December 2014

Technical Support Document #2

NOISE

TAGGART GROUP OF COMPANIES

miller THE MILLER GROUP

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APPENDICES

1.0 INTRODUCTION

This document presents the result of the technical study completed for the Atmosphere - Noise component. The study has been conducted in conformance with the requirements contained in the approved Terms of Reference (TOR) (EASR Appendix A). The general methodology for conducting the Environmental Assessment (EA) is presented in Section 2.0 of the Environmental Assessment Study Report (EASR). This noise impact assessment was carried out for the Site development plan as described in Section 10.0 of the EASR.

Golder Associates Ltd. was retained to prepare the Atmosphere-noise component of the impact assessment.

2.0 METHODS

Data for the Atmosphere-noise component of the impact assessment was collected and analyzed for three study areas as follows:

- Site – The Boundary Road Site lands owned or optioned by Taggart Miller Environmental Services (Taggart Miller) for the proposed Capital Region Resource Recovery Centre (CRRRC).
- Site-vicinity – The lands in the vicinity of the Site (within 1 km of the Site boundaries for Atmosphere – noise); and,
- Haul Route – The main haul/access route to the Site.

Noise was evaluated using the 1-hour equivalent noise level (LA_{eq}). The 1-hour LA_{eq} is the energy equivalent continuous sound level, which has the same energy as the time varying signal over a one hour period at the same location.

The baseline conditions are established as the minimum daytime (0700 to 1900), evening (1900 to 2300), and nighttime (2300 to 0700) 1-hour LA_{eq} monitored at three nearby locations in the Site-vicinity.

The proposed operating hours for outdoor waste receiving and processing (ancillary facilities) and landfill operations are from 0600 to 1900 hours Monday to Saturday. Outdoor activities for the organic processing at the primary reactor cells are limited to 0700 to 1900 hours. The proposed operating times for indoor operations for the MRF and C&D facility are from 0600 to 2300 hours Monday to Saturday. As such, the assessment for normal operations has been based on daytime operations (0700 to 1900 hours), evening operations (1900 to 2300 hours) and nighttime operations (0600 to 0700 hours). Essential equipment associated with bio-gas, leachate and power generation is required to operate 24 hours per day 365 days of the year. As such, the assessment for essential equipment has been based on nighttime operations (2300 to 0600 hours).

2.1 Methods for Describing the Existing Environment

A field study was carried out to characterize existing noise levels, due to the lack of existing noise data in the Site-vicinity. This field study involved continuous noise monitoring at three different locations (Figure 1). In addition, noise measurements were carried out at an existing Miller Waste Management Facility to obtain data for noise sources associated with the Material Recovery Facility (MRF).

The following summarizes the field study:

- Continuous noise monitoring was carried out at three locations within the Site-vicinity to collect the average and minimum existing noise levels for daytime (0700 to 1900), evening (1900 to 2300), and nighttime (2300 to 0700) periods nearby sensitive Points of Reception (PORs). The monitoring lasted from August 23, 2013 through to August 29, 2013. Noise data was logged continuously on an hourly basis for the duration of the monitoring period.
- Noise measurements were carried out for various external noise sources at the MRF located at 100 Garfield Wright Blvd, East Gwillimbury, Ontario.

The locations where baseline noise monitoring was carried out are shown in Figure 1 and summarized in Table 1.

Table 1: Summary of Noise Monitoring Locations

Monitoring Location	Address	Monitor UTM Coordinates
Meas Loc #1	6150 Chemin Thunder Road	464943, 5021708
Meas Loc #2	5368 Boundary Road	465339, 5021249
Meas Loc #3	5716 Boundary Road	465969, 5019628

A total of 10 PORs with existing residences were identified along and near the haul route from Highway 417 as being the closest off-Site receptors (see Figure 2). In addition, a total of 3 vacant lots (VL) zoned to allow possible future noise sensitive land use were identified (see Figure 3). Table 2 provides a summary of the PORs used in this assessment. The table also indicates which baseline noise monitoring location was used to establish the existing noise levels at each POR.

Table 2: Summary of Sensitive Points of Reception (PORs)

Receptor	UTM Coordinates	Representative Noise Monitoring Location
POR1	465558, 5020774	Meas Loc #2
POR2	465319, 5020015	Meas Loc #3
POR3	465888, 5019611	Meas Loc #3
POR4	465421, 5020818	Meas Loc #2
POR5	465428, 5021084	Meas Loc #2
POR6	465323, 5021149	Meas Loc #2
POR7	465319, 5021197	Meas Loc #2
POR8	465306, 5021229	Meas Loc #2
POR9	465318, 5021389	Meas Loc #2
POR10	464934, 5021613	Meas Loc #1

Receptor	UTM Coordinates	Representative Noise Monitoring Location
VL01	465916, 5020949[1]	Meas Loc #2
VL02	466206, 5020603[1]	Meas Loc #3
VL03	466808, 5021378[1, 2]	N/A[3]
	467094, 5020583[1, 4]	N/A[5]

Notes:
[1] UTM coordinates are for the assumed location of the future developments.
[2] Assumed location representative of worst-case noise impact for ancillary noise sources.
[3] Noise monitoring was not carried out at this location. The minimum background sound level due to road traffic was calculated using STAMSON v5.04 (see Table 5).
[4] Assumed location representative of worst-case noise impact for landfill noise sources.
[5] MOECC exclusionary sound level limits for Class 1 areas have been used.

2.2 Methods for Predicting Effects

2.2.1 Source Sound Level Measurements

Source sound level measurements were carried out at an existing Miller Waste Management Facility located at 100 Garfield Wright Boulevard, East Gwillimbury, Ontario. Measurements were made for all external noise sources at the Material Recovery Facility (MRF) and were used to represent similar external noise sources at the proposed MRF and Construction and Demolition (C&D) Waste Facility. Measurements were made using a Larson Davis 2900+ (Serial #0983) sound level meter/real-time analyzer. The instrument was calibrated before and after all sound level measurements and the calibration verified. This instrument provides the spectral (i.e., frequency) characteristics of the sound source(s) under review and it is a valuable tool for identifying, quantifying and ranking noise source emissions from equipment at a given point of reception. All measuring equipment used in this study meets the Ministry of the Environment and Climate Change (MOECC) requirements.

Golder's database of similar noise sources was used for equipment that does not currently operate at the East Gwillimbury location or was not operating at the time of site measurements.

2.2.2 CadnaA Noise Model

The Computer Aided Noise Attenuation (CadnaA) prediction model, (version 4.3.143), developed by DataKustik GmbH is widely accepted for evaluating noise from industrial projects, including landfill projects world-wide. The model algorithms are based on ISO 9613 Acoustics: Attenuation of Sound During Propagation Outdoors (ISO, 1993 and 1995). In addition, this model has been independently validated for its implementation of the ISO standard.

The model has the ability to simulate emission sources including roads, vessels and industrial facilities. Noise sources are characterized by entering the sound power and/or sound pressure octave band spectrum associated with each source. Other parameters including building dimensions, frequency of use, hours of operation, and enclosure attenuation ratings also define the nature of sound emissions. The ISO 9613 prediction method is conservative as it assumes that all receptors are downwind from the noise source or that a moderate ground based temperature inversion exists. In addition, ground cover and physical barriers, either natural (terrain-based) or constructed and atmospheric absorption are included as they relate specifically to the proposed undertaking.

