinion about the project, almost half of them indicated the need for employment in the area. Examples of their comments were "There is a desperate need for long term sustainable development in this area and this project would help" and "Employment opportunities in the area are limited and the project would provide much needed opportunities."

The situation can perhaps be summed up in 4.4 and 4.5 of the Community Knowledge Report located in EIS Reference Volume VI, Tab 23.

Section 4.4

Many of the participants expressed a feeling of loneliness associated with not having their children or grandchildren close at hand. #48 "They have had to go away to find work." and #16 stated "There is nothing here for them." #15 stated that "My children phone me every night since their dad died". She went on to say that "in the past you never moved very far away and families were close". The increased mobility and educational opportunities as well as a lack of viable employment opportunities are all factors in this situation. Many spoke of schools in Freeport, Central Grove, Tiverton, Little River, Mink Cove, Sandy Cove, Lake Midway, Centreville & Rossway. In the 1940's it appears that there were over 600 children in the small schools. In 2005, there are less than 180 students in the two remaining consolidated schools.

Section 4.5

When speaking of the current community #55 stated that "Anyone who could go has gone and those who stayed are living on the edge." He continued "We have a lot of folks on welfare or UI (Employment Insurance) for most of the year. None of my kids are here; they

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are all working away. Christ, I left when I was in my 20's and just came back to retire. If nothing changes in terms of employment, who is going to drive the fire trucks?"

Correct the references to the table numbers on Pg 60.

RESPONSE
On page 60, the Table reference should be Table CP – 23, not Table CP – 20.

Describe social networks and institutions, community values and concerns, and the cultural characteristics of the area.

RESPONSE
Please refer to:
EIS Volume VII – 9.3 Human Environment and Impact Analysis
9.3.7 Community Profile, page 28
9.3.10 Economy Fishery, page 85
9.3.11 Economy – Fishery/Aquaculture, page 88
9.3.12 Economy – Fishery/Intertidal, page 90
9.3.13 Economy – Fishery/Nearshore, page91
9.3.14 Economy – Tourism, page 97
9.3.15 Economy – Land Value, page106
9.3.17 Human Health and Community Wellness, page 119
9.3.22 Socio-cultural Patterns, page 136
9.3.23 Education, Training and Skills, page 150

Bilcon's Response to Comments
Section 8.1 – Impact Analysis in this document.

9.3.16 Recreation
Since the mid-twentieth century, community residents used the Whites Cove site as a recreation area, despite its status as private property. The Proponent identifies the nearest publicly-owned recreational area as 10 km away. The survey of residents identifies a desire for recreational facilities.

9.3.16.3 Does the Proponent plan to mitigate or compensate for the loss of community recreational use of the site?

RESPONSE
The Traditional Knowledge interviews describe recreational uses of the shoreline and of the quarry property itself but the consensus generally was that the usage for recreational purposes has declined significantly since the 1950's.
As noted in the EIS, access to crown land via the public Whites Cove Road cannot be restricted, and unrestricted access along the shore on crown lands below the ordinary high-

water line would be maintained. Access to the quarry site would be restricted for safety reasons and for the preservation of the environmental preservation zones. Bilcon recognizes that there is still some local recreational use of the Whites Cove Road. If Bilcon acquires the Whites Cove Road, traditional access to the coastline will be terminated. To mitigate the loss of this access to the coast, Bilcon proposes to build and maintain a new walking/hiking/nature trail from the quarry Compound Area, along their east property line to the coast.

While Bilcon has no plans to mitigate or compensate for the loss of community recreational use on the site, Bilcon would be prepared to discuss proposals from the community.

If the Proponent acquires the right to Whites Point Road, then how will harvesters gain access to the shore? Will the Proponent limit access to the beach to quarry operating hours?

RESPONSE

Should Bilcon acquire the right to the Whites Point Road, beach harvesters would gain access to the shore through the main quarry gates and access would only be restricted for a short period of time around blasting operations. The quarry will be in operation between 0600 and 2200 which means the site gate would be manned between 0500 and 2300. Bilcon is of the opinion that the access being restricted to the 0500 and 2300 period would not hinder beach harvesting activities.

Has the Proponent considered making the buffer properties it has acquired available for community recreation or other use?

RESPONSE

Bilcon has not considered making the buffer properties it has acquired available for community recreation or other uses. However, Bilcon would certainly be open to suggestions or requests by the community in the future.

9.3.17 Human Health and Community Wellness

The EIS does not adequately address the possible respiratory effects from dust generated from all aspects of the Project. It gives insufficient attention to the stress that may be caused by the Project to local residents. Describe the baseline conditions for respiratory illness in the area.

RESPONSE

Please refer to:
EIS Reference Volume VI, Tab 34, Human Health and Community Wellness Assessment – Sections 3.2.1.4 and 3.2.2 and 6.3.2, EIS Volume VI, Chapter 9.1.8 – Air Quality and Bilcon's responses in Section 9.1.6 – Air Quality.

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Consider the possible effects of the Project on mental health and well-being both among those in favour of and opposed to the Project.

RESPONSE

Bilcon does not believe that this question can be answered in a scientific manner.

9.3.19 Human Health – Marine Contaminants

9.3.19.2 The on-site sampling is not adequate to generate scientifically defensible information concerning copper concentrations. The Proponent argues that "implications to human health are uncertain". The Panel expects the Proponent to present current scientific information on the implications of copper on human health.

Given that periwinkles harvested for human consumption in the near shore environment on the site may be exposed to high concentrations of copper draining from the sediment ponds, this matter requires clarification.

RESPONSE

EIS Coverage

In EIS Section 9.3.19.2 Analysis, it is stated that copper levels in the soil at Whites Point was low (39 mg/kg at EQL 2). Also, copper levels in surface water entering the Bay from the Whites Point site is extremely low (2 – 3 ug/L at EQL 2). Likewise copper in the intertidal marine waters was extremely low (0.8 mg/L at EQL 0.1). Copper content in the basalt rock to be processed at the quarry site was also low (27 – 230 mg/kg, depending on depth at EQL 2).

On-site analyses as stated above are described in multiple sections of the EIS (e.g., Basalt bedrock and groundwater in 9.1.2.1 Research; Geochemistry of the Beaver River Till–Basalt Till Facies, soil, and pond sediments in 9.1.4.1 Research; surface water in 9.1.6.1 Research).

As stated in section 9.3.19.5 Impact Statement, Marine Contaminants – Human Health, background levels of metals are relatively low on-site. Surface water runoff and sediments from quarry operations will be contained in on-land environmental control structures, and sediments for future use during reclamation will be placed in dyked disposal areas on-site. These precautionary measures will reduce the possibility of contaminants entering the marine environment and affecting marine organisms harvested for human consumption.

A review of scientific information on the implications of copper on human health is briefly presented below in the Response to the Panel. Fate of copper in the environment is reviewed in Response to the Panel in the section on Contaminants.

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Response to the Panel

Like iron and zinc, humans have developed a homeostatic mechanism with regard to copper exposure. Copper is an essential element for humans involved in aerobic enzyme function, hemoglobin synthesis, and gene transcription (Ralph and McArdle 2001). Many organisms have developed similar mechanisms for regulating copper levels at the biochemical and molecular levels (IPCS 1998), seeking to maintain their copper levels in a range that avoids deficiency and excess. Doses below the recommended daily allowance (RDA) can produce adverse developmental consequences and heart disease, while higher doses can produce toxic responses, including liver (primary organ for copper distribution in humans), kidney, cardiovascular, hematopoetic, and central nervous system effects (Georgopoulos et al. 2006; Ralph and McArdle 2001). In essence, the toxicity and essentiality of copper produces a U-shaped dose response curve, a hormetic response (Calibrese and Baldwin 2001; Calebrese 2004). The United States RDA for adult men and women is 900 ug/day; the median intake of copper in the US ranges from 1.0-1.6 mg/day, again, for adult men and women (global average is 1.5 mg/d for adults (Ralph and McArdle 2001)). IPCS (1998) lists the lower acceptable level of intake at 20 ug Cu/kg/day generally with a higher level of 50 ug Cu/kg/day for infants. The maximum daily allowances for various global regions ranges from 130 to 500 ug/kg/day (Ralph and McArdle 2001).

Chronic effects in humans are rare but may occur in individuals with Wilson's disease (1:30,000 live births) in which copper transport enzymes are inactive and copper accumulates in the liver and brain (Ralph and McArdle 2001). Also, the usually fatal Menkes disease (1:200,000 live births) resembles a copper deficiency in which Cu is not distributed past the gastrointestinal tract (IPCS 1998; Ralph and McArdle 2001). Based on the copper level required to produce liver damage, the tolerable upper intake level for adults is 10,000 ug/day. Additionally, acute, gastrointestinal upset often occurs at levels of 3 mg/L in water and above (Georgopoulos et al. 2006). This GI irritation usually is associated with copper in water and not in food where it is typically less bioavailable (i.e., complexed to proteins, lipids, etc. (Ralph and McArdle 2001)). In the US, the secondary maximal contaminant level (MCL) for drinking water based on taste and odour (aesthetics) is 1.3 mg/L. Under the Canadian Drinking Water Guidelines, the Canadian Guideline limit is 1 mg/L. IPCS (1998) lists the maximum level of intake around 2-3 mg/day.

Periwinkles are anticipated to be harvested for human consumption from the near shore tide pools, adjacent to and on the site. These sea snails, *Littorina* sp., have exhibited a maximum copper level of 22.1 mg/kg in pre-operation sampling. Periwinkles do not appear to be sensitive to the levels of copper already present in this environment. Given the potentially elevated background levels of copper and the fact that on-site operations are not expected to significantly elevate those levels, additional impacts to this harvested food source are not expected. ATSDR (2004) notes that individuals who regularly consume shellfish typically have higher copper intakes (an additional 2-150 mg/day) than those who do not consume

shellfish. Research for this response did not identify current guidelines for copper content in marine organisms. Stewart and White (2001), in a review paper of contaminants on the Scotian Shelf, referred to a Health and Welfare Canada Guideline (circa 1996) of 100 µg/g in marine and freshwater animal products. According to the EIS (Section 9.3.19), levels above 800 ug/g (mg/kg or ppm) are considered excessive in aquatic food organisms. The current maximum levels found in periwinkles are over 30 times lower than that tissue concentration.

Country foods such as dewberry, raspberry and blueberry exhibit pre-operation levels of copper below 1 mg/kg. Health Canada recommends an upper limit dose of copper in adults (19 years and older) of 10 mg/day from drugs and health products (Health Canada 2004). Given the elevated background level of copper for this general vicinity, the fact that the berries do not show elevated levels of copper and the existence of homeostatic copper mechanisms in humans, the site is not expected to significantly elevate existing copper levels.

Please refer to Section 12 – AMEC Earth and Environmental – Copper, in this document.

9.3.19.2 Analysis – Provide the "Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health", cited as Reference 41 (but not there).

RESPONSE

A reference was made in the EIS for the Canadian Soil Quality Guidelines as reference 41 in the bibliography. References contained in a bibliography are generally not included with the report. This reference can be accessed at Environment Canada's web-site at – http://www.ec.gc.ca/CEQG-RCQE/English/Ceqg/Soil/default.cfm

9.3.20 Human Health – Land Contaminants

9.3.20.3 Mitigation – Identify all "chemical agents" that may be used at the Project site and their amounts/concentrations, properties, usage, storage and other relevant information. Include fertilizers, herbicides, pesticides and other agents.

RESPONSE

Please refer to Table 4 – Hazardous Materials Stored On-site, contained in Section 11.2 – Accidents and Malfunctions in this submission. Note that herbicides and pesticides will not be used on-site.

Although the Proponent commits to minimizing dust escaping from the site, dust is a by-product of blasting, crushing and loading. Consider the implications of dust on the health and well-being of neighbouring populations. Describe the areas likely to be affected and proposed methods of monitoring human health as well as air quality parameters – TSP, PM $_{10}$ or PM $_{2.5}$.

9.3.6 Human Health and Wellness and Socio-Cultural Environment

RESPONSE
Please refer to the responses to the series of questions raised by Health Canada with respect to dust and air quality parameters in Section 9.1.6, Air Quality in this submission.

Pg 145 – Explain the meaning of the statement "the project activities ... are not expected to have an adverse effect on social cohesion ... as it relates to social capital". What evidence supports this conclusion?

RESPONSE
The question needs to be put in the context of the entire paragraph. Bilcon acknowledges that before any actual construction takes place, the idea of the project has caused an adverse effect on social cohesion and has so stated, i.e. "the pre-project planning phase and the environmental assessment will temporarily create an adverse effect on social cohesion (P. 145)."

However, as explained in the next paragraph on the same page, the idea of the actual construction and operation of the project did not elicit any out of the ordinary negative comments in the quality of life survey with regard to social capital *. This is perhaps because the survey respondents' indicated that trust in each other and the provincial government was fairly low and this project was not likely to lower their level of trust any further.

*Social capital is defined as the characteristics of social organization such as networks, norms and social trust that facilitate coordination and cooperation for mutual benefits.

Pg 147 – A statement suggests that "New people employed at the quarry" may become active in volunteerism. Elsewhere the EIS suggests that employees will be hired locally. Resolve this discrepancy.

RESPONSE
One of the selection factors for the Whites Point quarry was the availability in the local area of trained or trainable people for the quarry and marine terminal operation. While no advertisements for prospective employees or job fairs have been held, Bilcon has received over 250 applications for employment, suggesting that Bilcon was correct in its estimation of employee availability. Bilcon is, however, aware that over the past four years, a significant number of people in the local area have taken up employment in western Canada and this process appears to be accelerating. However, at the request of local residents, a meeting was held on October 2nd, 2006, with 21 young people from communities immediately surrounding the project who were invited to the meeting by a community member. These young people expressed a strong desire to be considered for employment at the Quarry and Bilcon detailed its training plans.

