



DRAFT REPORT

Noise Existing Conditions and Impact Assessment

W12A Landfill Expansion EA, City of London, Ontario

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Acronyms and Glossary of Terms

Term / Acronym	Definition
AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
dB	decibels
dBA	A-weighted decibels
EA	Environmental Assessment
EASR	Environmental Assessment Study Report
ECA	Environmental Compliance Approval
HVAC	heating, ventilation and air conditioning
ISO	International Organization for Standardization
LCS	leachate collection system
LFG	landfill gas
Leq	equivalent noise level
LLM	Logarithmic Mean Impulse Sound Level
MECP	Ministry of Environment, Conservation and Parks
MRF	Material Recovery Facility
MTO	Ontario Ministry of Transportation
ORNAMENT	Ontario Road Noise Analysis Method for Environment and Transportation
POR	Point of Reception
POW	Plane of Window
WWTP	Wastewater Treatment Plant

1.0 INTRODUCTION

The City of London is proposing an expansion of the existing W12A Landfill site (the Project) located at 3502 Manning Drive, part of Lots 18, 19 and 20 of Concession 6 in the former Township of Westminster, in the south end of the City of London, Ontario.

The environment is considered in broad terms to include the natural, social, cultural, and economic aspects of the environment. This document presents the noise component existing conditions and impact assessment for the Environment Assessment (EA) of the proposed W12A Landfill expansion. In particular, this report describes and summarizes a noise assessment that considers the existing conditions and potential effects of the Project on the outdoor acoustic environment. Specifically, environmental effects relevant to human noise receptors are assessed. This work has been conducted in accordance with the requirements set out in the approved Terms of Reference (ToR), dated February 2019 and the work plan dated November 2019 prepared following commencement of the EA in September 2019 and circulated to the Ontario Ministry of Environment, Conservation and Parks (MECP).

This report is a supporting document to the Environmental Assessment Study Report (EASR).

2.0 PROJECT DESCRIPTION

The following describes the Project components considered relevant for the purposes of this noise assessment.

General Description: The landfill expansion consists of a vertical expansion over the existing landfill footprint to provide 13.8 million m³ of airspace for waste and daily cover. To accommodate ancillary features and provide additional on-Site buffer width compared to the existing landfill, the northern boundary of the landfill property will be adjacent to Scotland Drive and a 100 m buffer width will be provided on the east side of the landfill footprint and some additional area in the southeast corner to tie into the adjacent Material Recovery Facility (MRF) property line. This results in a 106.3 ha landfill footprint within a 192.4 ha landfill property, with a highest ridge elevation of waste of 318.43 masl.

Landfill Phasing and Development: The landfill expansion will be developed sequentially in eight Phases, 1E through 8E, progressing from the west side of the landfill towards the east. Landfilling in each Phase will be approximately 2.5 to 3.5 years based on an expected typical annual air space consumption of 500,000 m³ per year, which corresponds to an average annual waste receipt of 370,000 tonnes per year over the 25 year planning period. A separate cell dedicated for disposal of the non-decomposable portion of the waste stream will be provided in the southeastern area of the landfill expansion. Filling in this non-decomposable waste cell will take place in lifts over the 25 year expansion period, and will be blended in to meet the temporary sideslopes in the adjacent Phases 7E and 8E as they are developed. Because this waste is non-decomposable, it would not receive daily cover; however, if it is observed that specific materials are generating odours or are otherwise of concern if left uncovered, daily cover material would be placed. This fill area would receive final cover consistent with that on the remainder of the landfill, but it is not proposed to install a landfill gas collection system in this area as part of the final cover construction.

To commence filling in each Phase, the existing cover material would be progressively stripped from an area large enough to accommodate the year's disposal, which is estimated to average

approximately 4 ha. The area of exposed waste would be limited to that needed to spread, compact and cover the waste received on a daily basis, and will range from about 40 m by 25 m typically (1,000 m²) to 50 m by 30 m (1,500 m²). The waste will be spread and compacted in lifts of about 0.6 m to a height of approximately 3 m. All waste will be covered daily.