The likely noise effects of the proposed undertaking are evaluated with the aid of the CadnaA noise modelling software, which uses the ISO 9613 noise prediction algorithms. This model allows for the incorporation of the following environmental factors that can result in noticeable changes in noise levels:

- Attenuation because of the distance between the noise source and receiver location;
- Absorption of acoustic energy by the atmosphere;
- Loss of acoustic energy as it travels around or over intervening buildings; and
- Loss of acoustic energy as it passes over the ground (i.e., ground impedance).

In addition to the attenuation factors listed above, constructed features can be used to reduce the noise levels further, including: buildings, weather/acoustic enclosures, noise barriers, silencers, and exhaust mufflers.

To accurately account for these factors and features, the noise assessment relies on numeric models. The selection of appropriate models to support the noise assessment ensures that the results of the assessment are credible and indicative of the conditions likely to occur should the project proceed. The selection of the CadnaA noise modelling software considered several capabilities:

- Evaluates the various source types associated with the project;
- Has a technical basis that is scientifically sound, and is in keeping with the current understanding of the propagation of sound in the outdoors;
- Applies a prediction program that has undergone scrutiny for correct implementation of established ISO methods;
- Makes predictions that are consistent with observations; and
- Is recognized by the MOECC as one suitable for use.

Table 3 provides information regarding the model verification, model calibration, model validation, as well as the uncertainty and sensitivity of the model.

Table 3: Reliability Summary for the CadnaA Noise Model

Model Name	Developer	Use in Assessment	Verification	Calibration	Validation	Uncertainty and Sensitivity
CadnaA	DataKustik GmbH	Predicting noise levels associated with on-Site activities, equipment and operations	▪ CadnaA implements the ISO standards for noise propagation outdoors ▪ ISO 9613 (ISO, 1993 and 1995) ▪ Drew *et. al.*, 2005	▪ CadnaA predictions have been calibrated using measurements in the Site-vicinity	▪ CadnaA predictions are continuously validated ▪ Drew et. al., 2005	▪ ISO 9613 is based on known theory and proven to reliably produce repeatable results ▪ CadnaA predictions of sound energy are sensitive to inputs (i.e., doubling sources will result in a doubling of acoustic energy at receptors) ▪ Uncertainty associated with emissions is managed by making conservative assumptions (e.g., all construction equipment for certain construction works and activities operating concurrently)

Note:

Source operations, locations and elevations for the proposed project activities were selected to ensure that the predicted Site-vicinity noise levels would result in the predictable worst-case noise predictions at all PORs and VLs as shown on Figures 2 and 3, respectively.

3.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

The noise assessment methodology used in this study is based on the MOECC publication "Noise Guidelines for Landfill Sites" (MOE, 1998). This guideline outlines the sound level criteria adopted by the MOECC for evaluating landfilling operations and ancillary facilities (i.e., stationary noise sources). The sound level limits for landfilling operations are 55 decibels (dBA) and 45 dBA during daytime and nighttime hours, respectively. Should the environment be dominated by noise sources such as industry, commerce or road transportation, which produce sound in excess of the above limits, the higher sound levels may be used as the limit. This guideline also outlines the protocol for evaluating off-site haul road truck traffic. For ancillary facilities, the noise level limits are defined in MOECC publication "*NPC-300 Environmental Noise Guideline – Stationary and Transportation Sources – Approval and Planning.*" (MOE, 2013).

The noise assessment is carried out at the most sensitive off-Site PORs along and near the haul route. All POR locations identified in this study are best described as being located in a Class 1 area as defined by the MOECC, which is an area with an acoustical environment typical of a major population centre, where the background noise is dominated by the road traffic, often referred to as urban hum (MOE, 2013). Daytime, evening and nighttime hours for a Class 1 area are defined as follows:

- Daytime – 0700 to 1900 hours;
- Evening – 1900 to 2300 hours; and
- Nighttime – 2300 to 0700 hours.

The proposed operating hours of the landfill, compost facility and hydrocarbon contaminated soil treatment facility are 0600 to 1900 hours. Outdoor activities for the organic processing at the primary reactor cells are limited to 0700 to 1900 hours. The proposed operating times for indoor operations for the MRF and C&D facility are from 0600 to 2300 hours. As such, under normal operations, the assessment for nighttime operations focused on the one hour period from 0600 to 0700 hours. Essential equipment associated with bio-gas, leachate and power generation is required to operate 24 hours per day 365 days of the year. As such, essential equipment has been assessed separately and focused on the period from 2300 to 0600 hours.

3.1 Baseline Study

The existing acoustic environment in the Site-vicinity is dominated primarily by road traffic noise along Boundary Road. During nighttime hours, noise from traffic along Highway 417 can also be heard. Table 4 summarizes the measured noise levels at each of the three monitoring locations (see Figure 1). The noise monitoring data that show the hourly variation in sound level during the monitoring period is available in Appendix A. For the vacant lot located to the east of the Facility (VL03 – see Figure 3), the minimum background sound level due to road traffic was calculated using hourly traffic data for Highway 417. The sound energy exposure was determined using STAMSON v5.04 – ORNAMENT, the computerized road traffic noise prediction model provided by the MOECC. Predictions were made at two locations representing the assumed worst-case location for the ancillary and landfill operations, respectively. The minimum hourly noise level predictions for VL03 are summarized in Table 5.

Table 4: Summary of Hourly Noise Monitoring Data (dBA)

Meas Loc	Average Daytime (0700 to 1900 hours) Normal Operations		Average Evening (1900 to 2300 hours) Normal Operations		Average Nighttime (0600 to 0700 hours) Normal Operations		Average Nighttime (2300 to 0600 hours) Essential Operations		Minimum Daytime (0700 to 1900 hours) Normal Operations		Minimum Evening (1900 to 2300 hours) Normal Operations		Minimum Nighttime (0600 to 0700 hours) Normal Operations		Minimum Nighttime (2300 to 0600 hours) Essential Operations	
	L_{eq}	L_{90}*	L_{eq}	L_{90}*	L_{eq}	L_{90}*	L_{eq}	L_{90}*	L_{eq}	L_{90}*	L_{eq}	L_{90}*	L_{eq}	L_{90}*	L_{eq}	L_{90}*
#1	60	53	60	53	60	55	54	47	58	49	56	49	58	52	47	40
#2	67	52	66	51	67	54	57	45	65	45	61	45	63	50	50	34
#3	61	49	60	48	62	50	51	40	58	41	54	39	56	41	47	28

Note: * Sound pressure level exceeded for 90% of the measurement period.

Table 5: Summary of Minimum Background Sound Level (dBA) Due to Road Traffic (applicable to VL03)

Location	Daytime (0700 to 1900 hours)	Evening (1900 to 2300 hours)	Night-time Normal Operations (0600 to 0700 hours)	Night-time Essential Operations (2300 to 0600 hours)
VL03 (Ancillary Assessment)	57 [1]	55 [1]	54 [1]	45 [2]
VL03 (Landfill Assessment)	55 [2]	N/A [3]	45 [2]	N/A [3]

Notes:

[1] Minimum background sound level due to road traffic calculated using STAMSON v5.04

[2] MOECC minimum sound level limits for landfilling operations.

[3] Proposed operating hours of the landfill are 0600 to 1900 hours.

4.0 DESCRIPTION OF PROJECT EFFECTS

4.1 Landfilling Operations Noise Emissions

This portion of the noise assessment considers the predicted noise emissions associated with the operations of the CRRRC landfill component.