9.3.6 Human Health and Wellness and Socio-Cultural Environment

On Nov 15, 2006, Bilcon held another employment information meeting. Notices were placed in the communities of Digby Neck and Islands. Bilcon also invited people who had expressed interest in employment opportunities with Bilcon. Approximately 45 people attended. Handouts included job descriptions, rates of pay, benefits, skills and education required. Bilcon also addressed the issue of training for local people. Attendees were also interested in discussing the effects of quarry operations on their community. Consequently the topics of discussion turned to subjects such as air quality, noise, surface water, groundwater and wells, aesthetics and light. Both meetings were very positive and Bilcon plans more public information meetings at its office in Little River in the New Year.

In conclusion, Bilcon still believes that, with the exception of the Operations Manager who has already moved to the area, all employees will be hired locally. Bilcon also believes that with these young people in stable employment, the level of volunteerism could very well increase in the communities adjacent to the project.

Pg 148 – Explain how the benefits available to employees are interpreted to provide positive effects at a "community scale".

RESPONSE

Bilcon intends to hire the majority of its workforce from the local community and this could include bringing back to the community those who may have had to seek employment elsewhere due to a lack of local employment opportunities. An initial informal meeting held in October 2006, arranged by a community member and hosted by Bilcon at the quarry site, explained employment opportunities at the Whites Point Quarry and Marine Terminal. 21 people from the local community attended and showed interest in work at the quarry. A subsequent meeting held in November 2006 attracted approximately 45 people interested in employment at the quarry. This was an indication to Bilcon that their intention to hire from the community can be realistically realized.

In addition to providing the community with full-time employment opportunities, Bilcon will offer its employees a benefits package. Benefits to be offered will include medical and dental plans, and a pension plan. In addition, incentives will be offered in the form of cash bonuses for exceeding production targets.

Since the employees will be from the local community, the benefits indicated above will contribute to these persons well being and sense of security. The increased social well-being of these persons will be retained within their community and not be exported as would be the case if the workforce was hired from away. In a broader sense, employment opportunities, benefits, and incentives for the local workforce age group will help to retain this vital,

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productive age group within the community. Hence, it is Bilcon's contention that a positive effect, however insignificant, will be realized in the community.

During the community consultations and scoping sessions, some community members indicated a concern that the quarry Project would draw away skilled employees (like heavy equipment mechanics) from other local businesses. Address this concern.

RESPONSE

Bilcon does not perceive that there will be any measurable impact to the availability of skilled labour in the area due to its labour requirements. The level of unemployment in the region is relatively high and it is quite apparent from the applications Bilcon has received for employment at the quarry that there is a significant portion of skilled trades-people that are currently unemployed and seeking work.

Further, the wage rates to be offered at the quarry are on par with industry averages for skilled labour within the region for those job skills meeting Bilcon's requirements (please refer to average wage rates Table WR-1). Therefore, it is not anticipated that Bilcon will have a comparative advantage in this regard.

Bilcon does recognize that its commitment to training those that would currently be considered unskilled, may impact the immediate local labour market. However, there are and have been various government sponsored training programs through unemployment insurance initiatives and fishery adjustment programs such as TAGS, which were implemented in order to increase the employability of this "unskilled" set. One can assume that these skills development and training measures were, at least in-part, initiated to offer opportunities to those displaced due to the rationalization occurring in the fishery and to lessen the dependence on employment insurance or other forms of income supplement. Bilcon fails to see how their strategy of offering training to this unskilled set differs appreciably with other strategies that have been implemented in the region and why it would, in Bilcon's case, have negative connotations. If there is a difference, it is that Bilcon's training will result in employment within the local community, whereas the other may result in no increased opportunity for employment based from the training received or individuals having to seek employment elsewhere in order to benefit from the training received.

Nevertheless, Bilcon will exercise care in its recruiting strategies to try and limit labour impacts on local businesses. Bilcon's strategy to entice those that have left the community to return is one of the measures they plan to employ to insure there is limited disruption in the local labour pool.

Of those with highly specialized skills required by the Project who have submitted applications to the Proponent, what proportion is already employed locally?

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RESPONSE
Bilcon has been receiving job applications for a period of 4 ½ years. Of those with highly specialized skills who have submitted applications to Bilcon 92% were either unemployed at the time or expected to be unemployed in the near future. 8% were in current employment in the local area which included the Town of Digby.

On Pg 155, the Proponent refers to a possible "influx" of students due to quarry employment. (Are any effects expected on staffing in the schools?) On Pg 156, the EIS concludes there will "no significant influx of workers". Resolve this discrepancy on whether any "influx" is anticipated.

RESPONSE
On Page 155 of the EIS, Bilcon did not in fact refer to a possible "influx" of students due to quarry employment. What the EIS says is that "*There is adequate capacity to handle any influx due to quarry employment.*"

In this context, Bilcon was referring to the family formation in the area, fostered by long-term, well-paid employment. It is doubtful whether such increases in enrollment would have any affect on staffing in the schools.

On Pg 158 the Proponent says, "No similar undertakings are known to be planned in the near future.". During the scoping sessions, community residents identified a concern that the nature of the local geology and geography could facilitate further developments of basalt quarries along North Mountain. To address that issue, describe the anticipated demand and supply for aggregates along the Eastern Seaboard over the next 25 years.

RESPONSE
Please refer to Section 7.0 Revised Project Description – Alternatives to the Project.

WP 1498 - Nova Scotia Department of Environment and Labour
Environmental Monitoring and Compliance Division

6. Chapter 9.3.18 discusses groundwater from one borehole only. It states that the existing baseline groundwater quality data from the quarry site meets existing drinking water guidelines for MACs and IMACs and on-site wells, for domestic use are expected to provide good quality drinking water" This seems to be more a statement rather than fact since no baseline samples were taken from any of the existing domestic wells and compared to the single borehole water quality. Additional on-site and off-site baseline monitoring should be required prior to commencement of operation in the event that an approval to operate is issued..

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RESPONSE
Bilcon advises that baseline groundwater quality data from all six new monitoring wells has been obtained and is attached in Appendix 1 in Section 9.1.2 – Geology and Hydrogeology, further Bilcon advises that partial baseline water quality data from offsite existing domestic wells has been obtained and is set out in the Domestic Well Survey by Conestoga Rovers – February, 2007, in Section 12 of this submission.

WP 1542 - Health Canada

Noise and Vibration (Table ECM-2, Section 9.1.9, Section 9.1.11, Reference Document #31, Noise and Air Quality Study at Whites Point Quarry)

1 *In Table ECM-2, Noise and Vibration – the frequency of monitoring is identified as "weekly". This statement should be clarified to indicate that noise monitoring will be conducted during blasting events, as presented in Section 9.1.9.4 – Monitoring.*

RESPONSE
Bilcon agrees. Monitoring of all blast events will be conducted as presented in paragraph 9.1.9.4 of the EIS.

Please refer to EIS Vol. VI, Chapters 9.1.9 and 9.1.10 and EIS Reference Vol. V, Tab 31

2 *The report does not look at potential cumulative effects of multiple site activities on total noise levels (including blasting, Drilling, plant operations, vehicle traffic and ship loading). Could cumulative effects result in elevated noise levels above provincial standards (55 dBA at night, 60 dBA in evening, and 65 dBA during the day – Nova Scotia Department of Environment Pit and Quarry Guidelines)?*

RESPONSE
In addition to Project operations, cumulative effects at Whites Point Quarry would include noise emissions from ship loading activities, drilling, and blasting. Material handling and movement is performed on-site. There is little to no vehicular traffic off-site since aggregate is loaded directly on to a ship and is transported from there. Blasting is an event that is short in duration and, as indicated in the EA, will likely be conducted every two weeks, so it is not appropriate to include blasting in modeling cumulative effects.

The cumulative effects of noise emissions from normal Project operations, drilling, and ship loading was modeled using CadnaA. Sound power levels for ship loading and drilling were found to be approximately 105 dBA (European Commission, 2005) and 90 dBA (E.A.R,

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2006), respectively. Predicted noise levels at nearby residential receptors with the treed buffer zone were modeled and are shown in Table 1.1 on the following page.

Table 1.1 Predicted Sound Levels for Cumulative Effects at Whites Point Quarry

Residential Receptor	Predicted Cumulative Effects Noise Level (dBA)	Nova Scotia Sound Level Limits (dBA)		
		Day (07:00 – 19:00)	Evening (19:00 – 23:00)	Night (23:00 – 07:00)
R1	48.8	65	60	55
R2	44.2	65	60	55
R3	51.5	65	60	55
R4	37.1	65	60	55
R5	47.3	65	60	55
R6	49.1	65	60	55
R7	48.9	65	60	55
R8	48.6	65	60	55

Table 1.1 shows that the predicted cumulative effects noise levels (resulting from the inclusion of ship loading and drilling) at the nearby residential receptors met provincial noise guidelines.

References

E.A.R., Aearo Company. 2006. Noise NavigatorTM Sound Level Database. Indianapolis, Indiana

European Commission, Directorate General Environment. 2005. Service Contract on Ship Emissions: Assignment, Abatement and Market-based Instruments, Cheshire, England.

3 *In addition to cumulative effects associated with multiple site, no mention is made about the cumulative effects associated with noise withy respect to this quarry and the other existing quarries on Digby Neck, and how an additional quarry will contribute to increased noise levels in the area.*

RESPONSE

In the whole of Digby County there are numerous pits and quarries, possibly numbering in the range of 80-85. There are two pits (Mink Cove and Sandy Cove) and one quarry (Rossway Quarry) that are located relatively close to Whites Point, neither of which was

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audible during visits to the area. Many others of various sizes are located at a greater distance.

Due to lack of specific noise data for other pits and quarries it is difficult to accurately model the specific contributions of pits and quarries; however their contributions would be incorporated into the existing baseline data collected prior to construction and operations at Whites Point Quarry.

4 *Plain Language Summary – section 1, second paragraph – This clause indicates there will be two shifts, please clarify if this means operation will occur during the night.*

RESPONSE
There will be 2 shifts – 0600 – 1400 hours and 1400 – 2200 hours. No operations will be conducted at night.

5 *Section 9.1 Existing Physical Environment, Section 9.1.9.2 – Recognizing that the Nova Scotia Department of Environment Pit and Quarry Guidelines (199) require a concussion (air blast) to not exceed 128 dBA within 7 metres of the nearest structure, Health Canada would like to provide information on the use of 128dBA in comparison to the use of 128 dB unweighted (i.e., lin). From discussion with an official of the Ministry of the Environment for Ontario, our understanding is that the concussion criterion should be 128db unweighted i.e., lin (not A-weighted) to protect property from damage.*

The EPA (1974 recommended that the peak level of a single daily sonic boom be less than 125 dB in order for there to be little or no public annoyance. As blasts and sonic booms create similar levels of annoyance (Schomer et al, 1997) for equal peaks and the blasts will not occur more than once every 2 weeks, it does not seem likely that the blasts will cause significant t annoyance if they meet a 128dB unweighted criterion when monitored.
At the 128dB unweighted criterion level, and with the expected duration of less than 1 second and frequency spectrum of a blast, there should also be no concerns regarding irreversible hearing damage or other significant adverse physiological effects. However if the same numerical criterion level is used with A-weighting, Health Canada would like to know the C-weighted peak level, the C-weighted SEL, the A-weighted SEL and the overall blast B-duration of the pulse(s) in order to determine the potential for health effects.

Although we cannot comment on the potential for property damage using a 128 dBA criterion as this is not our area of expertise, the proponent may wish to further

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consider this potential concern as a further argument for a commitment to a 128dB unweighted (i.e., lin) criterion level.

RESPONSE

Bilcon are not aware of the reasoning by which the A weighting scale was used in the Pit and Quarry Guideline, but do recognize that a linear scale is more common. For example, the Halifax Regional Municipality uses 128 dB unweighted. As the reviewer is aware, the objective of blasting in a quarry is to expend the maximum energy in the fracturing of rock, and the minimum of energy in the air as noise. A blast with undue noise can result from either lack of confinement of the explosives (i.e. poor practice), or from unforeseen geologic conditions. Because of the two routes of energy dissipation, there are two safeguards ensuring proper practice. The energy dissipated in the rock is limited through the imposition of maximum vibration criteria, expressed as peak particle velocities. The Nova Scotia criterion is identical to the HRM criterion, and the Ontario one. The protection of structures from damage is accomplished mainly by the vibration limit.

The criterion limiting the noise level is set to limit disturbance and annoyance, and offers a margin of safety for hearing damage or property damage. As a benchmark, the sound pressure levels of the "noon gun" were measured in Halifax on January 5, 2007. The gun is fired at 1200 from the Citadel, and has attained the status of a heritage feature in the city. Two Larson Davis 824 Type 1 meters were set up at the corner of Duke and Brunswick Streets, and measurements were made for the noon event. The meters were set on fast response, and the impulse, A, C and linear weighted readings were all within 1 dB of 123 dB. The measurement was approximately 205 m from the cannon, and lower in elevation. These observations are introduced here to assist in "benchmarking" the sound pressure levels under discussion. An "on-axis" measurement would likely have been significantly higher.

In the case of a blast in a quarry, a greater amount of the energy would be in the lower frequencies, but the A weighted reading would still be relevant for "annoyance" effects. It must be noted that the 128 dBA is a prescribed limit, and that routine, properly controlled blasts would be less than this, and will be protective of annoyance to persons. Although it is intuitively appealing to relate the different weighting schemes, there is a logical problem with this. For a given explosives charge, the sound pressure level may vary greatly, depending on the proper stemming of the charge holes, and the character of the rock. In the extreme, if the charge is in air, the A and linear responses might be essentially the same (as with the noon gun), but if that charge were to be installed perfectly, the bulk of the energy would dissipate in the rock, and the sound pressure level in the atmosphere would be much lower, by either scale. In reality, each case will be between these two extremes. As the A weighted sound goes up, the linear sound becomes closer to the A weighted level because the lower frequency component is reduced. As the A weighted sound goes down, more energy is dissipated in the rock and low frequencies. The relationship between the two scales will not

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be constant. It varies with the depth of the charge, and this relationship is illustrated in the ISEE Blasters' Handbook (Fig. 38.8, p 631) where a charge in air, average burial, and deep burial would approximately result in 171, 130, and 91 dB, respectively. It is therefore not possible to take a fixed difference, apply it to a 128 dBA blast and derive a linear reading, and it would be misleading to do so.

