DUST ASSESSMENT OF THE JIGS HOLLOW PIT
REPORT ADDENDUM

Prepared for:

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Prepared by:

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February 2010

Page 2-1, Section 2.1 Air Concentrations

The following should replace the entire Section 2.1:

Background contaminant concentration data is measured at many sites throughout Ontario under Federal and Provincial ambient monitoring programs. Monitoring locations are classified based on surrounding land uses: commercial, industrial, residential, agricultural rural, forested rural and undeveloped rural.

The Jigs Hollow Pit will be located in a predominantly rural location with **undeveloped rural** being the most representative comparison. **Agricultural rural** monitoring locations are located on active farms with periodic tilling of soils, which would result in concentrations higher than those anticipated to occur at the Jigs Hollow Pit. **Forested rural** monitoring locations are likely to under predict background concentrations based on the tendency for particulate matter to adhere to vegetation.

Therefore, TSP, PM_{10} and $PM_{2.5}$ monitoring data from the undeveloped rural Point Petre station were used for developing background concentrations. Table 2.1 below presents five years of 90th percentile 24-hr measurements for TSP, PM_{10} and $PM_{2.5}$, along with five years of annual average TSP concentrations. The average of the five years of data is provided at the bottom of the table. The 90th percentile values are values that will only be exceeded 10% of the time under adverse meteorological conditions.

It should be noted that a review of the average monthly $PM_{2.5}$ and PM_{10} concentrations at the Point Petre station indicate that particulate concentrations fluctuate from month to month, with the highest concentrations during the summer months and the lowest concentrations during the winter months. Maximum modelled concentrations, presented in Section 4.0 below, are predicted to occur during the late fall months, therefore, use of 90th percentile values is conservative.

TABLE 2.1
TSP MEASUREMENTS FROM THE POINT PETRE STATION

Year	90th Percentile $PM_{2.5}$	90th Percentile PM_{10}	90th Percentile TSP	Annual Average TSP
2000	9	13	27	16
2001	10	15	30	17
2002	10	15	30	17
2003	11	15	30	18
2004	14	19	38	19
Average	**11**	**16**	**31**	**17**

TSP was not measured at the Point Petre Station, the value above was estimated using the observed average relationship TSP= PM_{10}x2

The proposed Jigs Hollow Pit is located near other proposed aggregate pits, therefore the actual background concentrations in the vicinity of the proposed Jigs Hollow Pit will likely be greater than the typical undeveloped rural background concentrations provided above. For this reason, more conservative background concentrations were selected for the proposed Jigs Hollow Pit as shown in Table 2.2 below.

TABLE 2.2
SELECTED BACKGROUND CONCENTRATIONS FOR TSP, PM_{10} AND $PM_{2.5}$

Averaging Time	Contaminant Background Concentration (µg/m³)		
	TSP	PM_{10}	$PM_{2.5}$
24-hr	50	25	12.5
Annual	30	n/a	n/a

These numbers were generated as follows. Based on SENES' experience the maximum emissions scenario from an aggregate pit will result in an additional 0.5 µg/m³ of $PM_{2.5}$ after 2 km of travel. Therefore, assuming that three upwind active farms or aggregate pits could line up with the proposed Jigs Hollow Pit, 1.5 µg/m³ was added to a background of 11 µg/m³ for an overall $PM_{2.5}$ background concentration of 12.5 µg/m³. An average factor of 2 was applied from $PM_{2.5}$ to PM_{10} and from PM_{10} to TSP to get the other numbers in the table. As $PM_{2.5}$ will travel longer distances this fraction is considered to be the worst case, and when compared with Table 2.1, the PM_{10} and TSP values provided in Table 2.2 are likely to be very conservative.

Page 3-3, Section 3.2 Meteorology

The following should replace the second paragraph of Section 3.2, located on page 3-3:

The 5-year period 2001 – 2005 was used to develop a meteorological input file representative of all possible weather conditions that the proposed Jigs Hollow Pit would be subjected to during its operation. The ISCST3 model requires hourly values of wind speed, wind direction, ambient temperature, atmospheric stability class[1], and mixing height[2] to determine the air concentrations of particulate matter at sensitive receptors caused by dust emitted from the site. These meteorological variables are determined from hourly surface weather observations, and twice-daily upper air soundings. For the purpose of this study, surface observations were obtained from the Toronto Pearson International Airport (approximately 70 km east of the proposed Jigs Hollow Pit location) and upper air data were obtained from the National Weather Service station

[1] Relates to the ability of the atmosphere to resist or enhance vertical motion. It is determined from cloud cover, wind speed and time of day.
[2] The maximum vertical distance through which a contaminant released at ground level is able to mix. It is related to solar insolation (heating of the ground) and time of day.

at Buffalo, N.Y (which is geographically the nearest upper-air station to the area being modelled). Pearson Airport data (70 km from site) was selected over London Airport data (80 km from site) based on proximity to the proposed Jigs Hollow Pit site.