Table 6 provides a summary of the overall sound power data for each noise source considered in the assessment of landfilling operations.

Table 6: Sound Power Data for Landfilling Operations Noise Sources

Source	Quantity	Overall Sound Power Level (dBA)
Loader	1	109
Excavator	1	103
Backhoe	1	92
Grader	1	116
Dozer D6	1	110
Dozer D8	1	114
Compactor	1	108
Water Truck	1	107
Haul Trucks	35 (total peak in and out)	103

4.2 Landfilling Operations Modelling Results

Table 7 provides a summary of the maximum landfilling operations noise modelling results for the identified PORs in the Site-vicinity.

Noise predictions have been carried out for each of the eight phases of development of the landfill (as shown on Figure 4). Source locations and elevations were selected to ensure that the predicted Site-vicinity noise levels would result in the worst-case noise predictions at all receptor locations. In Table 7, the corresponding landfill phase is presented with the maximum predicted noise level.

Table 7: Landfilling Operations Noise Predictions (dBA)

Receptor	Existing Minimum Noise Levels (0600 to 0700 hours)	Existing Minimum Noise Levels (0700 to 1900 hours)	Maximum Predicted Landfilling Operations Noise Levels (Phase)	Compliant with MOECC Noise Guidelines
POR01	63	65	54 (6)	Yes
POR02	56	58	53 (6)	Yes
POR03	56	58	55 (7)	Yes
POR04	63	65	53 (6)	Yes
POR05	63	65	50 (6)	Yes
POR06	63	65	48 (6)	Yes
POR07	63	65	48 (6)	Yes
POR08	63	65	47 (6)	Yes
POR09	63	65	46 (6)	Yes
POR10	58	58	43 (6)	Yes
VL01	63	65	51 (3)	Yes
VL02	56	58	56 (3)	Yes
VL03	45	55	45 (1)	Yes

4.3 Ancillary Facility Noise Emissions

The proposed Site components include (or may include in the case of the electrical generation component) a MRF, C&D facility, organics processing, hydrocarbon contaminated soil treatment, surplus soil management, leaf/yard materials composting, flare and electrical generation facility, maintenance facility, leachate treatment facility, exhaust fans and heating, ventilation and air conditioning (HVAC) equipment.

Table 8 provides a summary of the overall sound power data for each noise source considered in the assessment of ancillary facilities.

Table 8: Sound Power Data for Ancillary Facilities Noise Sources

Source	Quantity	Overall Sound Power Level (dBA)
HVAC	17	83
Large Exhaust	19	87
Ventilation Openings	24	83
Dust Collector	2	102
Welding Fume Hood	1	91
Biofilter	2	90
Pump	1	106

Source	Quantity	Overall Sound Power Level (dBA)
Diesel Generator	1	117
Loader[3]	5	109
Chipper	1	118
Conveyor	2	94
Compost Turner	1	111
Screen	1	104
Air Classifier	1	111
Compost Aerator Fan[1]	4	95
Waste Truck Movements	47 (total peak hour in and out)	103
Truck Idling	5	98
Flare[1]	1	104
Dump Truck	1	108
Grader	1	116
Dozer	1	110
Leachate Truck Movements[1]	2	104
Leachate Truck Pumping[1]	1	111
Excavator[4]	2	103
Skid-steer	1	92
Electrical Generator[1, 2]	7	105

Notes:

[1] Equipment operates 24 hours per day, 365 days per year.

[2] Generators will be equipped with silencers and they will be housed in containers. Generator containers designed not to exceed 55 dBA at 10 m.

[3] The number of loaders modelled is 5, though a total of 4 loaders are shared by ancillary facilities and may operate at one time.

[4] The number of excavators modelled is 2, though 1 excavator is shared by ancillary facilities and may operate at one time.

4.4 Ancillary Facility Modelling Results

As the facility operations would begin daily at 0600 hours, Tables 9, 10 and 11 provide, respectively, a summary of the maximum ancillary facilities noise modelling results for daytime (0700 to 1900 hours), evening (1900 to 2300 hours), and nighttime (0600 to 0700 hours) compared to the minimum 1-hour L_{eq} monitored. For the existing PORs and vacant lots VL01 and VL02, the existing minimum 1-hour L_{eq} has been determined by noise monitoring. For the vacant lot VL03, the existing minimum 1-hour L_{eq} due to road traffic has been calculated. Table 12 provides a summary of the maximum noise modelling results for essential equipment for nighttime (2300 to 0600 hours).

Table 9: Daytime (0700 to 1900) Ancillary Facilities Noise Predictions (dBA) – Normal Operations

Receptor	Existing Minimum Noise Levels	Maximum Predicted Ancillary Facilities Noise Levels	Compliant with MOECC Noise Guidelines
POR01	65	52	Yes
POR02	58	44	Yes
POR03	58	43	Yes
POR04	65	51	Yes
POR05	65	51	Yes
POR06	65	49	Yes
POR07	65	49	Yes
POR08	65	49	Yes
POR09	65	49	Yes
POR10	58	45	Yes
VL01	65	59	Yes
VL02	58	56	Yes
VL03	57	51	Yes

Table 10: Evening (1900 to 2300) Ancillary Facilities Noise Predictions (dBA) – Normal Operations

Receptor	Existing Minimum Noise Levels	Maximum Predicted Ancillary Facilities Noise Levels	Compliant with MOECC Noise Guidelines
POR01	61	39	Yes
POR02	54	32	Yes
POR03	54	29	Yes
POR04	61	38	Yes
POR05	61	36	Yes
POR06	61	35	Yes
POR07	61	35	Yes
POR08	61	35	Yes
POR09	61	35	Yes
POR10	56	31	Yes
VL01	61	46	Yes
VL02	54	46	Yes
VL03	55	47	Yes

Table 11: Nighttime (0600 to 0700) Ancillary Facilities Noise Predictions (dBA) – Normal Operations

Receptor	Existing Minimum Noise Levels	Maximum Predicted Ancillary Facilities Noise Levels	Compliant with MOECC Noise Guidelines
POR01	63	52	Yes
POR02	56	44	Yes
POR03	56	43	Yes
POR04	63	50	Yes
POR05	63	50	Yes
POR06	63	49	Yes
POR07	63	49	Yes
POR08	63	49	Yes
POR09	63	49	Yes
POR10	58	44	Yes
VL01	63	58	Yes
VL02	56	56	Yes
VL03	54	50	Yes

Table 12: Nighttime (2300 to 0600) Essential Equipment Noise Predictions (dBA)

Receptor	Existing Minimum Noise Levels	Maximum Predicted Ancillary Facilities Noise Levels	Compliant with MOECC Noise Guidelines
POR01	50	38	Yes
POR02	47	31	Yes
POR03	47	27	Yes
POR04	50	36	Yes
POR05	50	34	Yes
POR06	50	31	Yes
POR07	50	31	Yes
POR08	50	30	Yes
POR09	50	29	Yes
POR10	47	25	Yes
VL01	50	45	Yes
VL02	47	45	Yes
VL03	45	45	Yes

4.5 Off-Site Haul Route Noise Emissions

The primary off-Site haul route is along Boundary Road. A maximum of 271 trucks were assumed to come and go from the Site per day. Assuming 10 hours per day and applying a 1.45 peaking factor to all trips to account for random arrivals, the total number of peak hour trips are:

- 271 trips per day / 10 hours per day x 1.45 peaking factor = 40 trips per hour entering and exiting

In addition, three leachate trucks per hour were assumed making 43 total trips entering or exiting the Site. Using the road traffic data in Table 13, the sound energy exposures were determined using STAMSON v5.04 – ORNAMENT, the computerized road traffic noise prediction model of the MOECC. The STAMSON model was calibrated to provide results consistent with the monitored levels. The model was used to predict future traffic noise levels by adding the peak hour number of trucks associated with the Site. It is noted that there is adequate areas for queuing of waiting trucks within the Site such that there will not be back up onto Boundary Road.