6 *Section 9.1.9.3 Mitigation – Given the apparent t distances between source, 30 metre buffer of trees and receiver, please clarify how much attenuation could be expected from this buffer. A significant attenuation does not seem consistent with the use of ISO 9613-2(1996). Attenuation of sound during propagation outdoors – Part 2: General method of calculation.*

RESPONSE

Predicted sound levels at residential receptors closest to the Project study area were measured using CadnaA (Computer Aided Noise Abatement) version 3.5.115, a computer program capable of predicting noise levels at specified receiver positions originating from a variety of noise sources. CadnaA includes the international standards prescribed by the International Organization for Standardization (ISO) *Standard 9613* – Attenuation of Sound during Propagation Outdoors (ISO 9613).

The sound attenuation resulting from the 30 m buffer of trees surrounding the quarry site was investigated by predicting the sound levels at receptors without the 30 m treed buffer and then running the model again under the same conditions with the inclusion of the buffer. The map below shows the residential receptors taken into consideration for the model.

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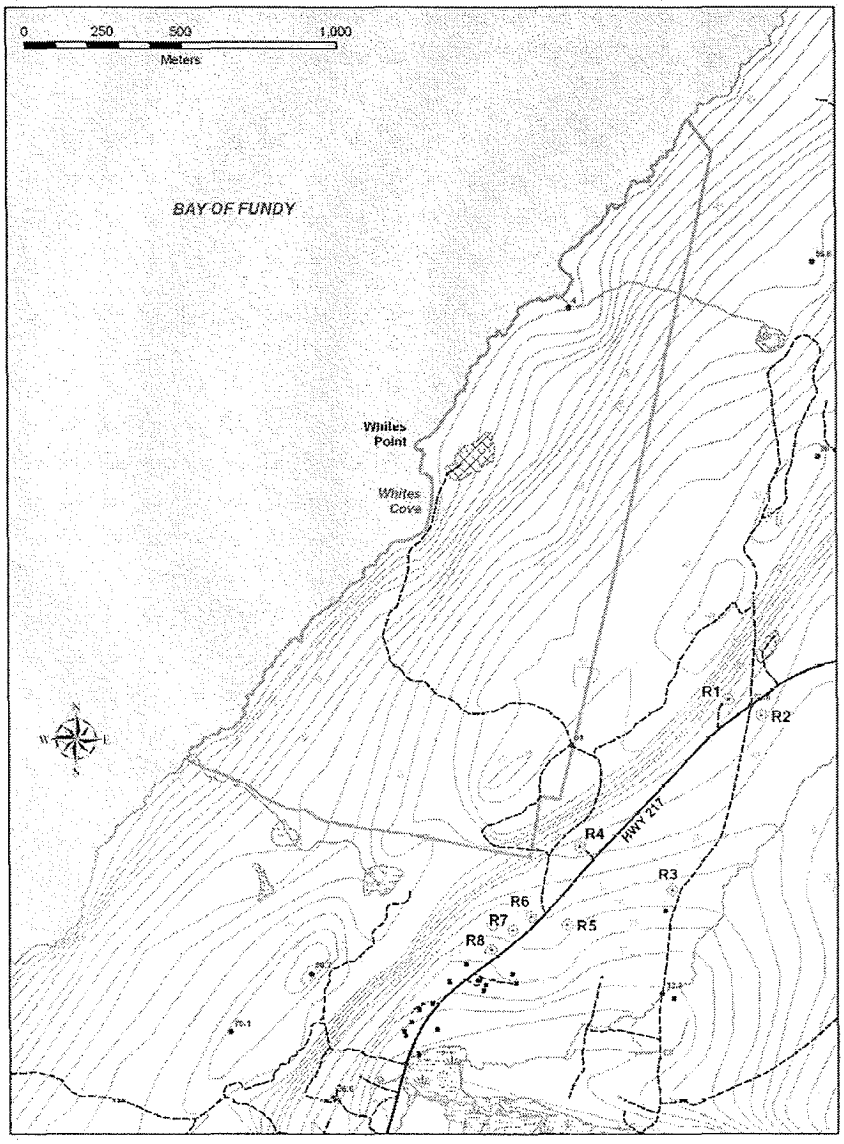
Figure 1.1 Location of Closest Residential Receptors to the Whites Point Quarry Study Area



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The predicted sound levels due to Project operations with and without the buffer zone are summarized in Table 1.2.

Table 1.2 Predicted Sound Levels for Operations at Whites Point Quarry with and without the presence of a Buffer Zone

Residential Receptor	Predicted Operations Noise Level (dBA)	Predicted Operations Noise Level with Buffer Zone (dBA)	Nova Scotia Sound Level Limits (dBA)		
			Day (07:00 – 19:00)	Evening (19:00 – 23:00)	Night (23:00 – 07:00)
R1	50.8	48.8	65	60	55
R2	48.9	44.2	65	60	55
R3	51.5	51.5	65	60	55
R4	47.1	37.1	65	60	55
R5	49.6	47.3	65	60	55
R6	49.1	49.1	65	60	55
R7	48.9	48.9	65	60	55
R8	48.6	48.6	65	60	55

As is evident from the modeling results, attenuation due to the buffer zone impacted receptors R1, R2, R4, and R5. R4 and R2 are the most impacted due to the inclusion of the buffer, likely due to their relatively low elevation with reference to the buffer. In addition, R4 is located on property that is owned by Bilcon and is closer to the buffer zone than other receptors, which promotes noise attenuation.

References

International Organization for Standardization (ISO). 1993. International Standard 9613-1, Acoustics – Attenuation of Sound During Propagation Outdoors – Part 1: Calculation of Absorption of Sound by the Atmosphere. Geneva, Switzerland.

7. *Section 9.1.10.1 Noise and vibration research (page 71, first paragraph) – Health Canada recommends that this paragraph be deleted ....based on very old data (1972). Health Canada recommends the use of CAN CSA/ISO9613-21996 or software based on this standard for calculation of sound propagation.*

RESPONSE

Comment noted. The reference noted has not been deleted as suggested as it contains original research on noise, especially in relation to plants and the study work is still applicable to today. However, predicted sound levels at residential receptors closest to the Project study area were measured using CadnaA (Computer Aided Noise Abatement) version 3.5.115. CadnaA includes the international standards prescribed by the International Organization for

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Standardization (ISO) Standard 9613 – Attenuation of Sound during Propagation Outdoors (ISO 9613).

8. *Section 9.1.10.2 Noise and Vibration, Analysis (page 72, first paragraph) – Please clarify if operation will occur during the night time*

RESPONSE
No operation will be conducted at night time i.e. between 2200 and 0600 hours.

9. *Can the proponent verify that the noise levels at the nearest receptor will be below the appropriate Health Canada criterion? Guidance on the appropriate criterion to use is given below.*

   In quiet rural areas, Health Canada recommends an Ldn at residences below 45 dBA for impulsive noise sources that are neither high energy impulsive noise or highly impulsive noise (these two latter sources are enumerated in CAN/CSA-ISO01996-1:05(2005)(ISO 1996-1:2003). Description, measurement and assessment of environmental noise – Part 1: Basic quantities and assessment procedures).

   For representative residences, Health Canada normally requests the Leq from 7 a.m. to 10 p.m., Ld, and the Leq from 10 p.m. to 7 a.m. Ln. Given that these time periods differ from those presented in the Nova Scotia Guidelines for Environmental Noise Measurement and Assessment, if it is not technically or economically feasible for the proponent to provide the numbers as per Health Canada's Leq intervals, Health Canada would be willing to approximate values based on the Nova Scotia guidelines measurement intervals. Health Canada normally requests the Leq values for baseline, construction and for operation. Relevant information was provided in the EA, but not clearly enough for Health Canada to make a comparison to the draft Health Canada criteria.

   Higher values are permissible under other conditions as can be determined from the enclosed draft Health Canada Fact Sheet for Noise Issues. Based on the data given in the Environmental Assessment, this level appears to be attainable.

RESPONSE
The Ldn of 45 dBA recommended by Health Canada for impulsive sources, which are neither high energy impulsive noise or highly impulsive noise, is not applicable in this case because impulsive noise will not occur during night time hours. Hours of operation are 0600 – 2200 hours – please refer to 7.8 Operations and Maintenance Phase in Revised Project Description. Pile driving may be conducted; however it will be limited to daytime hours of

operation during the construction period. Blasting, estimated to be conducted on a weekly to bi-weekly time scale, is predicted to add about 2 dB of peak noise to the routine operational noise, although there is likely to be some compensation for this by a shutdown of other activities during the period that blasting occurs.
The residential receptor located closest to the quarry property boundary is R4, for which there is 24 hour baseline noise monitoring data and predicted sound levels due to construction and operational activities, determined using noise modeling software (CadnaA). R4 is located on property owned by Bilcon. The baseline Leq values for R4 calculated from monitoring data were 42.7 dBA and 47.0 dBA, for night and day, respectively. The predicted Leq values at R4 for Project construction and operation are 39.5 dBA and 47.1 dBA, respectively. It should also be noted that construction and operations will be carried out only during day time and evening hours.

Note: When computing the Ldn an additional 10 dB was added to the baseline night time data; however in computing the night time Leq, above, 10 dB was not added.

10. Section 9.1.10.4, Noise and Vibration, Monitoring – Health Canada requests that the proponent verify that the monitoring criteria will also respect the appropriate Health Canada criteria at residences.

RESPONSE
The analysis shows that the facility as planned, will meet the guideline criteria from Health Canada, and be well within the criteria from the Pit & Quarry Guidelines that form the basis for operating permits in the Province of Nova Scotia. Bilcon will undertake to assess the performance of the quarry in conjunction with the monitoring program, and to enact such further mitigation that is consistent with normal business practice.

References
Nova Scotia Department of Environment (NSDEL). 1999. Pit and Quarry Guidelines, Halifax, Nova Scotia.

11. Section 9.1.11.2, Noise and Vibration, Ship Loading – Please clarify if ship loading operations will occur at night.

RESPONSE
Bilcon will attempt to schedule shiploading operations during the 0600 – 2200 hours time period. However, it is possible due to the ship schedule that occasional shiploading will take place at night.

12. Please indicate why at Sechelt, the decibel levels and distances on page 74 do not seem to be consistent with the value of 45 dBA at 1480 m reported on page 75.

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RESPONSE

Decibel levels recorded at Sechelt during ship loading are presented on pages 74 and 75 of the EIS. These data are taken from reference 69 identified in the EIS bibliography. The dBA data presented appears consistent with diminishing dBA further from the source. At 1480m, shiploading noise diminished to background levels of 45dBA.

Health Canada Comments Related to Reference Document #31 – Jacques Whitford Environment Limited 2005 Noise and Air Quality Study at Whites Point Quarry, Project No. NSD19591

1. *Section 2.1 Introduction to Noise – To call a 3 dB change in sound level barely perceptible may be misleading. If used inappropriately, this generalization can be detrimental to an environmental assessment. Please provide references for this statement. Although the statement may be true in some cases, it can be misleading if the change is due to the addition of two dissimilar sounds. For example, consider masking thresholds for sounds at different frequencies or with different temporal patterns. As another example, a doubling of the number of events may not be noticed by some, but in most cases it is expected that it would be easily perceptible.*

   The use of 90 dBA for noise level from television is not realistic and may cause readers to underestimate the impact of 90 dBA. A better typical comparison may be to the sound level of the background if you have to shout to carry on a conversation with someone only 0.5 metres away. The sound level on the shoulder of a major highway is typically in the range of 80 to 90 dBA.

   It may be illustrative to give an example for a doubling of sound energy level such as two trucks will produce 3 dB more noise than one truck.

RESPONSE

Detecting differences in sound intensity varies according to frequency and sound level. It is noted that when combining two dissimilar sounds, whether differing in frequency and/or temporal pattern, they may not necessarily produce a 3 dB change in sound level, but, in this environment, with the normal variations and composite nature of background as well as project-specific sounds, it is likely that changes of 3 dB would be very difficult to detect.

For the important mid-frequency range and for commonly used levels within the range of human audibility, the minimum detectable change in level that the ear can detect is about 2 or 3 dB (Everest, 2001). While it is agreed that frequency and sound levels are factors that can alter the threshold of detection of differences, it is also noted in the cited reference, and borne

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out by observations that the detection of such small differences requires a relative absence of interfering sounds, and a relative steady-state of the subject sound.

Televisions are more often found to operate in the 60-70 dBA range, but other audio entertainment systems are operated at levels approaching 90 dBA. Some qualifying text was inadvertently dropped, and it is acknowledged that the 90 dBA should be considered typical of the high end of the range for entertainment devices.

2. *Section 2.8 Potential Issues, Interactions and Concerns – Please indicate the following:*

- *all hospitals, schools, day-cares and seniors' residences for which a significant effect is plausible from either project construction or operation noise – if there are none, state this explicitly and provide a rationale;*
- *any sites within the study area where socially significant First Nations cultural or religious ceremonies take place;*
- *an indication of whether the community is a quiet rural one*

RESPONSE

With regard to hospitals, schools, day-cares and seniors' residences, there is only one school located on Digby neck, located approximately 3 km from the quarry property boundary. However, due to this separation distance it is not expected that the school would undergo significant effects from project construction or operation noise. Attenuation with distance, alone, would likely reduce project-related sound levels by a further 10 dB, or more, at the school.

There are no sites within the study area where socially significant First Nations cultural or religious ceremonies take place.

As indicated in Reference Document #31, Table 2.4, baseline noise monitoring measurements indicate a variety of sound levels within the community. The baseline sound levels in Table 2.4 indicate that the community would lie between the category of quiet suburban and normal suburban community.

3. *Section 2.11, Construction – How many months will the construction last?*

RESPONSE

The construction period will be to some extent contingent upon the date at which permits are issued. This is because the marine terminal will be constructed during the summer months. However, it is reasonable to assume a construction period of 12 to 18 months from the end of the permitting process.

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4. *Please verify that there will be no night time (i.e. 10 p.m. to 7 a.m.) construction*

RESPONSE
There will be no construction between 2200 – 0600 hours.