It should be noted that pre-processing of the meteorological data was completed following all requirements outlined by the model developer, including the treatment of calm wind conditions.

O.Reg. 419/05 regionally representative meteorological data is provided by the MOE, and will be used for any Certificate of Approval (Air) application for the Jigs Hollow Pit. O.Reg. 419/05 allows for the elimination of meteorological anomalies by discarding the highest 24-hr average predicted concentration for each meteorological year, which was not done for this assessment.

Page 3-7, Section 3.3.1 On-site Emissions

The following paragraph should replace the first paragraph of this section:

In order to be conservative, a maximum emission scenario was developed to capture expected worst-case daily particulate emissions from the proposed Jigs Hollow pit. This worst-case operating scenario was based upon a maximum daily extraction rate of 792 tonnes/day and an hourly maximum extraction rate of 66 tonnes/hour. This scenario also incorporated an estimated maximum daily shipping rate of three 22 tonne trucks loads per hour and 36 trucks per day. It should be noted that two 30 tonne truck loads per hour is likely more representative, however, three 22 tonne trucks is more conservative based on a 15% greater load and 50% greater truck traffic. This more conservative approach allows for small daily increases in traffic from asphalt and concrete recycling activities. Asphalt and concrete recycling activities will not result in an increase of the 792 tonnes/day maximum crushing and screening rate.

Page 3-9, Section 3.3.1 On-site Emissions

The following paragraph should replace the first paragraph of page 3-9:

The seasonal shipping and production factors assumed are presented in Table 3.5. The Jigs Hollow Pit will operate for 220 days per year and will be closed during the winter. To be conservative a winter seasonal factor of 10% was considered.

Page 3-10, Section 3.3.1 On-site Emissions *Material Handling and Processing Emissions*

The following paragraph should replace the second paragraph at the top of page 3-10 ***Material Handling and Processing Emissions***:

The particulate emissions resulting from the screeners and crushers were estimated using U.S. EPA emission factors [U.S. EPA 2006] in conjunction with the maximum hourly extraction rate.

Site specific analyses indicate that the moisture content of the raw material extracted from pits is greater than 2.5% (typically 3 to 4%). When this is the case, "controlled" emission factors may be used to estimate the emissions from screening and handling operations. However, for the worst-case scenario extracted material is picked-up and dropped three times before crushing. Therefore, it was conservatively assumed that after handling of extracted material the moisture content decreased, therefore **uncontrolled emission factors were used for crushing and screening** activities in the processing area. If required water will be sprayed on aggregate surge piles to increase the moisture content and further reduce emissions.

Page 3-11, Section 3.4 Reduction of Uncontrolled Fugitive Dust

The following paragraph should replace the first paragraph of Section 3.4 on page 3-11:

Reduction of uncontrolled industrial emissions is commonly achieved by applying a 'control mechanism'. An example of a control mechanism is simply applying water or another dust suppressant to an unpaved road, which dramatically reduces dust emissions. SENES estimated the emissions assuming that sufficient dust control measures will be applied that the control efficiencies indicated in Table 3.5 will be achieved on all roads. These efficiencies were used to reduce the uncontrolled emission rates estimated using the U.S. EPA emission equations. As outlined in the Best Management Plan (BMP) provided in Appendix D, a water truck will be used as required based on site specific meteorological conditions (i.e., more frequent watering on hot dry days).

Page 3-13, Section 3.5 ISCST3 Settings

The following paragraph should be added to the end of Section 3.5 on page 3-13:

A sensitivity analysis was completed based on modelling PM_{10} concentrations with MOE Ontario terrain data and without terrain data (i.e., assuming flat terrain as indicated above). Results indicate identical maximum model predicted contaminant concentrations at all sensitive receptor locations.

Page 5-1, Section 5.2 Recommendations

The following recommendation should be added to the end of Section 5.2 on page 5-1:

- a visual monitoring program should be established to ensure twice daily visual observations of the on-site roads and operations and of the off-site gravel roads. Observation of dust emissions would require immediate mitigation measures to be taken.