Table 13: Road Traffic Data

Roadway	Year	AADT	% Trucks		Speed Limit (km/hr)
			Medium	Heavy	
Boundary Road	2011	7,820	5	5	80

4.6 Off-Site Haul Route Modelling Results

Table 14 provides a summary of the maximum predicted change in noise levels along the off-Site haul route based on 86 trucks (43 trips) in a one hour period. As the traffic volume data presented in Table 13 is based on information obtained in 2011, the traffic volume in the analysis has been adjusted to account for a growth factor of 2% per year to 2013, to coincide with the year in which noise measurements were obtained.

Table 14: Change in Noise Levels Due to Off-Site Haul Route

Receptor	Maximum Predicted Change in Noise Level (dB)
POR01, POR04 to POR09, VL01 and VL02	4.9
POR02	1.7
POR03	0.7
POR10	2.8
VL03	N/A*

Note: *VL03 is not located near to the off-Site haul route, therefore no change in noise level is expected.

Table 15 below is provided by the MOECC to assess the effect of off-Site vehicles on the existing noise environment.

Table 15: Effect of Off-Site Vehicles

Sound Level Increase (dB)	Qualitative Rating
1 to 3 inclusive	Insignificant
3 to 5 inclusive	Noticeable
5 to 10 inclusive	Significant
10 and over	Very significant

In accordance with MOECC noise guidelines, the maximum predicted sound level increase of 4.9 dB results in a qualitative rating of 'noticeable' (but not significant) for sensitive receptors along Boundary Road and 'insignificant' elsewhere in the Site-vicinity. It is also noted that the use of 2013 background traffic volumes renders the analysis conservative.

5.0 MITIGATION MEASURES

While predicted noise increases along the approximate 800 metres of Boundary Road from Hwy 417 to the Site would be noticeable, the assessment of noise effects has not identified the need for additional mitigation measures. The following noise mitigation measures were assumed in the noise assessment:

- Constructed screening features (berms) will be installed. The required screening berms for the existing receptors will be placed as shown on Figure 3;
- Between 0600 and 0700 hours motorized equipment will only be idling; however, this assessment conservatively assumes full operations at this time. The screening berm requirements presented in Table 16 are for landfilling operations between 0600 and 0700 hours only. The mitigation measures for vacant lot receptors (VL01, VL02 and VL03) are only required if a noise sensitive building is developed on those lands in the interim;

Table 16: Landfilling Operations 0600 to 0700 hours

Phase Number	Receptor	Phase Boundary Location	Barrier Height (m)	Distance to Phase Boundary(m)
1	VL2	Northwest	2.5	< 70
	VL3	East	6	< 50
			5	50 to 100
			4	100 to 210
			3	210 to 300
			2.5	> 300
2	VL3	Northeast	5	< 100
			4	100 to 210
			3	210 to 300
			2.5	300 to 390
3	VL2	North	2.5	< 50
4	None			

Phase Number	Receptor	Phase Boundary Location	Barrier Height (m)	Distance to Phase Boundary(m)
5	VL3	East	4.5	< 50
			4	50 to 120
			3	120 to 150
			2.5	> 150
6	POR3	Southwest	2.5	< 30
	VL2	Northeast	2.5	< 50
7	POR3	Southwest	3	< 30
			2.5	30 to 60
8	POR3	Southwest	2.5	< 30
	VL2	North	2.5	< 40

- In the event that landfilling operations are postponed until 0700 hours, screening berm requirements will be reduced. The screening berm requirements presented in Table 17 are for landfilling operations between 0700 and 1900 hours. The mitigation measures for vacant lot receptors (VL01, VL02 and VL03) are only required if a noise sensitive building is developed on those lands in the interim;

Table 17: Landfilling Operations 0700 to 1900 hours

Phase Number	Receptor	Phase Boundary Location	Barrier Height (m)	Distance to Phase Boundary(m)
1	VL2	Northwest	2.5	< 55
	VL3	East	3	< 65
			2.5	65 to 110
2	VL3	Northeast	2.5	< 40
3	VL2	North	2.5	< 45
4	None			
5	VL3	East	2.5	< 40
6	VL2	Northeast	2.5	< 45
7	POR3	Southwest	2.5	< 50
8	None			

- All motorized equipment will be kept in good repair and be fitted with standard operational exhaust mufflers;
- "Drive-through" methods of moving equipment on-Site will be maximized to reduce the use of back-up beepers, and there will be speed limit control for traffic on-Site;
- Completed phases may provide shielding for some PORs for operations occurring in adjacent cells; and
- Between 0600 and 0700 hours motorized equipment will only be idling, full operation will occur between 0700 and 1900 hours (i.e., daytime hours).

6.0 FOLLOW UP MONITORING PROGRAM

The guidelines stipulate that the need for, and the requirements of any follow-up program for the CRRRC be identified. A follow-up program is required to determine that the environmental and cumulative effects of the CRRRC are consistent with predictions reported in the EA. It can also be used to verify that mitigation measures are effective once implemented and determine whether there is a need for additional mitigation measures. The follow-up program is designed to be appropriate to the scale of the CRRRC project and the predicted effects identified through the EA process (in this case the noise effects).

Follow-up noise monitoring is recommended to initially take place annually during operations and shall include hourly noise readings taken at or near POR2 and POR3 for at least 48 hours during peak operations. Prior to the follow-up monitoring being carried out, confirmation of which landfill phase is under operation shall be determined and reported along with the monitoring results. Modifications to the noise monitoring program would be determined in consultation with the MOECC.

7.0 CONCLUSION

This noise assessment evaluated the potential effect of the CRRRC on the Atmosphere – noise component. Measurable changes to existing noise levels were identified; however, the noise levels are predicted to be in compliance with MOECC guidelines.

Follow-up monitoring is recommended to confirm that the mitigation measures considered integral to the CRRRC are being incorporated as planned, and are effective. Follow-up monitoring should take place annually, at least initially, during operations at the CRRRC. Modifications thereafter will be determined in consultation with the MOECC.