For the southern Phases 1E, 3E, 5E and 7E the waste would be placed initially to build a berm along the south side of the Phase and will be covered with final cover soil and seeded to establish vegetation; the berm will screen the view of subsequent filling operations north of the berm from off-Site vantage points to the south. The south side perimeter waste berm would be raised sequentially and filled in behind until the peak elevation is reached. The Phase boundaries have been designed (offset) such that the completed southern Phases (1E, 3E, 5E, 7E) will effectively screen the view of landfilling operations in the northern Phases (2E, 4E, 6E, 8E) from off-Site vantage points to the south.

Temporary soil berms, and if necessary shallow swales, would be provided to direct surface water runoff from existing covered upslope areas around the active fill areas / Phases to the stormwater management system since this runoff has not been in contact with waste.

On an annual or biannual basis, final cover would then be constructed over areas reaching final grade and permanent vertical landfill gas (LFG) wells will be installed and connected to the LFG collection system

For the portion of the proposed vertical expansion that will involve placement of additional waste above the Phase 2 area, the existing leachate collection system (LCS) will continue to be used to collect and remove leachate from the area.

Leachate Control and Management: Phase 2 utilizes the clay till as a natural low permeability liner, and has a continuous granular drainage blanket and piping system over a shaped subgrade to collect leachate and direct it by gravity to the north end of the Phase 2 area where the collected leachate is removed for subsequent off-site treatment. The waste in the Phase 1 area rests directly on the underlying low permeability clay till and has a perimeter LCS around the north, east and south sides to intercept leachate seepage at the base of the waste. Collected leachate either drains into the Phase 2 collection system or into a separate storage tank from where it is removed for subsequent off-site treatment.

For the portion of the proposed vertical expansion that will involve placement of additional waste above the Phase 2 area, the existing LCS will continue to be used to collect and remove leachate from the area. For the vertical expansion above the Phase 1 area, it is proposed to replace the existing perimeter LCS with a new perimeter LCS that will more effectively serve the same functions as the existing system. To control the potential for leachate seeps along the perimeter sideslopes that could occur as a result of leachate mounding and/or perched leachate in Phase 1, it is proposed to construct granular finger drains around the north, east and south sides of the exterior perimeter of the Phase 1 area and connect them into the replacement Phase 1 perimeter LCS.

The leachate collected from the Phase 1 and Phase 2 LCS will continue to be routed through on-Site piping to the main leachate pumping station located at the southeast corner of the Site. From here, the leachate will be pumped off-Site through a leachate forcemain to the Dingman Road pump station, where combined with municipal sewage it will enter the municipal sanitary sewer system to treatment at the Greenway Wastewater Treatment Plant (WWTP).

Landfill Gas Generation and Control: It is estimated that the total expanded landfill will theoretically generate a maximum of approximately 4,000 standard cubic feet per minute (scfm) of LFG in 2049 (the year following completion of filling of the expansion), of which typically 50% is methane. LFG is collected from completed areas of the landfill using a vertical well system that is connected to an enclosed flare; the existing flare is sized to combust a maximum of approximately 1,700 scfm of LFG. Considering the actual extent of the LFG well extraction system and its collection efficiency, analysis indicates that the capacity of the existing flare may be exceeded around year 2027. The timing for installation of additional flare capacity will depend on the actual operation of the existing flare and its ability to handle the collected gas flow rate. It is proposed to utilize vertical LFG extraction wells to be progressively installed with the construction of final cover following placement of waste to final contours in each Phase. To reduce air emissions (for odour control purposes during landfilling operations and to increase the overall collection of landfill gases), it is proposed that a number of horizontal landfill gas collection pipes will also be installed progressively as waste is placed.