Appendix D Best Management Plan

The following should replace Sections D.1 to D.4 of the Best Management Plan:

D.1 POTENTIAL SOURCES OF FUGITIVE DUST

Due to the nature of activities at a sand and gravel operation, there are several on and off-site sources at the Jigs Hollow Pit that could potentially contribute to fugitive dust emissions. These are as follows:

- truck travel on the site entrance road;
- truck travel on off-site regional unpaved roads;
- loader travel on on-site unpaved roads;
- material processing and handling (conveying, loading, crushing and screening of aggregate); and
- stockpiling (raw and processed materials).

The fugitive dust generated by these sources and activities arises from processing or pulverizing crustal materials, and thus generally does not have significant amounts of other contaminants associated with it. Also, a significant portion of the fugitive dust from these sources is in the coarse fraction which tends to result in nuisance effects; only a small fraction of the dust is in the respirable range, which is of most concern from a health perspective.

In many instances, fugitive dust emissions depend on the wind speed at any given time as well as the activity rates. Thus the amount of effort necessary to control such emissions is greater during windy conditions than during calm conditions.

D.2 REQUIRED CONTROL ACTIONS

In general, most approaches for controlling fugitive dust involve the application of water to prevent the fugitive emissions from being generated. Depending on the source, there are other measures that can be used to remove the source of the dust, and/or reduce the impact of the emissions when they occur. These are discussed in the following sections.

D.2.1 Application of Water to the Off-Site Unpaved Haul Route, Site Entrance Road and Internal Haul Route

The Ministry of Natural Resources (MNR) requires that dust be mitigated on site and therefore, water will be applied to the site entrance road and internal loader routes to mitigate fugitive dust. In the assessment, sufficient calcium chloride application and watering was assumed to be applied to achieve a control efficiency of 80% on the off-site unpaved haul road and 90% on all unpaved on-site roads travelled by non-road equipment (loaders, etc) and by product trucks that will be used to ship finished materials off site. These levels of control are reasonably achievable, and necessary to prevent excessive emissions.

In order to achieve the level of control that is required to meet the levels that were used in the completion of this study, the following actions are recommended:

- the Township of Woolwich currently applies a single application of calcium chloride to the off-site haul road on Peel Street and Jigs Hollow Road during the spring, in addition Kuntz Topsoil, Sand & Gravel should apply a second application of calcium chloride during the late summer;
- all unpaved on-site haul roads should receive an application of calcium chloride during the spring, and a second application of calcium chloride during the late summer;
- all unpaved on and off-site haul roads should be watered at a sufficient frequency to control dust generation due to vehicle travel; and,
- vehicle speeds on on-site unpaved haul roads should remain at 20 km/h or less.

An operational watering scheme that is based on the activity levels and meteorological conditions will be developed and followed by trained site personnel, to ensure that watering is completed frequently enough to adequately control fugitive dust emissions. For the purpose of illustration, the following scheme is included as an example of the type of system that could be developed at the Jigs Hollow Pit.

D.2.2 Example Operational Watering Scheme

Internal haul routes (both within the pit and at grade) will be treated with water as necessary for dust control. The capability for main internal haul truck watering will provide for the required number of passes per hour, as needed to achieve the recommended dust control efficiency.

For operational purposes, a scheme based on the type of day (hot/dry/windy, warm/overcast, cool/overcast, rainy) that prescribes the recommended watering frequency based on the number of truck passes and the length of road, is suggested, as presented below:

- During very hot, dry and sunny conditions (typical of July or August) or windy days (i.e. greater than 20 km/h), sufficient water will be applied to all in-pit roads for these conditions, depending on the traffic level;
- During moderately warm, dry conditions (late spring & fall), sufficient water will be applied to in-pit unpaved roads for these conditions, depending on the traffic level; and
- During wet or rainy periods, the roads generally will not be watered.

The scheme presented above will be adjusted as conditions dictate. For example, roads will definitely be watered regardless of the "rules" if there is visible or blowing dust. A site specific watering table, which will be a function of wind speed, temperature and relative humidity, will be produced as part of the dust management plan following approval of the final site design.

Dust emissions from traffic and operations will be observed at least twice daily. A visible dust observation from any operation will trigger appropriate mitigation action.

D.2.3 Application of Water to Material Handling and Processing

This assessment was completed assuming that crushing and screening equipment will not have any water sprays to reduce dust emissions. The assessment assumed that no controls will be used on material drops from loaders, excavators and stackers. However, should problems with fugitive dust arise, installation of spray bars on processing equipment will be considered.