REFERENCES

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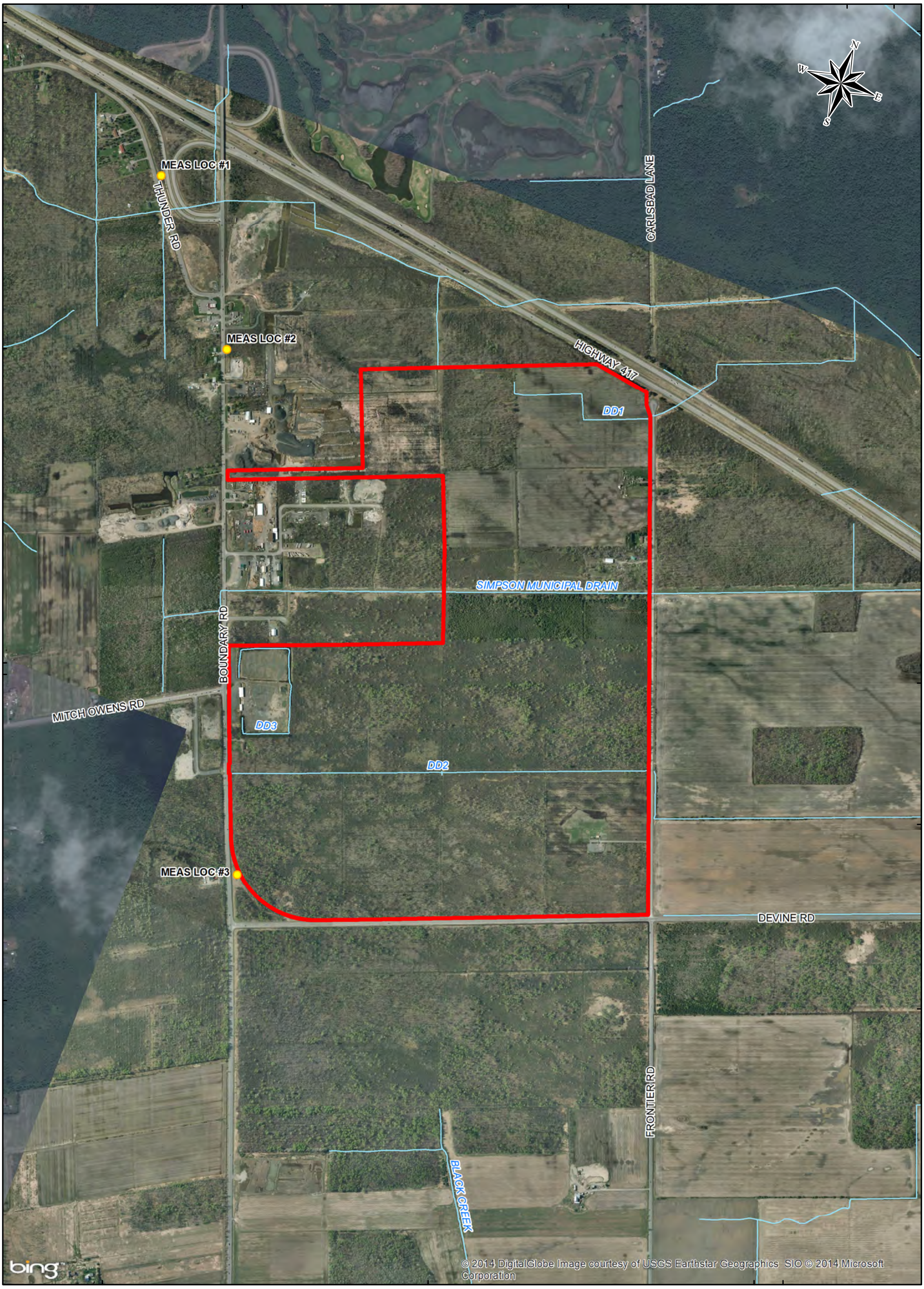

LEGEND

- NOISE MONITORING LOCATIONS
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCE

BACKGROUND IMAGERY - BING MAPS AERIAL (C) 2010 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS.
AERIAL PHOTOGRAPHS PURCHASED FROM THE CITY OF OTTAWA.
LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2012.
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

400 200 0 400
SCALE 1:12,000 METRES

PROJECT
ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE
NOISE MONITORING LOCATIONS

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0.0
DESIGN	TG	NOV. 2013	FIGURE 1	
GIS	BR	NOV. 2013		
CHECK	PLE	AUG. 2014		
REVIEW	PAS	AUG. 2014		

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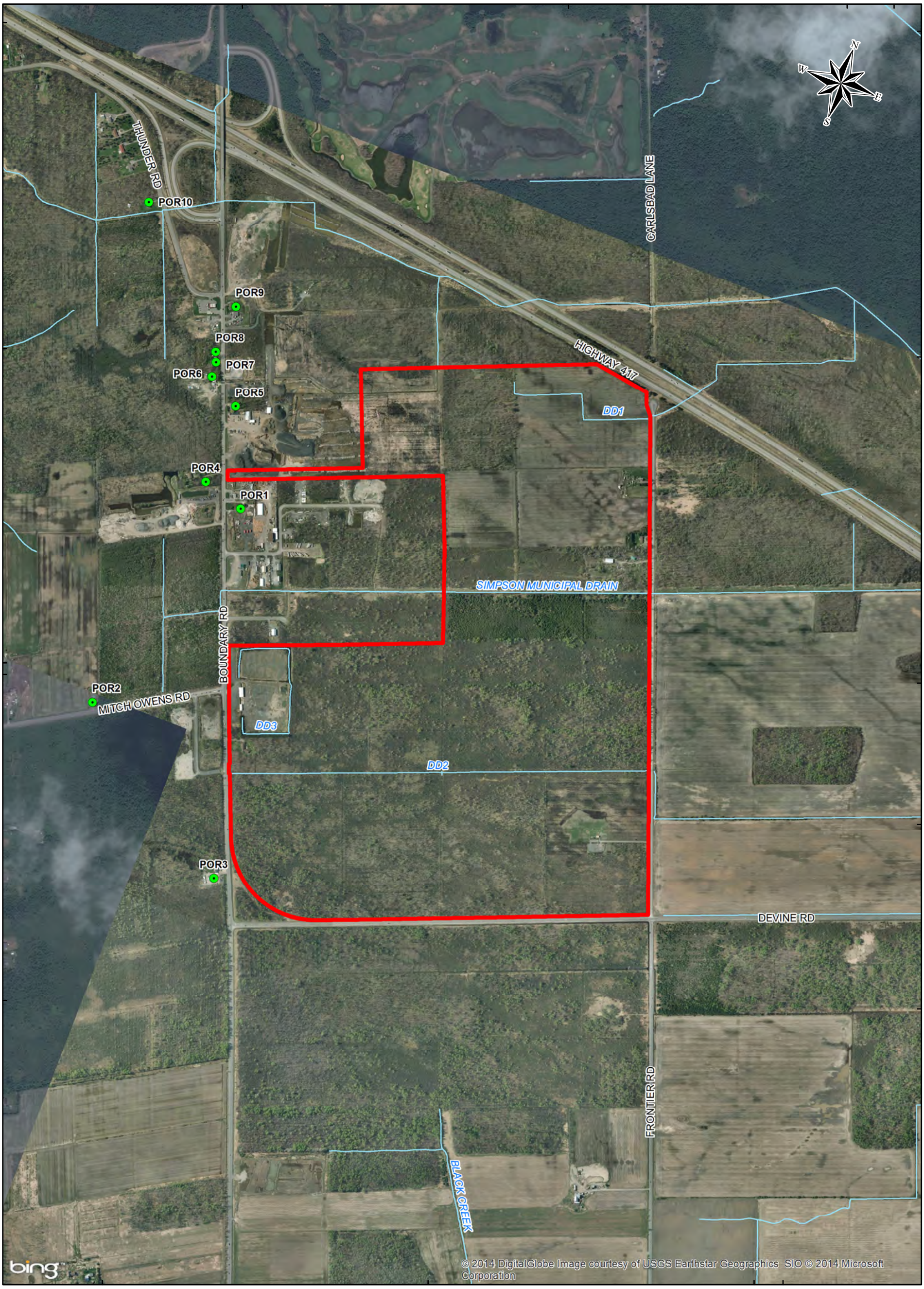