5. *It is not clear if the construction noise levels provided of 64 dBA at the nearest receptor will not be likely to cause widespread complaints. This should be verified by the proponent for the following assumption. Health Canada predicts that it is not likely for there to be widespread complaints if construction noise levels are less that 60 or 65 dBA Leq for 12 hours of daytime activity depending on whether the area can be characterized as quiet suburban/rural or normal suburban, respectively. The following assumptions apply:*

   1a) Quiet suburban or rural community (Ldn <52 dBA);
   1b) Normal suburban community (Ldn in range of 53 to 57 dBA);
   2)Construction affecting any one site has a duration of less than 2 months; and
   3)No pure tone or impulsive character.

RESPONSE
The listed assumptions were considered for the Project and Ldn values were calculated based on 24 hours of data taken on June 19, 2005 at the Project boundary and May 3, 2005 at the nearest receptor. The Ldn at the Project boundary was determined to be 44.4 dBA, categorizing that area as quiet suburban or rural community. This categorization was supported by the Ldn value of 49.6 dBA calculated at the nearest receptor. Construction will likely not exceed 2 months in duration at any one site except for the marine terminal and processing area and impulsive noise (*i.e.,* jack hammer) will be kept to a minimum.

Construction noise levels at nearby residential receptors were modeled using CadnaA. The effects of noise due to construction were analyzed by determining the activities that would create noise, and the typical levels of noise produced. Table 1 lists typical construction equipment noise emission levels. Actual equipment used on site may differ from those modeled.

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Table 1 Typical Noise Emission Levels of Construction Equipment

Construction Equipment	Typical Sound Level at 15 m (dBA)
Earth Moving	
Loader	85
Bulldozer	85
Backhoe	80
Scraper	89
Grader	85
Excavator	93
Heavy Truck	88
Materials Handling	
Crane (Mobile)	83
Crane (Derrick)	88
Concrete Mixer	85
Screen	100
Vibratory Roller	102
Conveyor Belt	93
Crusher	96
Stationary Equipment	
Air Compressor	81
Generator	81
Impact Equipment	
Jack Hammer	88
Pile Driver (Impact)	101
Source: US Department of Transportation, 2006 European Commission Noise Database 1.0	

For the purposes of modeling, it was assumed that 13 major items (i.e., 2 loaders, 2 bulldozers, air compressor, generator, pile driver, scraper, grader, crane (mobile), excavator, heavy truck) of construction equipment would be operating at any given time within the project development area (*i.e.,* processing plant). When conducting noise modeling, the construction equipment was positioned at the centre of the work area.

Because construction activities will occur between daytime hours of 06:00 and 22:00, construction activity is expected to have little to no effect on night time sound levels. The predicted construction noise levels at each residential receptor location are provided in Table 2, along with provincial noise limits as prescribed by the Nova Scotia Pit and Quarry Guidelines. The level of noise will vary according to the type of construction activity being conducted and the number of pieces of equipment in operation at any given time; however the predicted values offer an indication of impacts on nearby residential receptors.

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Table 2 Predicted Sound Levels for Construction at Whites Point Quarry				
Residential Receptor	Predicted Construction Noise Level (dBA)	Nova Scotia Sound Level Limits (dBA)		
		Day (07:00 – 19:00)	Evening (19:00 – 23:00)	Night (23:00 – 07:00)
R1	43.4	65	60	55
R2	41.6	65	60	55
R3	43.9	65	60	55
R4	39.5	65	60	55
R5	42.2	65	60	55
R6	41.7	65	60	55
R7	41.8	65	60	55
R8	41.1	65	60	55

Predicted noise levels at the nearest receptors are well below provincial noise limits for all designated time periods. According to Health Canada, the predicted noise levels due to construction will not likely cause widespread complaints.

6. *Section 2.12, Operation - Please indicate if there will be operation at night*

RESPONSE

No operations will be conducted at night, i.e. 2200 – 0600 hours.

7. *Please clarify the statement that operation levels will be 40 dBA at the nearest receptor due to distance. Health Canada assumed that the nearest receptor was 1 km away and calculated 36 dBA of attenuation due to geometric spreading, yielding a sound level of 49 dBA at the nearest receptor due to distance (i.e., geometric spreading).*

RESPONSE

The answers to the preceding questions have provided much more detailed sound modeling information, including the effects of topography, vegetation buffering, and other factors, such as the site layout, that were not available in the initial analysis but were approximated.

Air Quality (Table ECM-2, Section 9.1.8, Reference Document #31, Noise and Air Quality Study at Whites Point Quarry)

The project EIS report includes many pictures and maps; unfortunately, many processes that will be used have not been described schematically. It would be useful to obtain more visual information regarding project processes and equipment, such as the crusher/screening operations.

RESPONSE

Please refer to Section 9.1.6 – Air Quality for photos of typical processing plant in this document.

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General Air Quality Comments

1) Is there a wind rose for the site? (A wind rose is a graphical representation used to show the information about the distributions of wind speeds, and the frequency of the varying wind directions, based on meteorological observations of wind speeds and wind directions).

RESPONSE

No specific wind rose was prepared for the site. However, general wind rose diagrams applicable to the site are provided in the EIS, Appendix 48 – Wind statistics.

2) Health Canada is looking for clarification as to the location of the closest residences, including how many are within two kilometres of the site. Several references provide different distances; 1000 metres (ref: EIS Plain language summary, Section 7.3); and 500 metres (ref: Noise and Air Quality Study, Jacques Whitford (2005), Section 2.11, page 12).

RESPONSE

Please refer to EIS Volume III – Maps, specifically Maps 3A to 3E. These maps were generated in response to the EIS Guidelines requesting buildings by type within 4 kilometres of the quarry site. Please refer to the legend on each map for detailed information.

Specific Air Quality Comments

Blasting operations

Study report descriptions of blasting activities impacts on air quality are very general. The Noise and Air Quality Study at Whites Point Quarry by Jacques Whitford (2005), Section 3.5, page 27, states "Blasting can result in a concentrated plume of particulate matter, but the volume and time duration of such plumes are constrained. Even when blasts result in a visible plume, the contribution to 24-hour averages, as in the Air Quality Regulations, will be negligible." Such activity requires more in depth analysis and should answer the following questions:

- *What are the characteristics of the emissions associated with blasting?*
- *What is the dispersion pattern of the plume, e.g. where does it go?*
- *How long would it stay in the air and what is the exposure that is anticipated for the population located close to the site?*
- *Who are the most exposed people?*
- *Has there been modeling of those plumes? If not, how can the proponent conclude that contribution to ambient air deterioration will be negligible (see citation above)?*
- *Blasting has been associated with carbon monoxide poisoning in houses located close to a blasting area. Is there any risk of such an effect?*

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RESPONSE

Quarries must drill and blast to reduce aggregate material to sizes that can be transferred in an efficient way to the crusher, if necessary. Similar to crushing, blasting operations consist of particulate matter generated during physical attrition of the aggregate and are conducted by professional blasters, who design custom blast plans to increase efficiency while reducing dust emissions and vibration.

Blasting technology has undergone significant improvements in order to minimize vibration and dust problems. With precision detonation techniques that have been adopted, explosive charges located in drilling holes are detonated with precisely timed millisecond delays. The result is a number of small detonations as opposed to one large blast, which reduces dust. In addition, the blast control plugs and/or stemming materials used when blasting serve to further reduce dust generation and flyrock. Therefore, blasting produces aggregate and particulate of relatively larger sizes that do not remain suspended in the atmosphere for an extended period of time. The plume created when blasting would likely only remain visible for a matter of minutes whereby a large fraction of the particulate would settle close to the blast site. A small fraction of dust could become entrained according to wind direction; however its effects on air quality at the residential receptors located closest to the quarry will most likely be negligible. The people most exposed to blasting emissions would be employees present on the blast site; however strict precautions are taken to ensure the health and safety of workers, minimizing exposure as much as possible.

Carbon monoxide (CO) has been associated with the detonation of explosives for the purposes of blasting; however by employing a few preventive measures, CO migration can be curtailed. The measures found to be safe and reduce CO production were to excavate the overburden before drilling, place blast mats, excavate the broken rock after each blast, and change the sequence of blasting (Martel, R. *et al.*, 2004).

A blast emission is more accurately characterized as a puff, than as a plume. The event is relatively short lived, generally passing a downwind observer in a time frame of seconds to a minute or two. Bilcon will use the services of a professional blasting firm to conduct these activities, ensuring that the appropriate amount of design is used to use the blast energy in the fracturing of rock, rather than in suspending particulate matter in the air. Given an estimate of a worst-case visible puff, of dimensions of, say, 100m, and with concentrations of particulate at the visible range of 1000 $\mu g/m^3$, and an ambient level of about 40 $\mu g/m^3$, the resulting 24 hour suspended particulate matter would be elevated from 40 to 41 by the passage of the puff at a slow wind speed of 1 m/s. Therefore, the contribution to the 24 hour average is negligible. It is Bilcon's intended policy that there will be no visible puffs affecting any offsite receptors.

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Crushing operations

Based on the project description as presented in the EIS, crushing and screening would be more regular activities than blasting, and may also result in particulate matter emissions. The Noise and Air Quality Study at Whites Point Quarry by Jacques Whitford (2005), Section 3.5, page 27 states "In this project, the crushing is to be conducted in an enclosed space, which is to be ventilated through filters to the outdoors. The material is collected after crushing, and the finer particles are transported in a moist state to be used as fill on the property." In Section 9.1.10.3 of the EIS (Mitigation), the document states that "processing equipment will be enclosed whenever practical to reduce noise levels at the source".

- *Will the equipment be in an enclosed space (as opposed to being enclosed whenever practical)?*
- *What are the chemical characteristics of the particles associated with crushing?*
- *Is there any toxicity associated with such particles (for example leachable toxic metal)?*
- *What size are the particles that will go in the air after filtration (what is the filter mesh size)?*
- *What is the pattern of the plume, e.g. where does it go?*
- *How long will particles emitted from crusher and passed through filters stay in the air?*
- *Has there be any modeling of those emissions?*
- *Will the deposit site for particles (see Noise and Air Quality study, paragraph above) be maintained in a moist state on a permanent basis?*

RESPONSE

The only pollutant emission of concern from stone crushing operations is particulate matter; which is generated due to the physical attrition the aggregate undergoes. Particles formed by crushing operations have chemical compositions identical to the parent material undergoing size reduction. The main constituents of mineral particulate are typically natural crustal elements. These emissions are similar to particulate emitted by agricultural and construction operations.

Physical attrition processes such as crushing typically yield particles, which have aerodynamic diameters that are predominantly larger than 10 μm. Only a minute fraction of the mineral particulate would be in the PM_{10} range. Due to the significant amount of energy required to further subdivide the particles, even less of the mineral particulate are in the $PM_{2.5}$ size range.

The particle size distribution characteristic of mechanically generated particulate from processing aggregate and unprocessed ore is provided in the US EPA AP-42 (Fifth Edition, Volume 1, Appendix B.2) reference document (Figure 1).

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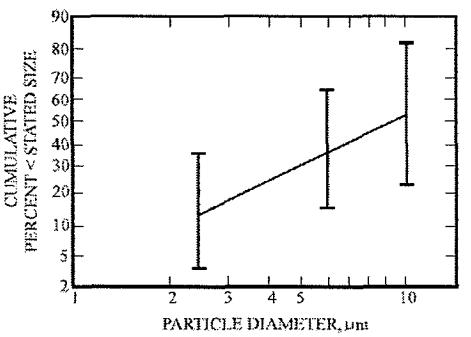
Figure 1



$PM_{2.5}$ emissions, of greater concern with respect to health-related impacts, are produced primarily from combustion processes (e.g., internal combustion engines) as opposed to mechanical processes. In fact, the cumulative percent of mechanically generated $PM_{2.5}$ from the production of aggregate and/or unprocessed ores is less than or equal to 15% (US EPA, AP-42).

Due to the nature of the size distribution of the particles generated by crushing, the particles would settle within a relatively close distance from the source.

In this particular case, the crusher will be completely enclosed in a building. It is intended that the building be completely contained to maintain a safe working temperature through the year, and to enable the use of water as a medium to completely control the dust production from the crusher; therefore no emissions and/or plume will be emitted from crushing operations. Ventilation of the building will be strictly for the purpose of providing an appropriate working environment for staff, and there will not be visible emissions from the source.

<u>*Storage of material*</u>
This is also an on-going activity, since the project implies both removal of organic soil on the area where extraction will be carried out and the subsequent storage of blasted rock material. The Noise and Air Quality Study at Whites Point Quarry by Jacques Whitford (2005), Section 3.5, page 27 states "Storage piles and exposed areas are often left uncovered due to the need for frequent material transfer, which can lead to considerable dust generation. Dust emissions can take place during several points in the storage cycle, including material loading onto the pile, disturbances by strong wind currents, and removing loads from the pile. The potential drift distance of particles caused by wind is determined by the initial injection height of the particle, the terminal settling velocity of the particle, and the degree of atmospheric turbulence."

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- *What would be the characteristics of the stored particles?*
- *What would be their size?*
- *Is there any mitigation procedure to prevent particle dispersion?*

RESPONSE

The characteristics and size distribution of the particulate matter in storage piles would be similar to that of the material produced by crushing; therefore primarily consisting of particles great than 10 microns in diameter with the additional washing step to completely rid the stockpiles of fine material. There is only the potential for fugitive dust emissions to occur from topsoil storage piles, or from the storage are of the washed fines by wind action and/or by human activities.

There are several different mitigation options to minimize particle dispersion from storage piles, if needed. These types of mitigation measures are outlined in the table shown below.