D.2.4 Application of Water to Material Storage Piles

Depending on the amount of "fines" present in the material, windblown dust from material storage piles can occur. The assessment was completed with the conservative assumption that wind erosion will occur at all wind speeds. In addition, it was assumed that no controls will be specifically employed to mitigate this source. Should emissions from storage piles become a problem, the piles will be sprayed with water or another approved dust suppressant as necessary to reduce windblown dust.

D.2.5 Record Keeping

A daily log of water applications and other dust control procedures and observations should be kept at the site to demonstrate, if necessary, that dust control actions are being taken.

D.2.6 Control of On-site Contractors

On-site contractors will be required to meet the same requirements as set out in this Best Management Plan at all times that they are on-site.

D.3 Recommended Actions for Improved Control

In addition to the procedures outlined above, SENES recommends that the following options also be considered to further reduce the potential for off-site dust emissions:

- Apply calcium chloride or other chemical dust suppressants annually or semi-annually, if permitted by the ARA license; and
- Ensure that the site perimeter berms and surrounding area be sufficiently vegetated as follows:
    - It is important to note that as trees and shrubs grow, some will become tall, while others will remain short; some will spread, while others will remain columnar. The mature plant characteristics of the selected species should be examined to determine the appropriate plant spacing and placement, such that a good screen is produced once all plants reach their ultimate height and spread; and
    - The plantings should contain a mix of coniferous and deciduous species, such that some screening potential remains after the leaves have fallen off of the deciduous plants.

D.4 Environmental Complaint Documentation and Response Procedure

SENES recommends that a complaint documentation and response procedure be established for the Jigs Hollow Pit, such that standardized procedures are followed in the event that a complaint is made by a member of the public. The documentation should include the date and time of the complaint, the nature of the problem, and whether any follow-up action was taken. The complaint information should be maintained in an on-site log that is available for review by the MOE, if requested.

A sample form is included on the following page.

RECORD OF ENVIRONMENTAL COMPLAINT AND RESPONSE

1. Location: _____

2. Date and Time Complaint Received: _____

3. Name of Complainant: _____

   Address: _____

   Telephone Number: _____

4. Form of Complaint and Summary: Visit:[ ] Telephone Call:[ ] Letter:[ ] Attach Copy
   Other _____

5. Meteorological Conditions When Complaint Received:

   _____

6. Operation Conditions When Complaint Received:

   _____

7. Complaint Referred to Technical Services: No [ ] Yes [ ] and provide details:

   _____

8. Contact Made With Government Official(s): No [ ] Yes [ ]
   If Yes, Complete and Attach Record of Government Environmental Official Contact Form -- Yes [ ]

9. Details Concerning Investigation Made by Company Concerning Complaint:

   _____

   _____

10. Response to Complainant:
    Letter [ ] Date _____ Attach copy of letter to this form.

    Telephone Call [ ] Date _____ Time _____

    Summary of Telephone Call:

    _____

    _____

11. Follow-up Action Required and/or Taken by Company:

    _____

    _____

    _____

12. Filed Original Form in the Plant Environmental Manual: Yes [ ]

    Date _____ _____
    Employee Signature, Name & Position

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34915-1

3 March 2010

Mr. David Sisco
Principal – Planning
IBI Group
279 Queen Street South
Kitchener, Ontario
N2G 1W6

Dear Mr. Sisco:

In order to meet the requirements outlined by Dr. Tony van der Vooren in his peer review dated 29 October 2009, a number of changes need to be made to the site plan notes.

In the AMEC review under Section 2.2, on Page 4 (under the heading Kuntz Application), Dr. van der Vooren recommends that the SENES best management practices (BMP) be acknowledged by the Site Plans (so there would be an assurance of enforcement). As such, SENES would suggest the following:

That under the section entitled Recommendations from Technical Reports of the Site Plan notes on the Operational Plan (Sheet 2 of 4) that the following be added:

Dust Assessment Recommendations

1) *The licensee shall maintain a visual monitoring program to ensure twice daily visual observations of the on-site roads and operations and of the off-site gravel roads are undertaken. Observation of dust emissions would require immediate mitigation measures to be taken.*