Site Operations and Ancillary Components: The expanded landfill will operate, at the maximum, from 7 a.m. to 5 p.m., Monday through Saturday plus one hour before, i.e., 6 a.m. to 7 a.m., for site preparations and one hour after, i.e., 5 p.m. to 6 p.m. to complete placement of daily cover. The Site will be closed on Sundays; on statutory holidays site operations will be as required to accommodate hauling contracts.

It is proposed that the maximum annual receipt of waste for the expanded landfill will be 500,000 tonnes per year, reduced from the 650,000 tonnes per year allowed for the existing landfill.

The expanded landfill will also need to continue to occasionally operate 24 hours per day, 7 days per week when lime stabilized dewatered biosolids (dewatered sewage sludge) from the Greenway WWTP are being received and disposed at the landfill. This is typically required for three weeks per year; however, some years this period could be extended. In addition, re-builds or major equipment repairs typically occur approximately every five years or longer and can take up to two to three months to complete. The landfill may receive a load of biosolids (approximately 15 tonnes) every 75 to 90 minutes. Disposal of the biosolids involves excavating a hole in the existing waste in the active area (when practical) prior to the load arriving and covering the biosolids with daily cover soil as soon as the load has been dumped.

The main site access for the expansion will be at the same location as for the existing site, off Manning Drive at the southeast corner of the Site. The main ancillary facilities are located along the perimeter road across the south side of the Site. It is proposed that many of the existing ancillary facilities at the site will be progressively upgraded or replaced during the expansion at or close to their existing location, except for a new site office / administration building to be located close to the site entrance. These facilities consist of the contractor's office and garage; administration building; flare and control system; weigh scales and scale house and leachate pump station; and small vehicle waste drop-off. A new enclosed night

waste storage facility for receipt and temporary storage of three to five loads of waste may also be constructed; access to the landfill at night will be done using card key access and automatic gates. In addition, in the vacant southeast corner area between the landfill and the MRF there will be a new scale and scalehouse, a grade-separated small vehicle drop-off for waste, a grade-separated small vehicle drop-off for recyclable materials, an area for drop-off of brush, tires and large items, and a new Household Special Waste depot.

The source of heating for all site buildings will be natural gas.

The existing roads on the south and west sides of the landfill are paved and will remain paved for the expansion. It is proposed that the perimeter access road around the north and east sides of the landfill will also be paved, as will the vehicle access roads for the proposed recycling drop-off facilities in the southeast corner between the landfill facilities and the MRF. Access for collection vehicles to the expansion Phases will be mainly from the south side perimeter road, and for Phases 1E and 2E from the west side perimeter road. From the south side, it is anticipated that the two existing granular surfaced haul roads will continue to be utilized.

A secondary site access off Scotland Drive will be used as a service road for operations and maintenance vehicles to the north part of the landfill property and as an emergency access/exit. The secondary access will have a locked gate to prevent unauthorized usage and will be gravel surfaced.

Off-Site Haul Routes: The current designated haul route consists of two options: Manning Drive via Wonderland Road to the west and Manning Drive via Wellington Road South to the east (Haul Routes).

Closure and Post-closure: The landfill Phases will be progressively closed after the final waste contours have been reached in a Phase and landfill operations have proceeded into the next Phase(s). The final cover on the landfill will consist of a permeable cover design, comprised of 600 mm of soil topped with 150 mm of topsoil or similar and vegetated. The vertical LFG extraction wells will be installed to collect gas from within the expanded waste mass as part of the progressive construction of the final cover system.

Post-closure activities will involve continued operation and maintenance of the leachate collection and removal system, the LFG control system and the stormwater management system. In addition to general inspection of the site, there will be inspection of the landfill cover for evidence of erosion, leachate seeps or instability, and maintenance / repair as required.