	Control Techniques																				
Fugitive Emission Source	*Chemical Stabilizers*	*Vegetative Cover*	*Watering*	*Windscreens*	*Wind Barriers/Berms*	*Baunings*	*Pile Shaping and Orientation*	*Paving and Gravel*	*Sweeping and Cleaning*	*Reduced Speed*	*Curbing and Stabilizing Shoulders*	*Operations Change*	*Reduced Drop Distance*	*Water Sprays and Foggers*	*Electrostatic Curtains*	*Partial or Complete Enclosure*	*Hooding and Ducting*	*Covers*	*Wheel Washes*	*Foams*
Paved roads			X	X	X	X			X	X	X										
Unpaved roads	X		X	X	X	X		X		X	X										
Unpaved parking lots	X		X	X	X	X		X		X	X										
Active storage piles			X	X	X	X	X					X				X		X			
Inactive storage piles	X	X	X	X	X	X	X					X				X		X			
Exposed areas	X	X	X	X	X	X		X													
Construction sites			X	X	X			X				X				X					
Conveyor transfer				X		X						X	X	X	X	X	X				X
Drop points				X								X	X	X	X	X	X				X
Loading and unloading				X	X							X	X	X	X	X	X				X
Vehicle carryout								X	X										X		
Truck and rail spills								X	X	X								X			
Crushing and screening			X	X	X							X	X	X	X	X	X	X			
Waste sites	X	X		X		X		X				X									
Tilling operations			X									X									
Feed lots	X	X	X									X									

(Reference: Environmental Engineers' Handbook, Second Edition)

In the case of Whites Point quarry, topsoil storage piles will remain relatively inactive with no frequent transfer of particulate matter. In addition, with the treed buffer zone surrounding the quarry site and the strict watering regime, suppression of fugitive dust emissions will be sufficient. The storage piles will also ultimately contribute to quarry reclamation as well, where they will be covered with vegetation. The washed fines will be maintained in a moist

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state, by water sprays in the sediment storage area or in the settling ponds potentially fully covered by a water surface, and will not be susceptible to wind erosion.

Power supply and heating source
From available information, it appears that the project will mainly be electrical powered, using the provincial electricity network. Is there any possibility that the quarry project execution could reduce any Nova Scotia community air quality because of the additional electric energy requirement?

RESPONSE
Discussions with Nova Scotia Power Inc. (NSPI)indicate the following:

1. The electrical distribution system from Digby to Whites Point will need to be upgraded. This will be carried out by NSPI at Bilcon's expense.

2. NSPI has sufficient capacity in its current system to supply the demands of the quarry operation.

Since no additional production capacity is required, it is not anticipated that there will be a reduction of the air quality in any Nova Scotia community.

The report also mentions another on-site source of air pollutant emission:

Heating systems for the office
"Heating systems for the office and shop will be fueled by recycling waste oil from the mobile equipment. A double walled fuel storage tank with an alarm system and surrounding spill containment will be located in the compound area." (Source: EIS Report Volume V, section 7.8, p. 43). More details on the nature of this heating and storage system are required in order to determine the potential for adverse human health effects. Details would include:

- *What are the chemical characteristics of the fuel to be used?*
- *Could those fuels be considered as dangerous waste?*
- *Does this use of recycling waste oil require a permit and, if affirmative, does the proponent own such permit?*
- *What type of equipment will be used to heat the office and shop?*
- *What is the dispersion model for the plume?*
- *Who are the most exposed people?*

RESPONSE
Bilcon has revisited this element of the conceptual design and at the present time does not anticipate fuelling the heating systems for the office and shop with recycled waste oil from the mobile equipment. Heating will be by conventional oil-fired equipment.

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Cumulative Effects
No mention is made about the cumulative effects associated with dust related to multiple quarry operations (i.e. blasting, crushing, screening, stockpiling, etc.) and also with respect to this quarry and the other existing quarries on Digby neck, and how an additional quarry will contribute to increased dust generation in the area.

RESPONSE
In the whole of Digby County there are numerous pits and quarries, possibly numbering in the range of 80-85. There are two pits (Mink Cove and Sandy Cove) and one quarry (Rossway Quarry) that are located relatively close to Whites Point. Many others of various sizes are located at a greater distance. Due to lack of specific dust data for other pits and quarries it is difficult to accurately model the specific contributions of pits and quarries; however their contributions would be incorporated into the existing baseline data collected prior to construction and operations at Whites Point Quarry.

Please also refer to Section 10.0 – Cumulative Effects in this document.

Health Canada Conclusions Re: Air Quality Assessment
The report on Whites Point quarry reveals some significant uncertainties regarding air quality issues. As a result, at this point, it is not possible to give an evaluation of the potential health risk for the project related to air quality.

RESPONSE
As stated in the EA, the primary air quality issue involved with Whites Point Quarry, and other similar quarry and aggregate processing operations, is PM emissions. This is illustrated in Table 1, shown on the following page:

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Table 1 Whites Point Quarry Construction and Operation Activities and Associated Emissions						
	Non-Engine Emissions					Engine Emissions
Process	**Total Suspended Particulate (TSP)**	**Carbon Monoxide (CO)**	**Sulfur Dioxide (SO_2)**	**Nitrogen Oxides (NO_x)**	**Volatile Organic Compounds (VOC)**	**NO_x, CO, CO_2, VOC, TSP, HC**
Construction Activity						
Site Infrastructure (*e.g.*, roads)	X					X
Site Clearance (*e.g.*, grading, scraping)	X					X
Earthmoving	X					X
Operations Activity						
Drilling	X					
Blasting	X					
Crushing	X					
Screening	X					
Conveying	X					
Material Handling	X					X
Material Transport	X					X
Ship Loading/Unloading	X					X
Fugitive Sources (*e.g.*, storage piles, power generation)	X					X

As stated in the EA, applicable regulatory requirements considered included those prescribed by the Nova Scotia Air Quality Regulations and the Nova Scotia Pit and Quarry Guidelines. Table 2 on the following page shows the Nova Scotia Air Quality Regulations.

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Table 2 Nova Scotia Air Quality Regulations		
Contaminant	**Averaging Period**	**Maximum Permissible Ground Level Concentration ($\mu g/m^3$)**
Nitrogen Oxides (as NO_2)	1 hour 24 hour Annual	400 - 100
Sulfur Dioxide (SO_2)	1 hour 24 hour Annual	900 300 60
Particulate Matter (PM)	24 hour Annual	120 70
Carbon Monoxide (CO)	1 hour 8 hour	34,600 12,700

The Nova Scotia Pit and Quarry Guidelines echo the Nova Scotia Air Quality Regulations for PM at the site property boundaries:

- Annual Geometric Mean 70 $\mu g/m^3$
- Daily Average (24 hours) 120 $\mu g/m^3$

From Table 2, it is evident that PM is the air contaminant of concern in terms of quarry construction and operations; however, as stated in the EA, mitigative measures will greatly reduce the quantity of PM emissions. Mitigative measures such as enclosing equipment (*i.e.,* crushers) and the use of water as a dust suppressant are highly effective ways in which to reduce PM dispersion.

In addition, a dust monitoring plan will be developed in consultation with Nova Scotia Department of Environment and Labour (NSDEL). Through periodic ambient air quality monitoring at specified monitoring locations the effectiveness of implemented mitigative measures can be verified and further action can be taken, if required.

The impact of the White's Point Quarry is estimated to be significantly less than the many comparable operations in the province, because of the lack of truck traffic out of the site, the strict washing and consequent dust control, the enclosure of the crusher, and the topography and site isolation. Bilcon is of the opinion that Health Canada can conclude with some degree of confidence that the health impacts are likewise lower.

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Light (Table ECM-2, Section 9.1.12, Reference Document #31, Noise and Air Quality Study at Whites Point Quarry)

The EIS indicates that operational lighting will be kept to a minimum and synchronized with needs to reduce energy consumption at the quarry. Potential effect of light on people is not assessed. JEWEL Report (2005) discusses lightscape management but does not address the potential adverse effects of light/sky glow on people. Sky glow is defined as "the brightening of the night sky due to man made lighting" (IDA, 2002). At this time there is not enough information to determine whether the presence of light/sky glow will have an adverse effect on nearby residents.

RESPONSE
Please refer to page 100 of the Revised Project Description.

With limited research available on the topic of the effects of artificial light on human health, an assessment cannot be provided at this time. According to the U.K. Environment Agency, the following measures can be employed to reduce the effects of night time light/sky glow.

- Positioning lights properly and directing light downward
- Using only the necessary amount of light
- Switching off unnecessary lighting particularly late at night and in the early morning hours; and
- Designing light fittings that reduce light emitted upwards

These measures will be included in the design of Whites point quarry in order to reduce the potential of exposure of light to nearby residents. The presence of numerous other light sources on the coastline has not resulted in the development of guidelines by government agencies that the proponent has been able to identify, but, should such guidelines be issued, it shall be the policy of Whites Point quarry to make every reasonable effort to comply.

Drinking Water Quality – Comments on EIS

1 *Section 9.1.3.2, Analysis – Only five of the 17 drilled residential wells in the vicinity of the proposed quarry had provincial well logs, and as such, the depths of the other twelve wells are not known. The report then states that these other twelve are either "pre-1965 drilled wells, non-registered wells, dug wells, or springs", which contradicts the previous statement that indicates the 17 wells are drilled. Health Canada recommends that a detailed well survey of all 24 wells in the vicinity of the project be conducted to determine their depth and to verify the aquifer that they are utilizing.*

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RESPONSE
A detailed well survey of all wells within 800 metres of the active quarry will be conducted to determine their depth, yield and water quality. Please note that this has been partially completed and the results are contained in Conestoga Rovers – Domestic Well Survey, November 2006, in Section 12 of this document.

2 *Section 9.1.3.2 Analysis – The report assumes that all of the drilled wells are in a different hydrostratigraphic unit than the quarry, indicating that quarrying will occur in the upper flow unit of the North Mountain basalt (fractured bedrock) whereas "drilled wells are constructed in the middle or lower flow units of the North Mountain Basalt or in the deeper Blomidon Formation". The report thus concluded that "local wells will be located hydraulically down-gradient of the quarry and/or in different geologic horizons and groundwater watersheds". Given that there are no well logs for 12 of the 17 drilled wells in the vicinity of the proposed project site, Health Canada believes it is not possible to make this conclusion with certainty.*

RESPONSE
One of the primary objectives of the geologic investigation conducted by Bilcon was to delineate the structure and the stratigraphy of the UFU and MFU and the contact between the units.

Ten boreholes were drilled. Eight holes were drilled on the Bilcon property. Two holes were drilled in the valley south of North Mountain. Five of these holes penetrated the contact between the UFU and MFU unit. The contact was not penetrated in the remaining holes because it dips and plunges below sea level to the northwest. Core data were analyzed and sampled by MVC and Dr. Kontak, Ph.D., Regional Geologist with the NSDNR, Minerals and Energy Branch, the recognized expert on the North Mountain Basalt. The drill data were supplemented with detailed local and regional field work conducted in December 2004 and May 2005 by MVC and Dr. Kontak.

The aforementioned data enabled the investigators to clearly delineate the subsurface structure and the outcrop of the contact between the UFU-MFU, and the surficial bedrock geology. Consequently, it is possible to conclude with confidence that the surveyed drilled wells are constructed in the middle or lower flow units of the North Mountain Basalt or in the deeper Blomidon Formation, and thus, in a different geologic horizon than the quarry.

Please refer to Map 2-R1 in Section 7.0 – Revised Project Description.

Health Canada, the Panel, etc. are strongly encouraged to visit the project field. Inspection of the site geology will validate this conclusion and allay the concerns of the reviewer.

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3 *Section 9.1.3.2, Analysis and Mineral Valuation and Capital Inc. (2005) – The report and supporting documentation indicates that several of the neighbouring domestic and industrial wells are locate hydraulically downgradient of the quarry, however, if they are downgradient of the site, wouldn't any contaminants entering the groundwater as a result of site activities flow downgradient and potentially enter these wells? In addition, if groundwater drawdown occurred at the site, would this not decrease the quantity of groundwater available downgradient?*

According to the Oregon Department of Environmental Quality, "groundwater outside and upgradient of the facility is generally presumed to be unaffected by the source. Groundwater beneath and downgradient from the area of facility operations is most likely to be affected by pollutant discharges. Once pollutants affect groundwater, the contaminants usually move in the direction of groundwater flow downgradient and away from area of immediate impact" (http://www.deq.state.or.us/wq/groundwa/IMDMonitoringBGGQuality.pdf).

RESPONSE

It is possible that contaminants entering the groundwater as a result of site activities could potentially enter these wells. However, all quarry activities with the exception of the access road from Highway #217 will be conducted on the west side of the groundwater divide. In addition, the contaminant, barring an accident or malfunction, would be basalt fines, which testing has shown to contain no toxic materials.

There is no intention to use groundwater in any site activity other than in the office facility and quarrying of the rock will not take place below the water table, however, it is true that changing the topography could change the water table to the east of the groundwater divide. However, as noted elsewhere all wells in the vicinity of Highway #217 are either in the upper till unit (dug wells) or drilled wells in the middle flow unit or lower flow unit. A significant loss of yield in domestic wells in considered to be highly unlikely. In the event that this occurs, Bilcon has established a no litigation compensation policy which would involve drilling new wells at Bilcon's expense.

4 *Section 9.1.3 – Hydrogeology – No mention is made about the on-site groundwater use. Will groundwater be used on-site for such purposes as for drinking and in office facilities? If so, please identify the frequency and parameters to be tested as part of the monitoring program.*

RESPONSE

Groundwater will be used in the office facilities for drinking and washing. This water will be tested every six months for bacteriology and once per year for general chemistry and trace metals.

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Groundwater Monitoring

1 Section 9.1.3.3, Mitigation, Section 9.1.3.4, Monitoring 9.3.18.4, Monitoring and Table ECM-2 outline different proposed groundwater monitoring programs:

- *Section 9.1.3.3 – "Groundwater from all neighbouring properties will be analysed for bacteriology, general chemistry and trace metals once prior to quarry operations to establish baseline conditions". Will this be conducted for all 24 wells?*

RESPONSE

An analysis for bacteriology, general chemistry and trace metals will be conducted prior to quarry operations for all wells in the vicinity of the quarry.