LEGEND

- POINT OF RECEPTION LOCATIONS
- SURFACE WATER FEATURE
- PROPERTY BOUNDARY

400 200 0 400

SCALE 1:12,000 METRES

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCE

BACKGROUND IMAGERY - BING MAPS AERIAL (C) 2010 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS.
AERIAL PHOTOGRAPHS PURCHASED FROM THE CITY OF OTTAWA.
LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2012.
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT
ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE
POINT OF RECEPTION LOCATIONS

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0.0
DESIGN	TG	NOV. 2013	FIGURE 2	
GIS	BR	NOV. 2013		
CHECK	PLE	AUG. 2014		
REVIEW	PAS	AUG. 2014		

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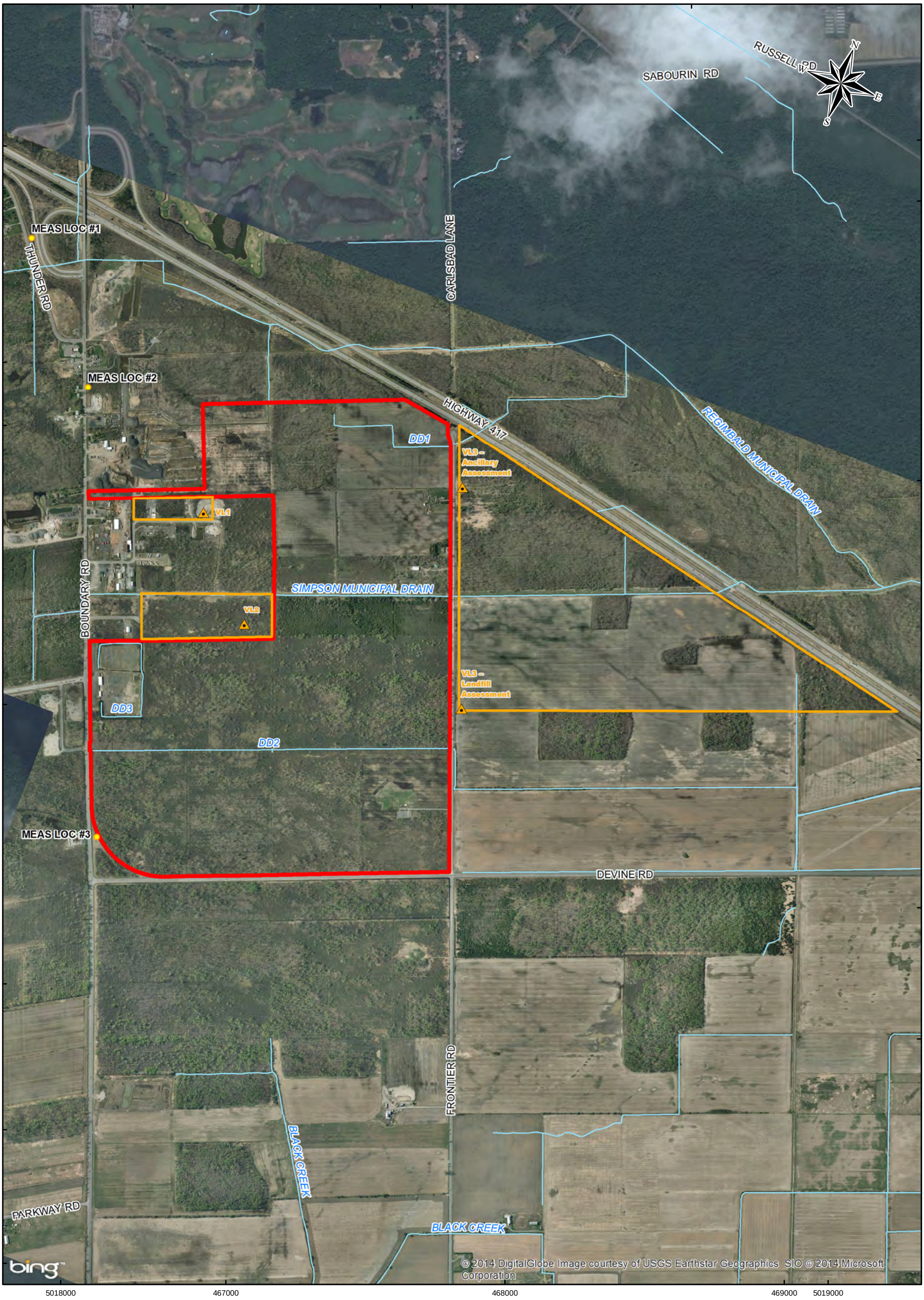

LEGEND

- RECEPTOR LOCATION
- SURFACE WATER FEATURE
- VACANT LOT
- PROPERTY BOUNDARY

400 200 0 400

SCALE 1:14,000 METRES

NOTE

THIS FIGURE IS TO BE READ IN CONJUNCTION WITH THE ACCOMPANYING REPORT.

REFERENCE

BACKGROUND IMAGERY - BING MAPS AERIAL (C) 2010 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS.
AERIAL PHOTOGRAPHS PURCHASED FROM THE CITY OF OTTAWA.
LAND INFORMATION ONTARIO (LIO) DATA PRODUCED BY GOLDER ASSOCIATES LTD. UNDER LICENCE FROM ONTARIO MINISTRY OF NATURAL RESOURCES, © QUEENS PRINTER 2012.
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 18

PROJECT

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

TITLE

VACANT LOT LOCATIONS

Golder Associates
Ottawa, Ontario

PROJECT No. 12-1125-0045			SCALE AS SHOWN	REV. 0.0
DESIGN	TG	NOV. 2013	FIGURE 3	
GIS	BR	NOV. 2013		
CHECK	PLE	AUG. 2014		
REVIEW	PAS	AUG. 2014		