3.0 KEY NOISE CONCEPTS

Acoustic values can be described in terms of noise or sound. While noise is defined as unwanted sound, the terms noise and sound are often used interchangeably. An introduction to key concepts used in the assessment of outdoor acoustics is provided below:

- “Noise” or “noise levels” refers to the levels that can be heard or measured at a Point of Reception (POR).
- A noise “receptor” or “POR” is any location on a noise sensitive land use where noise is received.
- The “level” of a noise is expressed on a logarithmic scale, in units called decibels (dB). Since the scale is logarithmic, a noise that is twice the noise level as another will be three decibels (3 dB) higher. “Sound pressure level” is the physical quantity that is measured in the environment that describes sound waves quantitatively. It is a ratio of the absolute pressure relative to a reference (i.e., 20 micropascals [μPa]). This ratio of pressures is converted to a decibel scale (dB).
- Noise emissions and noise levels have an associated frequency. The human ear does not respond to all frequencies in the same way. Mid-range frequencies are most readily detected by the human ear, while the human ear is generally less sensitive to low and high frequencies. Environmental noise levels used in this assessment are presented as “A-weighted decibels” (or dBA), which incorporates the frequency response of the human ear.
- Outdoor noise is usually expressed as an “equivalent noise level” ($L_{eq, T}$), which is a logarithmic average (i.e., energy average) of the measured or predicted noise levels over a given period of time (T). An equivalent noise level measured or predicted over the nighttime period would be referred to as $L_{eq, \text{night}}$.
- The “percentile noise level”, designated L_n , is the noise level exceeded “n” percent of a specified time period and is measured in dBA. The L_{90} , for instance, is the noise level exceeded 90% of the time. It is a noise level index that commonly refers to the baseline noise level and is most often referenced in a rural setting.
- Environmental noise levels vary throughout the day and it is therefore important to distinguish between the time of day (i.e., daytime / evening / nighttime). For the purposes of this assessment, in general the day is divided into two periods for which noise is evaluated: daytime from 07:00 to 23:00 and nighttime from 23:00 to 07:00. However, applicable guidance documents for this assessment provide other definitions of daytime and nighttime, or define three periods (i.e., daytime, evening, and nighttime), which were also considered depending on the assessment criteria being evaluated.

4.0 METHODOLOGY

The following methodology was carried out to establish existing noise levels and assess the potential impacts due to the Project:

- identification of Study Areas including noise sensitive receptors;
- determination of applicable noise criteria;

- determination of existing ambient noise levels without the Project;
- determination of future noise levels with the Project;
- determination of potential noise impact; and
- assessment of noise mitigation.

4.1 Study Areas

The EA study areas are the areas within which activities associated with the Project will occur and where potential environmental effects will be studied. The following study areas have been defined for the noise assessment as follows and presented in Figure 1:

- **Site Area** – The lands for the preferred landfill expansion (existing W12A Landfill Site, located at 3502 Manning Drive plus the additional on-site buffer).
- **Site-vicinity Study Area** – The lands in the area within 1500 m of the Site Area boundary and within 500 m of the road centrelines of the two designated Haul Routes. This area has the potential to be directly affected by the landfill expansion activities associated with the Project.

A desktop review was completed using orthoimagery and information provided by the City to identify potential PORs in the vicinity of the Project where human activity is expected to occur. PORs were identified in general accordance with “*Environmental Noise Guideline Stationary and Transportation Sources – Approval and Planning Publication NPC-300*” (NPC-300) (MECP 2013). NPC-300 defines PORs as sensitive land uses with human activity, including dwellings, campsites or campgrounds, sensitive institutional uses (e.g., educational, nursery, hospital, healthcare, community centre, place of worship, or detention centre), or sensitive commercial uses (e.g., hotel or motel).