- *Section 9.1.3.3 Section Water table levels will be monitored in the six new monitor wells and the four existing boreholes as quarrying proceeds. The number times water levels will be monitored is not stated here, but found later in Table ECM-2 that it will be weekly. The water table levels are intended to be monitored in the four existing boreholes, three of which were unable to be sampled in 2002(JWEL) because of damage, have these boreholes been repaired: In addition there is no mention of collecting water table levels prior to quarry operations. Will this be done in order to establish baseline conditions?*

RESPONSE

The monitoring wells have now been repaired twice as a result of vandalism, but the bore holes have not yet been repaired. The bore holes will be repaired once a drill rig capable of recoring the holes is brought to the site. It should be noted that water table levels have been collected on a weekly basis since September 2005 to the present time and will be collected on a weekly basis in the future.

- *Section 9.1.3.4 – states that an "on-site groundwater monitoring program was selected", however it indicates that both on-site and adjacent property groundwater data is essential for establishment of baseline conditions and to further demonstrate no diminution in groundwater quantity or quality"*

RESPONSE

A partial domestic well survey has been completed for the domestic wells along Highway #217 within 800 metres of the active quarry and this will be completed prior to any work on the quarry site in order to establish baseline conditions.

- *Section 9.1.3.4 – "A comprehensive groundwater monitoring program was initiated in the fall of 2005 for the six monitoring wells", although details of this program are not presented (i.e. parameters tested, frequency of sample collection etc.)*

RESPONSE

Please refer to Appendix 1 in Section 9.1.2 – Geology and Hydrogeology in this document.

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- *Section 9.1.3.4 – Monitoring – the report states that "water quality monitoring will be performed by Bilcon of Nova Scotia Corporation on an annual basis for bacteriology, general chemistry and trace metals", however, the locations of this monitoring is not clear – will it be samples from the boreholes, the monitor wells and/or the off-site residential/commercial wells?*

RESPONSE

Monitoring will be conducted on an annual basis for bacteriology, general chemistry and trace metals for the six monitoring wells. Monitoring will be conducted on the domestic wells adjacent to the Highway #217 every five years unless a complaint is received from a homeowner in which case testing will be conducted immediately. NSDEL advises that there are no registered commercial wells on Digby Neck.

- *Section 9.1.3.4 Monitoring – the report states that "summary reports of groundwater levels and water quality will be provided to the NSDEL monthly during operation of the quarry". It is previously stated that groundwater levels will be measured in the six new monitoring wells and four existing boreholes monthly, but it is unclear as to what water quality parameters will also be analysed and submitted to NSDEL on a monthly basis.*

RESPONSE

Water levels in the six new monitoring wells and four existing boreholes will be collected on a weekly basis and reported to NSDEL on a monthly basis during quarry operations. In addition, water quality parameters, bacteriology, general chemistry and trace minerals for the six monitoring wells and the four bore holes will be monitored annually. The results will be submitted to the NSDEL in the month in which the monitoring was conducted.

- *Section 9.3.18.4 Monitoring – "chemical, physical and biological well water parameters will be monitored both on-site and off-site at the specially constructed monitoring wells" and "water samples will be taken from a monitoring well located on the quarry property line" and "off-site monitoring will be conducted in the same groundwater source as existing deep, domestic wells located in the immediate area". Health Canada would like to see the proposed groundwater monitoring program, including sampling locations, parameters, and frequency of sampling specified in the report.*

RESPONSE

Monitoring of groundwater both on-site and off site is discussed in the EIS Volume VI, Chapter 9.1.3.4 and 9.3.18.4, and as responses to the previous six questions. Bilcon will prepare a detailed monitoring program for the approval of NSDEL during the industrial permit stage of the project.

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- *Table ECM-2 indicates that only water levels will be measured monthly at the 6 monitoring well locations on the property and bacteriology, general chemistry and trace metals will be analysed annually. The locations where these samples will be collected are not clear.*

RESPONSE
Please refer to response to previous Health Canada questions.

2 *Section 9.3.18.4 – Monitoring – "since the groundwater from on-site sources meets the Summary Guidelines for Canadian Drinking Water Quality for MACs and IMACs parameters, this would result in a long term, neutral (no) effect of local scale." The report assumes that the project will have no impact on future groundwater quality, which is not necessarily correct. It is important to monitor during construction and operation to ensure that this quality is not deteriorated due to project activities.*

RESPONSE
Please refer to previous responses in this section.

3 *More frequent monitoring than what was recommended in the EIS may be appropriate to ensure quarry activities do not adversely affect water quality and levels, such as during periods of intensive blasting and rock cutting. Monitoring of the proposed perimeter and on-site wells should occur at a schedule that ensures that water quality is tested during periods of high quarry activity, especially in the initial phases of construction and operation. If water quality declines for any reason during these activities, immediate measures should be taken to provide adequate water supplies to local residents (I.E. bottled water and/or adequate treatment). In addition, monitoring for water level changes should take place over several years to confirm seasonal water level variations in addition to possible effects of quarry operations.*

Long term annual monitoring should continue to provide further information on the impact of quarry activity in addition to seasonal variations in water quality and water table levels.

RESPONSE
During early years of quarry construction, Bilcon will consider more frequent monitoring to ensure blasting does not adversely affect water quality of adjacent residential wells.

9.3.6 Human Health and Wellness and Socio-Cultural Environment

Comments Related to References #28 and #29 – JWEL (2002) and Mineral Valuation and Capital Inc (MVCI) (2005) Reports

1 *The two studies (JWEL, 2002 and MVCI, 2005) appear to have conflicting conclusions, for the JWEL (2002) report, based on a small project footprint (9.6 acres/-4hectares), indicated potential adverse effects to water quality and quantity, including on-site groundwater intrusion at the quarry site. In contrast, the MVCI (2005) study, based on the larger project footprint (indicated in the EIS to be approximately 300 acres of the 380 acre site over 50 years) concluded that there would be no adverse effects on water quality or quantity associated with larger project and there will be no groundwater intrusion at the quarry site. The following Table presents the conclusion from the JWEL(2002) study in comparison to the conclusions and rationale provided in MVCI (2005)*

JWEL Study Conclusions	MVCI Study Conclusions
Deterioration in water quality is not expected Since the residential wells are located up-Gradient of the proposed quarry	The local domestic and commercial wells will be located hydraulically down-gradient of the quarry
Blasting may result in temporary siltation Of nearby wells	Based on several U.S. studies, blasting will not Impact the groundwater quality or quantity (including groundwater chemistry, water well stability and turbidity, yield etc)
Site activities may result in reduced water levels in wells hydraulically up-gradient to the quarry.	Quarrying will be initiated above the natural water table, and, as a result, mine dewatering and pumping will not be needed and there will be no groundwater withdrawal or drawdown.
Short-term impacts from blasting vibrations may include temporary discoloration of water and that mitigation could include reducing the size of individual blast units, or provision of a dirt filter or bottled water during periods of intensive blasting.	Based on several U.S. studies, blasting will not impact the groundwater quality or quantity (including groundwater chemistry, water well stability and turbidity, yield etc).
Bedrock in the vicinity of the quarry has a low to moderate degree of permeability, suggesting that a moderate inflow of groundwater could occur to the quarry.	Quarrying will be initiated above the natural water table, and, as a result, mine dewatering and pumping will not be needed and there will be no groundwater withdrawal or drawdown.
As the proposed quarry advances northeast and east into the side of North Mountain, the water table in the immediate vicinity of the quarry wall will begin to decline as water drains into the quarry through numerous fractures in the bedrock.	Quarrying will be initiated above the natural water table, and, as a result, mine dewatering and pumping will not be needed and there will be no groundwater withdrawal or drawdown.
Significant decline in water level and/or loss of yield are not anticipated during the proposed 9.6 acre quarry operation, however, if the quarry extends further into the property and beyond the proposed 9.6 acres, the degree of impact would be related to individual well yields, distance from the drainage face, well depth and time of year. The conclusion of the report was that water level declines are possible under the large long term mining scenario.	Quarrying will be initiated above the natural water table, and, as a result, mine dewatering and pumping will not be needed and there will be no groundwater withdrawal or drawdown. In addition, the wells will be in a different groundwater watershed and/or hydraulically down-gradient of the quarry

RESPONSE

Please refer to Bilcon's response to WP 1431 – Panel (IR10) on page 1 in this section.

9.3.6 Human Health and Wellness and Socio-Cultural Environment

The MVCI (2005) study does not provide empirical evidence that the removal of 100 million tonnes of basalt rock (2 million tonnes per year for 50 years as presented in Section 7.0, Project Description) will not have an impact on the water table or will not result in groundwater drawdown or groundwater infiltration at the project site. In addition, the MVCI (2005) study does not provide mitigation measures in the event that off-site drinking water wells are affected by site operations. The JWEL (2002) report provides adequate mitigation measures for possible adverse effect to off-site drinking water wells resulting from quarry construction and activity, and Health Canada recommends that these proposed mitigation measures be implemented if adverse effects are identified during monitoring or as a result of public complaints.

RESPONSE

The MVCI 2005 study does not provide empirical evidence defined as "based on actual observations" since it is not possible to test mine 100 million tons. The opinion is based on work completed and is put forward in recognition that a number of mitigative, monitoring and compensation programs will be put in place to ensure that damage either does not occur or is fully compensated for under the compensation plan described elsewhere in this document.

It was noted in Section 4.5 of the JWEL (2002) that quarry groundwater sampling showed that all water chemistry parameters met Health Canada guideline values for drinking water quality with the exception of manganese. Table 4 indicated that the baseline level of manganese was 0.1 mg/L, which is 2-fold higher than the current Health Canada aesthetic objective of 0.05 mg/L. Is there any data available on manganese levels in residential wells and/or perimeter monitoring wells?

RESPONSE

The results with respect to manganese levels for residential wells currently tested are as follows:

8 wells showed non detected
1 well showed 2 micrograms per litre (µg/L)
1 well showed 11 micrograms per litre (µg/L)

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Country Foods (Table ECM-2, Section 9.3.21)

Health Canada recommends that raspberries and periwinkles be analyzed for metal following the first year of operation and then every subsequent five years. This would enable early detection of any elevated metals concentrations that may have been the result of quarry construction and early operations.

RESPONSE

EIS Coverage

EIS Section 9.3.21.4 Monitoring, states, in addition to monitoring air, water, and soil pathways as presented in previous sections of this EIS, Bilcon of Nova Scotia Corporation proposes to monitor country foods. Every five years, laboratory analysis of the metal content in wild raspberries and periwinkles will be conducted. A report comparing background levels to present levels will be compiled and made available to Health Canada if requested.

Response to the Panel

Considering the low background levels of metals (excepting copper in basalt and glacial till) in on-site soil, rock, and water, the proposed design considerations for spill containment, hazardous material handling, and proposed precautionary measures, the possibility of contaminants entering human food resources is extremely unlikely. However, Bilcon of Nova Scotia Corporation has proposed in EIS Section 9.3.21.4 Monitoring that wild raspberries and periwinkles be analyzed for copper following the first year of operation and then every subsequent five years; if the results are not substantially different between sampling events, the frequency may be decreased or even discontinued. In the unlikely event that the results are significantly higher, the potential hazard will be assessed, the mitigation processes re-evaluated if need be, and the monitoring frequency adjusted as appropriate.

Socio-Economic Assessment (Section 9.3, Reference Document #22 Digby Neck and Islands Individual Consultation Report, Reference Document #34 Human Health and Community Wellness Assessment, Reference Document #32 Digby Neck/Islands Economic Profile, Appendix III Tab 16 Mi'kmaq Use of Oositookum (Digby Neck), its surrounding waters, and the Mainland Shore of St. Mary's Bay)

Health Canada has reviewed the socio-economic aspects of this project specifically as they relate to the potential Environmental effects of the project.

According to the Canadian Environmental Assessment Act (CEAA)(1992), socio-economic effects can only be assessed indirectly, as a result of an environmental effect of a project. CEAA defines an environmental effect in respect of a project as:

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a) any change that the project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the Species at Risk Act,

b) any effect of any change referred to in paragraph (a) on
(i) health and socio-economic conditions,
(ii) physical and cultural heritage,
(iii) the current use of lands and resources for traditional purposes by aboriginal persons, or
(iv) any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, or

c) any change to the project that may be caused by the environment, whether any such change or effect occurs within or outside Canada.

Health Canada has reviewed the socio-economic aspects of this project specifically as they relate to the potential Environmental effects of the project.

RESPONSE
Comment noted.

Public Information and Consultation Process
Health Canada acknowledges the effort invested by the proponent regarding the public information and consultation process as detailed in the EIS Guidelines. Communication activities and information are well presented and easy to retrieve. The newsletters and the creation of a Community Liaison Committee (CLC) are good practices that help the proponent inform the community and at the same time receive feedback from the community on the project.

RESPONSE
Comment noted. Please see response to the Panel in Section 8.2 – Public Consultation in this submission

Health Canada notes that primary public concerns identified were related to the preservation of the environment and indirect effects of the project on income sources (fishing, lobster, tourism, etc.) and quality of life of local residents.

RESPONSE
Bilcon will be happy to work with the local tourism association to help objectively assess any changes in tourism visitation to Digby neck that can be directly attributed to the quarry.

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Health Canada also identified a gap in the public information and consultation process among First Nations in the regional and local area. As the proponent recognizes, good communication has not been established with First Nations living in the area and despite the numerous documented attempts. Health Canada would support any future attempt to consult with the local First Nations group.

RESPONSE

Please refer to Bilcon's response to the Panel under Section 3.1 Traditional and Community Knowledge.

Bilcon will continue to make efforts to establish contact with the Confederacy of Mainland Mi'kmaq and would welcome an opportunity to discuss the project and any issues the Confederacy has regarding the project.

Traditional Knowledge and Social Impacts on First Nations' Quality of life and well-being

The TKS elaborated by the Confederacy of Mainland Mi'kmaq states that: "the Mi'kmaq have used Digby Neck and its surrounding waters since before the arrival of Europeans and continue to use the area for traditional purposes to this day" (Appendix III, Tab #16- Confederacy of Mainland Mi'kmaq, 2005, page 3), and "there is significant traditional current Mi'kmaq use in Oositookum (Digby Neck) and its surrounding water" (page 21). No further information is provided regarding the potential impact the project site itself may have on the traditional use of land for camping, harvesting of wood, stones, clay, food plants, berries, wild fruit, quills, seashells, or the hunting of ducks and deer, or the use of the surrounding waters to fish for haddock, lobster, halibut, urchin, trout, Pollock, mackerel, herring, scallop and crab (Appendix III, Tab #16 – Confederacy of Mainland Mi'kmaq, 2005, page 21).