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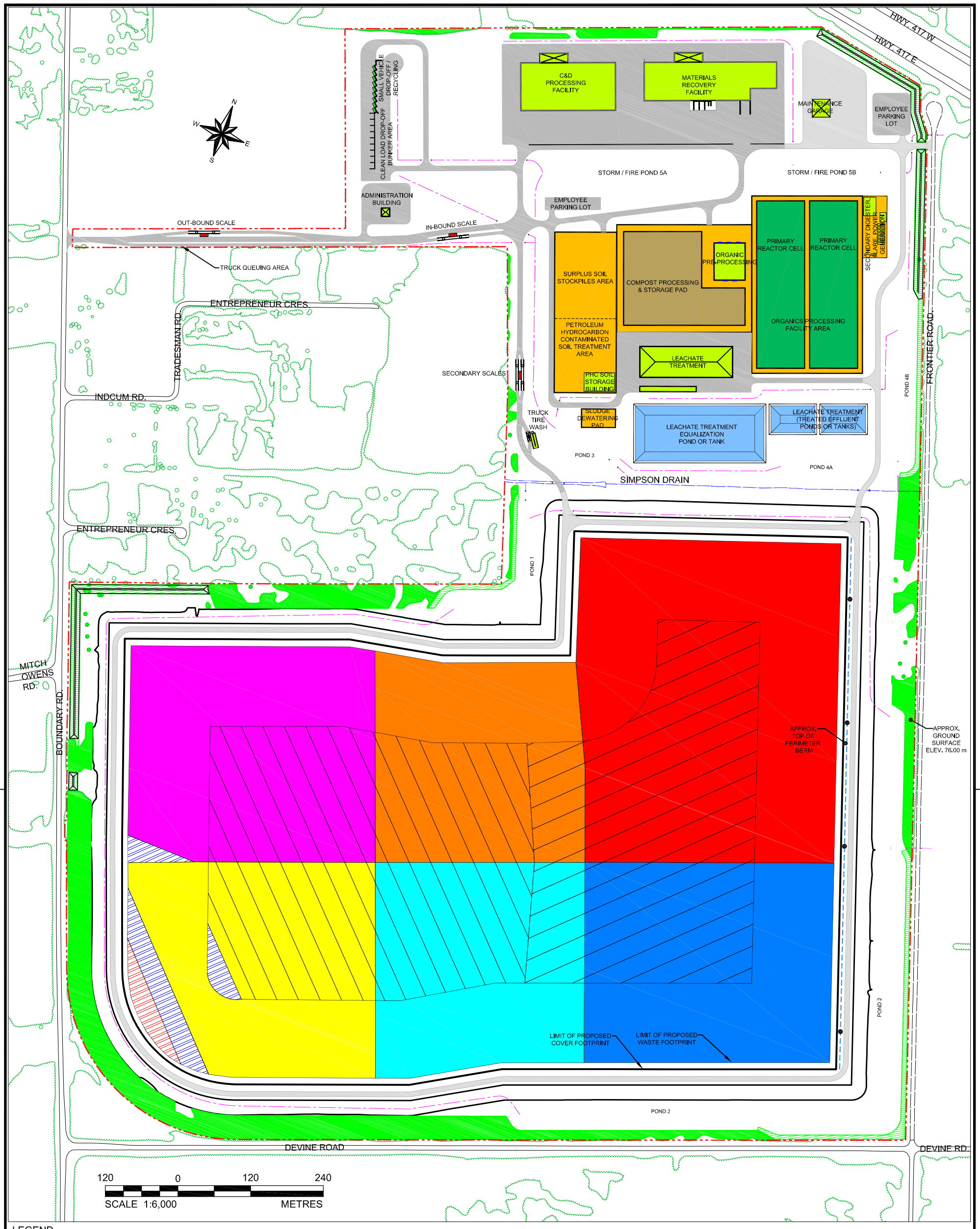
PLOT DATE: December 3, 2014
FILENAME: N:\Active\Spatial_IM\Miller_Paving_Ltd\CRRRC\ACAD\Phase 2000\Task 0110\1211250045-2000-0110-04.dwg



LEGEND

- PROPOSED FACILITY BUILDING
- OUTDOOR DIVERSION AREA
- PAVED ROAD (ASPHALT)
- GRAVEL ROAD
- PROPERTY BOUNDARY
- EXISTING VEGETATION SCREENING
- CONSTRUCTED SCREENING FEATURE
- DITCH
- STORMWATER MANAGEMENT PONDS
- PHASE 1
- PHASE 2
- PHASE 3
- PHASE 4
- PHASE 5
- PHASE 6
- PHASE 7
- PHASE 8
- LANDFILL OPERATING AREA REQUIRING 2.5 m NOISE BERM
- LANDFILL OPERATING AREA REQUIRING 3 m NOISE BERM

Golder Associates
Ottawa, Ontario, Canada

SCALE	AS SHOWN
DATE	Nov. 2013
DESIGN	M.L.F.
CAD	M.L.F./B.R.
CHECK	P.L.E.
REVIEW	P.A.S.

FILE No. 1211250045-2000-0110-04.dwg
PROJECT No. 12-1125-0045 REV.

TITLE

PHASING PLAN AND NOISE SCREENING BERM LOCATIONS

ENVIRONMENTAL ASSESSMENT OF THE
CAPITAL REGION RESOURCE RECOVERY CENTRE

FIGURE 4

APPENDIX A

Noise Monitoring Data

APPENDIX A

Date	Time	Leq POR1	L90 POR1	Leq POR2	L90 POR2	Leq POR3	L90 POR3
23-Aug-13	12:00 AM	57	49	58	45	51	35
23-Aug-13	1:00 AM	55	46	56	43	48	34
23-Aug-13	2:00 AM	54	43	57	42	49	36
23-Aug-13	3:00 AM	53	42	57	42	49	38
23-Aug-13	4:00 AM	55	47	56	44	49	36
23-Aug-13	5:00 AM	59	54	64	49	58	44
23-Aug-13	6:00 AM	63	59	69	57	64	54
23-Aug-13	7:00 AM	62	58	69	55	64	54
23-Aug-13	8:00 AM	61	56	68	52	63	49
23-Aug-13	9:00 AM	61	56	67	52	61	47
23-Aug-13	10:00 AM	61	55	66	52	60	45
23-Aug-13	11:00 AM	60	54	67	51	60	46
23-Aug-13	12:00 PM	60	54	67	50	61	45
23-Aug-13	1:00 PM	61	54	67	54	64	59
23-Aug-13	2:00 PM	61	56	68	54	61	48
23-Aug-13	3:00 PM	63	57	69	56	62	50
23-Aug-13	4:00 PM	63	58	68	59	62	51
23-Aug-13	5:00 PM	63	58	68	58	62	51
23-Aug-13	6:00 PM	62	57	69	53	60	48
23-Aug-13	7:00 PM	62	58	65	51	58	45
23-Aug-13	8:00 PM	63	60	65	52	58	45
23-Aug-13	9:00 PM	63	59	63	52	56	43
23-Aug-13	10:00 PM	62	58	62	50	54	39
23-Aug-13	11:00 PM	61	56	61	48	54	37
24-Aug-13	12:00 AM	60	55	58	47	51	33
24-Aug-13	1:00 AM	58	50	55	44	47	30
24-Aug-13	2:00 AM	57	47	56	43	47	32
24-Aug-13	3:00 AM	55	45	52	41	47	29
24-Aug-13	4:00 AM	55	46	56	42	49	29
24-Aug-13	5:00 AM	58	52	58	45	52	35
24-Aug-13	6:00 AM	61	57	63	50	56	41
24-Aug-13	7:00 AM	61	56	65	50	59	44
24-Aug-13	8:00 AM	59	52	65	47	59	44
24-Aug-13	9:00 AM	59	52	66	48	59	45
24-Aug-13	10:00 AM	59	53	66	50	59	45
24-Aug-13	11:00 AM	59	54	66	53	59	47
24-Aug-13	12:00 PM	58	51	66	54	59	50
24-Aug-13	1:00 PM	58	52	67	56	60	51
24-Aug-13	2:00 PM	58	50	66	56	59	50
24-Aug-13	3:00 PM	59	49	66	56	60	50
24-Aug-13	4:00 PM	59	51	66	55	59	51
24-Aug-13	5:00 PM	58	52	66	48	59	47
24-Aug-13	6:00 PM	59	50	65	46	58	43
24-Aug-13	7:00 PM	61	57	64	48	57	43
24-Aug-13	8:00 PM	62	58	64	49	56	44
24-Aug-13	9:00 PM	61	58	64	48	56	43
24-Aug-13	10:00 PM	61	57	62	47	55	41
24-Aug-13	11:00 PM	60	56	61	46	54	39
25-Aug-13	12:00 AM	57	53	58	44	50	33
25-Aug-13	1:00 AM	55	48	56	40	49	32
25-Aug-13	2:00 AM	52	44	54	37	47	29
25-Aug-13	3:00 AM	52	41	56	36	51	28
25-Aug-13	4:00 AM	49	40	53	34	49	29