Much of the lands within the Site-vicinity Study Area, near the Site Area, are owned by the City, as shown in Figure 1, and do not contain any existing noise-sensitive buildings or are scheduled to be demolished in the near future (i.e., vacant lands). According to the City of London Zoning By-law Z.-1 Section 45, the Agricultural AG2 zoning designation permits the use of the land for farm dwellings (in most cases) amongst a list of other types of uses. As presented in NPC-300, this type of land use is considered to be noise sensitive and, therefore, PORs representing these vacant lands were assessed as vacant lots following the methodology described in NPC-300. Note, according to NPC-300, vacant lands must be accessible in order to be assessed. Part of the vacant land directly east of the Project (i.e., south of R09) is within the Project boundary and was considered inaccessible, as the existing road that appeared to previously provide access is now within the Project boundary. Therefore, the vacant lands directly east of the Project were not assessed. In addition, as noted by the MECP, if noise mitigation for vacant land receptors is required for the Project to meet applicable sound level limits (discussed in Section 4.2), installation of these mitigation measures will be deferred to future dates following the development and occupation of sensitive-use buildings on these vacant lands. The City does not plan on building sensitive-use buildings on these vacant lands and therefore it is expected that mitigation measures will not be required.

Figure 1 presents all of the PORs that were identified within the Site-vicinity Study Area. A total of 11 of the identified PORs were selected as being representative of the most sensitive PORs in the Site-vicinity Study Area with respect to the Project for further assessment, which are summarized in Table 1.

Table 1: Summary of Representative Points of Reception Locations

Point of Reception ID	Description	UTM Coordinates (NAD83, Zone 17T)
R01	City-owned vacant lot directly west of the Site Area	480497 mE 4747525 mN
R02	City-owned vacant lot directly west of the Site Area	480554 mE 4747106 mN
R04	City-owned vacant lot 300 m east of the Site Area	482626 mE 4747261 mN
R06	Non-City owned vacant lot directly south of the Site Area	481951 mE 4746989 mN
R10	City-owned two storey residence 120 m northeast of the Site Area	481841 mE 4748321 mN
R15	Non-City owned two storey residence directly south of the Site Area	481544 mE 4746930 mN
R16	Non-City owned two storey residence 100 m northwest of the Site Area	480383 mE 4748259 mN
R19	Non-City owned two storey residence 1500 m east of the Site Area and 20 m from the Haul Route	483447 mE 4748476 mN
R23	Non-City owned one storey residence 1700 m east of the Site Area and 100 m from the Haul Route	483248 mE 4749075 mN
R25	Non-City owned one storey residence 1400 m east of the Site Area and 40 m from the Haul Route	483698 mE 4747304 mN
R50	City owned two storey residence 600 m east of the Site Area and 20 m from the Haul Route	482888 mE 4747138 mN

4.2 Noise Criteria

The methodology used for the noise assessment was based on the MECP publications “*Noise Guidelines for Landfill Sites*” (Landfill Guidelines) (MECP 1998) and NPC-300 (MECP 2013). These guidelines outline the sound level limit criteria for evaluating landfilling operations and ancillary facilities (i.e., stationary noise sources).

The noise assessment was carried out at the representative PORs identified within the Site-vicinity Study Area, as discussed in Section 4.1. All representative PORs identified in this noise assessment are conservatively described as being located in a Class 3 area, as defined

in NPC-300 as a rural area with an acoustical environment that is dominated by natural sounds.

The sound level limits for the Project landfilling operations are established in the Landfill Guidelines as 55 dBA and 45 dBA during the daytime period (i.e., 07:00 to 19:00) and nighttime period (i.e., 19:00 to 07:00) respectively.

The Landfill Guidelines also outline the protocol for evaluating off-site vehicle traffic for which there are no specific sound level limits. In accordance with the Landfill Guidelines, the potential noise impact of off-site vehicles on the existing noise environment is described qualitatively based on a quantitative assessment of the potential increase to the one hour equivalent sound level ($L_{eq,1hr}$), as described in Table 2.