Realizing previous consultation difficulties encountered by the proponent, Health Canada would like to see more information about whether the project may limit access to traditional hunting/gathering or fishing grounds used by local First Nations people.

RESPONSE

Access to the quarry site proper will be subject to some restriction due to safety considerations. Access to the shoreline will remain unimpeded either via the existing Whites Cove Road or by an alternate access, which would be constructed by Bilcon should the Whites Cove Road be acquired by Bilcon.

Please refer to Bilcon's responses in Section 3.1 Traditional and Community Knowledge and Section 8.2 Public Involvement in this submission.

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Socio-Economic Impact of Potential Environmental Effects on Local Industries
The main industries that may be affected by the environmental effects of the proposed quarry are the fishing (aquaculture, intertidal, and nearshore) and tourism industries.

According to Section 9.3.10 of the report, the Bay of Fundy in the area of the proposed quarry supports a fixed and mobile gear commercial fishery for groundfish (the most common species include cod, haddock, and pollock): pelagic species such as herring and mackerel; crustaceans (primarily lobster); mollusks (primarily scallops; and local harvesting of sea plants. In addition, localized harvesting of periwinkles, sea urchins, and more recently an experimental sea cucumber fishery has also been carried out in this area of the Bay. On Digby Neck/Islands, based on the last census of 2001, approximately 36% of the labour force was involved in the fisher (Section 9.3.9.1, Table E-1). Therefore, fishing is very important for the local economy. According to the EIS, the most lucrative sector is the lobster fishery, and lobster fishing and herring gill netting are the two main fishing activities occurring in the project area, including the nearshore area adjacent to the Whites Point Quarry property (Section 9.3.13.1)

Concerns were that fishing could be impacted by the project activities (including blasting and the construction and operation of the marine terminal) on economically valued marine species. Providing that the Department of Fisheries and Oceans (DFO) agrees with the marine species assessment conducted and the local fisherman agree on the mitigation measures to be implemented, Health Canada agrees that the socio-economic impact of the project on fishing is not expected to result in adverse effects. More specifically:
For the existing nearby aquaculture facilities, setback distances from the proposed quarry are greater than those outlined in applicable guidelines, and additional mitigative measures have been recommended, including minimizing potential blasting effects through the use of time delays and smaller individual charges

For fishing in the intertidal zone, the proponent indicates that access to the shoreline will remain. However, for the safety of these individuals, a check-in procedure will be required.

For nearshore fishing, the proponent indicates that herring nets are set closer to the shoreline than the course of the vessel, and would not likely be affected, however, lobster trap gear may become entangled during vessel arrival and departure. Specific mitigation measures were proposed for herring and lobster fishermen, including the development of designated shipping lanes, sharing of shipping schedule information with fishermen, and the potential development of a fund to compensate in the event of tangled gear.

In addition to fishing, tourism is also a major industry on Digby Neck. Based on the Attitude Survey (AMEC, October 2005) and the public registry, concern was expressed that tourism, particularly people visiting the area for its scenic beauty and/or its natural attraction

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including bird watching and marine mammal watching, could decrease as a result of the project. Section 9.3.14.2 (Analysis) of the EIS states that the proposed Whites Point quarry is not visible from the Digby Neck and Islands Scenic Drive (Hwy #27), from any tourist accommodations (fixed roof or campgrounds), adventure tour ports, designated heritage buildings or any of the proposed sites for the Discovery Centre. As a result of its proposed layout, including the proposed environmental preservation zone, the site (including marine terminal) would only be visible by water. With respect to whale watching, the EIS states that "the greatest concentration of whales and whale watching effort does not occur along the Digby Neck coast of the Bay of Fundy", and "whale watching tours, recreational boating or adventure boating in the Bay of Fundy presently do not frequent the nearshore waters of the Whites Point Area", thus "views of the quarry and marine terminal from tour boats will not be common" (Sections 9.3.14.2 and 9.3.14.5).

No specific mention is made of how noise from quarrying operations will impact tourism, tourist accommodations, designated heritage buildings or other buildings of potential interest to tourists. In general, the report indicates that noise will not result in adverse effects to humans due to adherence to the Nova Scotia Pit and Quarry Regulations for noise levels, however, the specific issue of noise and tourism is not addressed in the report.

As a mitigative measure, the proponent mentioned that a representative of the tourism industry will be invited to sit on the CLC. Although no significant adverse effects have been predicted by the proponent, Health Canada recommends that a formal follow-up process be implemented to assess the potential change in volume of tourism and its potential causes. This follow-up should include an annual review of tourism statistics (and possibly a tourist survey) during the construction phase and the first few years of operation.

RESPONSE

Bilcon will develop a follow-up process to assess the potential change in volume of tourism and its potential causes. Consultation with the tourism industry representative on the CLC and annual review of tourism statistics during the construction phase and the first few years of operation will be conducted.

Social Impacts of Environmental Effects on Local Residents' Quality of Life and Well-Being

Quality of life is a composite measure of an individual's satisfaction with life. Many factors can therefore affect an individual's quality of life, from their socio-economic status to the state of the nearby environment. As per the scope of the Canadian Environmental Assessment Act, Health Canada focus of review is where there is a potential for adverse effects only based on the potential environmental effects of the project.

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In general, for Digby Neck residents, quality of life is closely associated with a healthy and safe environment (Human Health and Community Wellness Assessment, page 37). The study also states that Digby Neck is a relatively clean environment in an enjoyable natural setting, which is one of the likely reasons why people, including summer residents, live there. Over 80% percent of Digby Neck residents ranked their healthy environment as being somewhat satisfying to very satisfying. In addition, "people value a healthy environment and its importance to their health, as well as believe that environmental components, such as clean water and air, are necessary to achieve a healthy environment" (Human Health and Community Wellness Assessment, page 39). Many public concerns related to the proposed project are related to disturbance associated with the quarry activities (for example, noise and dust),

As per comments presented elsewhere in this letter, Health Canada is requesting some clarification regarding the assessment of specific project environmental effects (i.e. effects on noise, air quality, drinking water etc.) Therefore, it is not possible at this time to determine whether or not significant adverse effects to quality of life are anticipated. However, Health Canada would like to point out that the proposed mitigation measures (such as open communication and the complaint process) could help resolve concerns over the effects of the project on nearby residents' quality of life.

RESPONSE
Please refer to Section 9.1.7 – Noise and Vibration, Section 9.1.6 – Air Quality, Section 9.1.2 Geology and Hydrogeology. Bilcon will ensure that an open communication process will carry on throughout the life of the project and that an efficient complaint process will be implemented.

Mitigation Measures and Monitoring and Follow-Up Program
Provided there is participation by the relevant stakeholders, the proposed mitigation appears to be appropriate in order to reduce the potential social and economic impacts that could be derived from the potential environmental effects of the project. Again, openness, transparency and ready access to information is essential in ensuring an informed public and will assist in decreasing the distance between reality and perception.

RESPONSE
Comment noted.

Regulatory Environment
Section 6.5 Regulatory Environment – Canada Health Act – The use of the Canada Health in this context is incorrect. The Canada Health Act is an "Act relating to cash contribution by Canada and relating to criteria and conditions in respect of insured health services and extended health care services" (Canada Health Act, 1984). The correct Act that gives the

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Minister of Health the power to ensure the protection of human health in Canada and to conduct research in areas related to human health protection and promotion is the Department of Health Act (1996) (Section 4)

In addition, Health Canada and Environment Canada are jointly responsible for administering the Canadian Environmental Protection Act (1999), including the assessment and management of risks associated with existing and new substances. (Under CEPA (1999), the Minister of Health is also responsible for conducting research on the role of substances in illness and other health problems.

Under CEAA, Health Canada's legislated role is typically as a Federal Authority to provide expert information and knowledge on health issues when requested by other federal departments carrying out environmental assessments under CEAA. Health Canada is also a Responsible Authority for projects it proposes or funds, such as nursing stations and treatment centres for First Nations people. In the case of this project, Health Canada is a Federal Authority and can provide expert advice on any of the following areas (if asked):

- *Drinking water and sewage management;*
- *Air, water, food and soil quality guidelines/standards;*
- *Impacts of noise on human health;*
- *Community health (First Nations);*
- *Radiation protection (ionizing and non-ionizing);*
- *Environmental and occupational toxicology;*
- *Health promotion in the workplace;*
- *Epidemiology; and*
- *Health risk assessment and risk management.*

RESPONSE

Please refer to correspondence, File: OF6-3-65-1, from Allison Denning, Regional Environmental Assessment Coordinator, Health Canada – Atlantic Region to Debra Myles, Panel Manager, Whites Point Quarry and Marine Terminal Project - Joint Review Panel dated August 4, 2006. On page 13 of that letter, Ms. Denning points out and clarifies an inaccurate statement relative to the role and responsibilities of Department of Health Act as follows:

" Section 6.5 Regulatory Environment – Canada Health Act – The use of the Canada Health Act in this context is incorrect. The Canada Health Act is an "*Act relating to cash contributions by Canada and relating to criteria and conditions in respect of insured health services and extended health care services*" (Canada Health Act, 1984). The correct Act that gives the Minister of Health the power to ensure the protection of human health in Canada and to conduct research in areas related to human health protection and promotion is the *Department of Health Act (1996)* (Section 4).

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WP1541 – Fisheries and Oceans Canada
Volume VII – Chapter 9.3 Human Environment and Impact Analysis
Page 127 – Section 9.3.18 to 9.3.20 – Contaminants – There is no proposal within this EIS for environmental effects monitoring of the commercially valuable species such as lobster, crab, and scallop that are sensitive to the toxic metal exposures, especially in the Bay of Fundy areas. The monitoring of water quality of outflow from the sediment retention ponds is insufficient to detect the possible problem of contamination associated with quarrying operation. In the study of the selection of bioindicators for monitoring marine environmental quality of the Bay of Fundy, Chou et al. (200) reported that lobsters from Digby had elevated digestive gland copper (70ug/g) in comparison to lobsters from Pubnico (10ug/g. Chou et al. also reported the ineffectiveness of mussels and sediments as reliable indicators of contaminants. Mussels and sediments failed to reveal the problem of high toxic metals in the Bay of Fundy area. The EIS quotes the Gulfwatch results and states that heavy metal concentrations in blue mussels are near natural levels (Table MC-l, page 128). The report should include recent bioindicator studies by Chou et al. with regard to the contaminant levels in lobsters and crabs from the Bay of Fundy areas. The selection of bioindicators is key to revealing the toxic metal exposure in marine organisms.

Comments on Mitigation and Monitoring
Contaminants
It is suggested that lobster, scallop and crab be assessed for contaminants in addition to other environmental samples within the environmental effects monitoring program.

RESPONSE
EIS Coverage
Section 9.3.18 Human Health - Drinking Water Quality; 9.3.19 Human Health - Marine Contaminants; 9.3.20 Human Health - Land Contaminants; 9.1.6 On-site Surface Water Drainage

In Section 9.1.6.4 Monitoring, it is stated that water quality monitoring of all outflows from sediment retention ponds will be conducted weekly for Total Suspended Solids (TSS) and pH and monthly for general chemistry. TSS will be maintained at less than 50 mg/L per grab sample or 25 mg/L monthly arithmetic mean while pH will be maintained within a range of 5 – 9 per grab sample or 6 – 9 monthly arithmetic mean at the sediment pond outlet. These TSS and pH limits correspond with those contained in the permit for the four hectare quarry on this site. The frequency of monitoring will be weekly for TSS and pH and a monthly summary of results will be prepared by Bilcon of Nova Scotia Corporation and be available to regulatory agencies.

In Section 9.3.19 Human Health – Marine Contaminants, 9.3.19.1 Research, it is stated that contaminants such as metals have been measured in scallop and lobster in the Bay of Fundy.

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Scallop from most of the Bay generally had metal levels comparable to those from uncontaminated areas (Bay of Fundy Ecosystem Partnership 2004, Ref. 99). Copper measurements in the tissues of lobster in the upper Bay of Fundy, **predominately in a non-industrialized area**, had levels as much as 30 – 100 times higher than industrialized areas.

Response to Fisheries and Oceans Canada
Given the concern over the potential for high copper levels, it is proposed that all outflows from sediment retention ponds be sampled semi-annually and the samples analyzed for copper. This program would then be sunsetted if the levels of copper can be shown to be of no concern .

The use of bioindicators is said to be "key to revealing the toxic metal exposure in marine organisms". This is incorrect because it assumes there will be significant exposure to organisms in the marine environment, which is a false premise. As indicated in the response to the panel in the previous section on contaminants, copper exposure is expected to be extremely low due to the planned mitigation strategy and the physical/chemical processes acting upon the copper in the environment. Analysis of periwinkle has shown copper levels of 22.1 mg/kg, a consequence of the naturally occurring background levels of copper. Research for this response did not identify current guidelines for copper content in marine organisms. Stewart and White (2001), in a review paper of contaminants on the Scotian Shelf, referred to a Health and Welfare Canada Guideline (circa 1996) of 100 µg/g in marine and freshwater animal products. Bilcon of Nova Scotia Corporation, in good faith, has proposed to continue the sampling and analysis of periwinkles for copper. It is anticipated that any biomonitoring will not discern exposure due to the site activities nor show copper levels over and above that which is due to background exposure.