2) *The licensee shall use best management practices to mitigate dust including:*

   a. *The Township of Woolwich currently applies a single application of calcium chloride to the off-site haul road on Peel Street and Jigs Hollow Road during the spring. In addition, Kuntz Topsoil, Sand and Gravel Ltd. shall apply a second application of calcium chloride during the late summer, and/or as directed by the Township.*

b. *All unpaved on-site haul roads shall receive an application of calcium chloride during the spring, and a second application of calcium chloride during the late summer, and/or as required.*

c. *All unpaved on and off-site haul roads shall be watered at a sufficient frequency to control dust generation due to vehicle travel.*

d. *Vehicle speeds on on-site unpaved haul roads shall remain at 20 km/h or less.*

3) *An operational watering plan shall be developed, based on the activity levels and meteorological conditions and followed by trained site personnel to ensure watering is completed frequently enough to adequately control fugitive dust emissions and carried out as described in the SENES Dust Assessment – Addendum Section D.2.2 (February, 2010).*

4) *Should visible fugitive dust from the processing of aggregate (crushing and screening) become a problem, the licensee shall install spray bars to control this dust.*

5) *Should visible dust emissions from storage piles become a problem, the piles will be sprayed with water or another approved dust suppressant as necessary to reduce windblown dust.*

6) *A daily log of water applications and other dust control procedures and observations shall be maintained and be available upon request to MOE or MNR to demonstrate, if necessary, that dust control actions are being taken.*

7) *The licensee shall ensure that the perimeter berms be sufficiently vegetated as follows:*

a. *Perimeter Berms: All berms shall be vegetated with a grass-type legume.*

b. *Peel Street Berm: In addition to the planting of grass-type legumes, the Peel Street berm shall be planted with a selection of deciduous and coniferous shrubs and tree species on the road side of the Peel Street berm such that a good screen (about 2 metres in height) is produced once all plants reach their ultimate height and spread. Refer to Typical Berm Planting Detail.*

Further, under Section 2.3.1, Dr. van der Vooren recommends that a MOE Certificate of Approval be obtained which would essentially contain the Dust Management Plan. As such, might SENES suggest an additional note be added to the Site Plans under Recommendations from Technical Studies to read as follows:

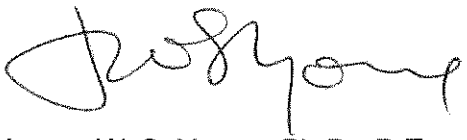
8) *The licensee shall obtain a MOE Certificate of Approval (if required by MOE) which will include the Dust Management practices noted above as Notes 2 – 6.*

It should also be noted that Dr. van der Vooren incorrectly assumed that controlled emission factors had been used in the assessment of dust from the crusher. SENES in fact assumed uncontrolled dust emissions fro this source so it is expected that some visible dust will be evident from the crushing/screening area. Notwithstanding this, item 4 above has been included.

Should you have any questions about these recommendations, please do not hesitate to contact me at 1.905.764.9389 x337.

Yours very truly,

SENES Consultants Limited



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Ontario

December 17, 2009

Mr. Paul Racher

RE: Review and Acceptance into the Provincial Register of Reports: Archaeological Assessment Report Entitled, "Stage 1 and 2 Archaeological Assessment, Proposed Jigs Hollow Pit, 125 Peel Street, Part of Lot 3, Broken Front Concession (West of the Grand River), Township of Woolwich, Region of Waterloo, Ontario", October 2008, Received December 10, 2008, Licence/PIF # P007-150-2007, MCL File 30AG038

Dear Mr. Racher:

This office has reviewed the above-mentioned report which has been submitted to this Ministry as a condition of licensing in accordance with Part VI of the Ontario Heritage Act, R.S.O. 1990, c 0.18. This review is to ensure that the licensed professional consultant archaeologist has met the terms and conditions of their archaeological licence, that archaeological sites have been identified and documented according to the 1993 technical guidelines set by the Ministry and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario.

As the result of our review, this Ministry accepts the above titled report into the Provincial register of archaeological reports. The report indicates that three pre-contact aboriginal findspots were found on the subject property and it is recommended that it be considered sufficiently documented. This Ministry concurs with the recommendation that the provincial interest in the archaeological sites identified within the subject property has been addressed.

Given the above, this Ministry is satisfied that concerns for archaeological sites have been met for the area of this development project as depicted by Figure 3 of the above titled report and as illustrated in the Existing Conditions Map dated December 15, 2008, prepared by IBI Group.

Should you require any further information regarding this matter, please feel free to contact me.

Sincerely,

Shari Prowse
Archaeology Review Officer

cc. MCL Archaeology Licence Office
IBI Group
Aggregate Officer, Aylmer District, MNR