Date	Time	Leq POR1	L90 POR1	Leq POR2	L90 POR2	Leq POR3	L90 POR3
25-Aug-13	5:00 AM	50	43	58	35	50	32
25-Aug-13	6:00 AM	53	45	59	41	53	35
25-Aug-13	7:00 AM	57	46	62	42	55	38
25-Aug-13	8:00 AM	57	46	63	41	56	36
25-Aug-13	9:00 AM	57	47	65	46	58	43
25-Aug-13	10:00 AM	58	49	66	53	59	48
25-Aug-13	11:00 AM	58	51	66	56	60	52
25-Aug-13	12:00 PM	59	51	67	56	60	53
25-Aug-13	1:00 PM	58	51	65	54	59	53
25-Aug-13	2:00 PM	58	50	66	56	61	54
25-Aug-13	3:00 PM	59	51	66	55	60	52
25-Aug-13	4:00 PM	59	51	66	54	59	50
25-Aug-13	5:00 PM	59	52	66	54	58	47
25-Aug-13	6:00 PM	60	50	65	46	57	44
25-Aug-13	7:00 PM	58	50	64	45	57	44
25-Aug-13	8:00 PM	57	49	63	50	56	48
25-Aug-13	9:00 PM	57	50	62	48	56	47
25-Aug-13	10:00 PM	55	48	61	47	53	43
25-Aug-13	11:00 PM	53	46	59	48	51	43
26-Aug-13	12:00 AM	49	44	56	49	50	45
26-Aug-13	1:00 AM	47	43	53	49	47	45
26-Aug-13	2:00 AM	48	43	54	50	47	44
26-Aug-13	3:00 AM	48	43	54	50	47	43
26-Aug-13	4:00 AM	50	44	56	47	51	43
26-Aug-13	5:00 AM	55	48	63	47	58	45
26-Aug-13	6:00 AM	58	52	68	54	63	53
26-Aug-13	7:00 AM	59	52	68	53	63	51
26-Aug-13	8:00 AM	59	51	68	51	62	49
26-Aug-13	9:00 AM	59	50	67	50	60	48
26-Aug-13	10:00 AM	59	52	67	51	61	48
26-Aug-13	11:00 AM	60	52	68	50	60	49
26-Aug-13	12:00 PM	58	51	67	49	60	49
26-Aug-13	1:00 PM	59	53	67	49	60	46
26-Aug-13	2:00 PM	61	53	67	49	61	48
26-Aug-13	3:00 PM	62	56	68	53	62	51
26-Aug-13	4:00 PM	64	57	69	57	63	54
26-Aug-13	5:00 PM	63	56	69	57	62	53
26-Aug-13	6:00 PM	60	51	67	50	60	47
26-Aug-13	7:00 PM	60	54	65	48	58	47
26-Aug-13	8:00 PM	60	55	63	51	56	49
26-Aug-13	9:00 PM	57	52	61	51	55	49
26-Aug-13	10:00 PM	56	51	61	50	54	49
26-Aug-13	11:00 PM	54	49	59	50	52	47
27-Aug-13	12:00 AM	53	50	56	50	51	48
27-Aug-13	1:00 AM	51	48	55	49	49	46
27-Aug-13	2:00 AM	50	48	53	48	49	46
27-Aug-13	3:00 AM	50	48	55	49	49	47
27-Aug-13	4:00 AM	50	45	56	47	52	46
27-Aug-13	5:00 AM	55	48	63	46	58	41
27-Aug-13	6:00 AM	59	54	69	54	63	54
27-Aug-13	7:00 AM	61	53	67	55	62	54
27-Aug-13	8:00 AM	61	51	67	51	61	46
27-Aug-13	9:00 AM	59	49	67	46	60	46
27-Aug-13	10:00 AM	59	49	67	45	60	46

Date	Time	Leq POR1	L90 POR1	Leq POR2	L90 POR2	Leq POR3	L90 POR3
27-Aug-13	11:00 AM	58	49	67	47	60	44
27-Aug-13	12:00 PM	58	50	66	48	60	48
27-Aug-13	1:00 PM	59	49	67	53	60	48
27-Aug-13	2:00 PM	60	51	67	50	61	49
27-Aug-13	3:00 PM	62	53	69	54	61	51
27-Aug-13	4:00 PM	62	53	69	54	62	52
27-Aug-13	5:00 PM	62	51	68	55	61	51
27-Aug-13	6:00 PM	60	50	67	51	64	50
27-Aug-13	7:00 PM	58	49	65	46	58	43
27-Aug-13	8:00 PM	58	52	64	48	59	47
27-Aug-13	9:00 PM	58	52	62	49	56	47
27-Aug-13	10:00 PM	57	50	61	49	54	45
27-Aug-13	11:00 PM	55	49	58	48	51	46
28-Aug-13	12:00 AM	54	45	57	47	53	48
28-Aug-13	1:00 AM	51	41	56	46	51	48
28-Aug-13	2:00 AM	49	40	53	44	53	50
28-Aug-13	3:00 AM	50	40	50	43	48	43
28-Aug-13	4:00 AM	49	41	55	43	50	41
28-Aug-13	5:00 AM	54	46	65	44	59	41
28-Aug-13	6:00 AM	60	53	68	53	63	50
28-Aug-13	7:00 AM	61	53	67	52	62	51
28-Aug-13	8:00 AM	60	49	69	48	61	46
28-Aug-13	9:00 AM	62	51	68	47	60	41
28-Aug-13	10:00 AM	60	51	69	54	59	42
28-Aug-13	11:00 AM	61	50	68	48	60	44
28-Aug-13	12:00 PM	61	51	67	48	59	45
28-Aug-13	1:00 PM	61	49	68	48	60	47
28-Aug-13	2:00 PM	60	51	68	49	60	50
28-Aug-13	3:00 PM	61	52	68	50	61	51
28-Aug-13	4:00 PM	63	55	69	54	62	55
28-Aug-13	5:00 PM	62	56	69	55	62	54
28-Aug-13	6:00 PM	62	54	67	51	61	50
28-Aug-13	7:00 PM	61	56	64	49	59	45
28-Aug-13	8:00 PM	61	57	64	52	58	52
28-Aug-13	9:00 PM	60	56	64	53	58	53
28-Aug-13	10:00 PM	58	54	61	52	56	51
28-Aug-13	11:00 PM	56	49	59	51	55	51
29-Aug-13	12:00 AM	54	46	58	50	53	49
29-Aug-13	1:00 AM	51	45	56	49	52	47
29-Aug-13	2:00 AM	52	43	55	48	49	43
29-Aug-13	3:00 AM	51	44	55	48	49	46
29-Aug-13	4:00 AM	55	46	60	46	50	40
29-Aug-13	5:00 AM	58	52	64	49	58	43
29-Aug-13	6:00 AM	62	57	69	55	62	54
29-Aug-13	7:00 AM	61	56	69	54	63	54
29-Aug-13	8:00 AM	60	54	68	52	62	50
29-Aug-13	9:00 AM	61	55	67	52	60	44
29-Aug-13	10:00 AM	61	53	67	54	60	46
29-Aug-13	11:00 AM	61	54	67	56	60	48
29-Aug-13	12:00 PM	61	53	67	59	60	49