The full range of elevated digestive gland copper in lobster as presented in Chou et al. (2003) include the following digestive gland (ug/g wet weight) copper concentrations from the Bay of Fundy:

Inner Bay of Fundy	Cobequid Bay	856 ug/g ± 40
	Minas Basin	405 ug/g ± 20
	Minas Channel	110 ug/g ± 25
New Brunswick Coast	Shepody Bay	637 ug/g ± 36
Nova Scotia Coast	Cumberland Basin	836 ug/g ± 17
Saint John Harbour	Dumpsite	317 ug/g ± 16
Annapolis Basis	Annapolis Basin	70.5 ug/g ± 2.8
Outer Bay of Fundy	Pubnico	10.4 ug/g ± 3.6

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There are several issues against the use of lobster in a biomonitoring strategy. In Chou et al. (2003), there were high levels of copper in the digestive gland (hepatopancreas) of lobster, but edible tissues were not analyzed. It is expected that muscle tissue would likely have been much lower in copper concentration than the level determined in the hepatopancreas. This phenomenon has been observed in other decapod crustaceans that regulate metals (Bryan 1968; Bagatto and Alikhan 1987). Metals are sequestered in the hepatopancreas via metallothioneins, membrane metal transport proteins, and vacuolar sequestration mechanisms (Ahearn et al. 2004) and thus removed from circulation. The correlation of hepatopancreas copper and the copper concentration in the sediments in the Bay of Fundy was poor. The source of copper was unknown and could be from background sources. Lobsters appear to have a greater capacity for metal uptake and accumulation. Lobsters are also rather mobile, making it even more difficult to pinpoint a contributing source of contamination.

Metals have been measured in scallop and lobster in the Bay of Fundy. Scallop from most of the Bay generally had metal levels comparable to those from uncontaminated areas (Bay of Fundy Ecosystem Partnership 2004). Copper measurements in the tissues of lobster in the upper Bay of Fundy, predominately in a non-industrialized area, had levels as much as 30 – 100 times higher than industrialized areas.

These facts raise serious questions as to the suitability of lobster in a monitoring program. A periwinkle biomonitoring program has been proposed. Use of lobster in a biomonitoring program is not recommended.

References
Please refer to Section 12 – AMEC Earth and Environmental Inc. – Reference Document on Copper.

WP 1630 - Environment Canada

Item #11 Characterizing Existing Ambient Air Quality
Information Request
Identify and use data from recording stations that are more indicative of air quality in the area likely to be affected by the Project.

Delineate and explain the airshed boundaries to be used in describing air quality and in assessing impacts while recognizing that particulates emitted by the Project have been identified in the EIS as the contaminant of most concern.

RESPONSE
In addition to ambient air quality monitoring stations operated by The Nova Scotia Department of Environment and Labour, stations are also operated by the National Air

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Pollution Surveillance (NAPS) network. Stations operated by NAPS that would be closest to the quarry site, and therefore representative of air quality in the area, would include those located at Kejimkujik National Park, Aylesford Mountain, Dayton (Yarmouth), and St. Andrews, New Brunswick. Air quality data collected by NAPS have been used to demonstrate the links between air pollution and human health, and also to evaluate air pollution control strategies, identify urban air quality trends, and forewarn of emerging air pollution issues. With reference to Whites Point quarry, the primary air quality issue is related to particulate matter generated from aggregate processing operations on-site.

The St. Andrews monitoring station is located on the grounds of the Huntsman Marine Science Centre and conducts monitoring for ozone (O_3), particulate matter < 2.5 μm (PM2.5), and mercury (Hg). With respect to measured PM2.5 concentrations, in 2003 and 2004 hourly values were consistently low. Hourly values seldom exceeded 30 $\mu g/m^3$, with the majority below 15-20 $\mu g/m^3$. The 98th percentile value for 2003 and 2004 (based on 24-hour averages) were 13.1 $\mu g/m^3$ and 9.5 $\mu g/m^3$, respectively.

The station located at Kejimkujik National Park showed low concentrations of PM10 between 1993-1996 and 1999-2001 of between 6 and 11$\mu g/m^3$. Similarly, low concentrations below 6 $\mu g/m^3$ were found at the Kejimkujik between 1999 and 2001.

Ground-level ozone is also measured at the Kejimkujik monitoring station, in addition to the Aylesford Mountain and Dayton (Yarmouth) sites. From 1986 – 2001, the Kejimkujik and Aylesford Mountain stations have shown an increase in ground-level ozone. Ground-level ozone concentrations measured at Aylesford Mountain are typically higher due to the elevation of the site. Given the relatively remote locations of both monitoring sites, their data are a good indicator of the impact of transboundary air contaminants from the US and central Canada.
While ground-level ozone and other air contaminants are integral in the region's overall air quality, it is particulate matter that is of concern when dealing with quarry operations. When assessing the impacts of operations at Whites Point Quarry, while the Nova Scotia Air Quality Regulations are essential, the current state of air quality in the region with respect to particulate matter will be considered.

Item #12 Predicting the Quantity and Fate of Emissions
Information Request
Provide more detailed emission estimates in terms of pertinent parameters (e.g. total particulate matter and its fractions including PM10 and PM2.5) and sources (e.g. construction equipment, bulk carriers). Discuss these estimates in the context of applicable regulatory requirements, standards, goals, objectives and targets as applicable.

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Provide more detailed discussion on dispersion of Project-related emissions, and their potential influence on ambient air quality in an appropriately defined airshed(s) taking into account the influence of wind conditions.

RESPONSE

A summary of emissions resulting from construction and operational activities at Whites Point Quarry are presented in Table 1.

Table 1 Whites Point Quarry Construction and Operation Activities and Associated Emissions

	Non-Engine Emissions					Engine Emissions
Process	**Total Suspended Particulate (TSP)**	**Carbon Monoxide (CO)**	**Sulfur Dioxide (SO_2)**	**Nitrogen Oxides (NO_x)**	**Volatile Organic Compounds (VOC)**	**NO_x, CO, CO_2, VOC, TSP, HC**
Construction Activity						
Site Infrastructure (*e.g.*, roads)	X					X
Site Clearance (*e.g.*, grading, scraping)	X					X
Earthmoving	X					X
Operations Activity						
Drilling	X					
Blasting	X					
Crushing	X					
Screening	X					
Conveying	X					
Material Handling	X					X
Material Transport	X					X
Ship Loading/Unloading	X					X
Fugitive Sources (*e.g.*, storage piles, power generation)	X					X

As stated in the EIS, applicable regulatory requirements considered included those prescribed by the Nova Scotia Air Quality Regulations and the Nova Scotia Pit and Quarry Guidelines. Table 2 shows the Nova Scotia Air Quality Regulations.

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Table 2 Nova Scotia Air Quality Regulations		
Contaminant	**Averaging Period**	**Maximum Permissible Ground Level Concentration ($\mu g/m^3$)**
Nitrogen Oxides (as NO_2)	1 hour 24 hour Annual	400 - 100
Sulfur Dioxide (SO_2)	1 hour 24 hour Annual	900 300 60
Particulate Matter (PM)	24 hour Annual	120 70
Carbon Monoxide (CO)	1 hour 8 hour	34,600 12,700

The Nova Scotia Pit and Quarry Guidelines echo the Nova Scotia Air Quality Regulations for PM at the site property boundaries:

- Annual Geometric Mean 70 $\mu g/m^3$
- Daily Average (24 hours) 120 $\mu g/m^3$

From Table 1, it is evident that PM is the air contaminant of concern in terms of quarry construction and operations; however, as stated in the EA, mitigative measures will greatly reduce the quantity of PM emissions. Mitigative measures such as enclosing equipment (*i.e.*, crushers) and the use of water as a dust suppressant are highly effective ways in which to reduce PM dispersion.

In addition, a dust monitoring plan will be developed in consultation with Nova Scotia Department of Environment and Labour (NSDEL). Through periodic ambient air quality monitoring at specified monitoring locations the effectiveness of implemented mitigative measures can be verified and further action can be taken, if required.

The presence of a ship at the dock will add the emissions of the "hotelling" systems to the project emissions; however, the spatial separation of 1 km, or more, from public receptors is adequate to provide safe dispersion of these emissions, and is much greater – perhaps an order of magnitude – than the separation of similar vessels from the public in harbours such as Halifax, Dartmouth, Digby, and elsewhere. The use of electrical power from the provincial grid eliminates the need for on-site generation, and the utility providing this power is approved to do so by the Department of Environment and Labour. Vehicles operated within the site will be well maintained, and are well separated from the public. The design of the facility to use ship transport of the product eliminates the need for trucking the material on the public roads.

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Item #13 Mitigating and Monitoring Effects on Air Quality
Information Request
Provide a more detailed description of how ambient air quality requirements will be met and the role of a monitoring program in this regard.

Present a proposed monitoring program for air quality consistent with the direction provided in Section 12.4 of the guidelines. Such a program should include regulatory requirements, standards, goals, objectives and targets; provisions for submitting monitoring results for review by the public and regulatory agencies; and, a discussion of how monitoring results will be used for making necessary adjustments to Project design and operation.

RESPONSE
A preliminary dust monitoring plan for Whites Point Quarry would resemble something similar to what is presented below.

Whites Point Quarry – Air Quality Monitoring Plan
Particulate matter emitted into the atmosphere consists of material in a broad range of aerodynamic diameters. Matter greater than about 44 μm in diameter will fall to the ground within a few metres, or tens of metres, of the source. Material of smaller diameter will remain suspended in the atmosphere, and is referred to as Total Suspended Particulate Matter (TSP), but is often referred to by the public as "dust". The "dust" monitoring plan technically refers to Suspended Particulate Matter. The standard method for determining Suspended Particulate Matter is the use of high-volume air samplers that draw about 2 m^3/minute of air through a filter paper that has been weighed prior to exposure. Following exposure, the filter is desiccated for 24 hours and then the weight difference is determined gravimetrically.

Dust emissions are inevitable when conducting quarry operations; however by applying the appropriate dust mitigation measures (as outlined in the EA) their effects will be kept to acceptable levels. To confirm the success of the mitigative measures or to signal the need to apply more aggressive mitigation, dust monitoring will be conducted.

According to the conditions of Nova Scotia Pit and Quarry Guidelines, the dust emissions will not exceed the following limits at the site property boundaries:

- Annual Geometric Mean 70 μg/m^3
- Daily Average (24 hours) 120 μg/m^3

Therefore, when conducting dust monitoring, these will be the guidelines by which the success of the dust mitigation measures will be gauged.

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Monitoring parameters and locations will be selected in consultation with NSDEL. The potential monitoring site locations would represent the areas of potentially sensitive receptors. Selection will be based on agreement from parties (*i.e.*, landowners) involved, power, access, and other relevant issues. In response to public consideration and concern the monitoring plan will comprise routine monitoring and attention to allegations of chronic problems or isolated events.

Visual inspections in conjunction with real-time monitoring will be performed to measure dust levels and to ensure that quarrying, materials handling, and consolidation operations do not result in excessive on-site dust emissions. Visual inspection will be the primary method for evaluating the effectiveness of dust control during this project. Real-time monitoring using a combination of hi-volt samplers and gravimetric weighing will be used to quantify total dust levels and/or to determine if corrective action is needed.

Regarding the frequency of dust monitoring, inspections for visible airborne dust will be conducted routinely several times during each working day. A schedule will be developed for real-time air sampling that includes meteorological fluctuations that occur on a daily basis and throughout the year. One option is that real-time monitoring is performed once a month and readings are collected at 0600, 1200, 1100 hours, which characterizes the morning, afternoon, and nighttime conditions. By doing this on a monthly basis, seasonal results will also be characterized. Monitoring is not appropriate during rain snow, or heavy fog conditions due to limitations of the method applicability. These weather conditions, however, substantially reduce the potential for heavy dust emissions.

If the dust emission limits of the Nova Scotia Pit and Quarry Guidelines are exceeded, then further mitigative action will be initiated. Furthermore, visible airborne dust will be used as the site action item. If dust is visible, dust suppression methods will be implemented. If visible dust is present at the site boundary, work will be stopped until engineering controls or alternate methods are initiated to reduce the levels of visible airborne dust. Appropriate engineering controls and personal protective equipment will be used where appropriate. In the event of a public complaint, additional monitoring will be used to aid in addressing the complaint so appropriate action can be taken, if needed. Whites Point quarry will establish a complaint resolution program to deal with residents' or other (*e.g.*, NSDEL) potential queries and/or complaints as they arise.

WP 1625 – Partnership for Sustainable Development
Deficiency Statement 72
EIS Guidelines
10.3.1 – Community Profile – "Describe and evaluate the beneficial and adverse effects of the Project on those VECs selected for the human environment, explaining the rationale used." "Describe and evaluate changes to health and social and economic conditions that

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may occur as a result of Project-related impacts to the biological and physical environments."

EIS

9.3 – Human Environment and Impact Analysis – The EIS argues that Digby Neck is a community in decline using indicators such as out-migration, income and education as evidence for this claim. What it does not address is the extent to which Digby Neck is a resilient or healthy community despite these challenges. It does not address the impact which the building of the quarry or the process that will lead to the final decision will have on the overall well being of the community. It does not address the extent to which the people of Digby Neck have the capacity to figure this one out for themselves. The analysis used to support the EIS findings of insignificant or neutral for the human environment VECs fails to recognize the integrated and complex nature of a vital community. The questions that need to be asked when a new opportunity arises are: will the opportunity be one that offers improved community vitality? Or, will the development harm existing healthy patterns in the community?

RESPONSE

Please refer to EIS Volume VII, Chapter 9.3 Human Environment and Impact Analysis and in Bilcon's responses to the Panel and Agencies in this section.

Deficiency Statement 77

EIS Guidelines

10.3.7 – Human Health and Community Wellness – "Describe and evaluate potential health impacts that may arise from changes in water quality and quantity."

EIS

9.3.18.5 - Impact Statement - The EIS uses water results from one borehole in 2002 to conclude that there is no long-term effect on drinking water quality for on-site sources. Using current conditions to make future predictions, when the soil cover, landscape, topography, land use, and geology of the area will change in the future is totally inappropriate. No predictive modeled or future scenarios are discussed. Similarly for the impact statement for off-site drinking water quality and quantity – the EIS assumes that the till and three flow units are completely distinct and always will be – without offering adequate evidence. The information provided fails to meet the requirements of section 10.3.7 of the EIS Guidelines by failing to adequately consider potential impacts.

RESPONSE

Please refer to Section 9.1.2 – Geology and Hydrogeology and Bilcon's responses to the Panel and Agencies in this section.