Table 2: Landfill Guidelines Qualitative Noise Impact Ratings for 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

The sound level limits for the Project ancillary facilities are established in accordance with NPC-300 for the daytime (07:00 to 19:00), evening (19:00 to 23:00), and nighttime (23:00 to 07:00) periods. In assessing steady sounds from stationary noise sources, the MECP has established exclusionary Plane of Window (POW) and outdoor sound level limits for Class 3 areas. The POW is typically assessed at the center of a window (i.e., for a two-storey home, typically it would be at a height of 4.5 m above grade). An outdoor location is assessed at a location within 30 m of a dwelling façade at a height of 1.5 m above grade. The POW sound level limit for the noise sensitive receptors in a Class 3 area is described as follows:

The sound level limit at a POW POR is set as the higher of either the applicable exclusionary limit of 45 dBA in the daytime period of 07:00-19:00, 40 dBA in the evening period of 19:00-23:00 and 40 dBA in the night-time period of 23:00-07:00, or the minimum background sound level that occurs or is likely to occur during the time period corresponding to the operation of the stationary source under impact assessment.

The outdoor sound level limit for the noise sensitive receptors in a Class 3 area is described as follows:

The sound level limit at an outdoor POR is set as the higher of either the applicable exclusionary limit of 45 dBA in the daytime period of 07:00-19:00 and 40 dBA in the evening period of 19:00-23:00, or the minimum background sound level that occurs or is likely to occur during the time period corresponding to the operation of the stationary source under impact assessment. In general, the outdoor POR will be protected during the night-time as a consequence of meeting the sound level limit at the adjacent POW.

Note that for vacant lands, the location of the POR was assessed in accordance with NPC-300; either at the centre of the vacant lot, or within a 1 hectare portion of the vacant lot

located in a manner consistent with the existing zoning by-law and the typical building pattern in the area, at a height of 4.5 m above grade.

The one hour equivalent sound level ($L_{eq,1hr}$) MECP exclusionary sound level limits for steady sounds from stationary noise sources at a POR in a Class 3 area are summarized in Table 3, and used to assess compliance of the Project. The potential Project noise levels at each of the existing residences were predicted at both the POW and outdoor POR, but only the results from the location with the highest levels (i.e., POW or outdoor) are shown.

Table 3: Sound Level Limits for Class 3 Area – Steady Stationary Sources

Time Period	POW MECP Exclusionary Sound Level Limit (dBA)	Outdoor MECP Exclusionary Sound Level Limit (dBA)
	Class 3	Class 3
Daytime (07:00 – 19:00)	45	45
Evening (19:00 – 23:00)	40	40
Nighttime (23:00 – 07:00)	40	not applicable

As the testing of emergency equipment is limited to a periodic basis, the MECP allows for an increase to the exclusionary sound level limit. NPC-300 outlines the emergency equipment sound level limits as follows:

The sound level limits for noise produced by emergency equipment operating in non-emergency situations, such as testing or maintenance of such equipment, are 5 dB greater than the sound level limits otherwise applicable to stationary sources.

The noise produced by emergency equipment operating in non-emergency situations should be assessed independently of all other stationary sources of noise. Specifically, the emissions are not required to be included with the overall noise assessment of a stationary source facility.

Therefore, the stationary sources sound level limits presented in Table 3 above were increased by 5 dB when assessing the testing of emergency equipment.

For impulsive sounds from a stationary source, the sound level limit at a POR expressed in terms of the Logarithmic Mean Impulse Sound Level (L_{LM}) is the higher of: the applicable exclusionary level limit given in Tables 4 and 5 for the POW and outdoor POR, or the background sound level for that POR.

Table 4: Stationary Sources (Impulsive Sounds) - Exclusionary Sound Level Limit Values of Logarithmic Mean Impulse Sound Level (L_{LM} , dBA) POW of Noise Sensitive Spaces

Actual Number of Impulses in Period of One-Hour	Class 1 Area (07:00-23:00)/ (23:00-07:00)	Class 2 Area (07:00-23:00)/ (23:00-07:00)	Class 3 Area (07:00-19:00)/ (19:00-07:00)	Class 4 Area (07:00-23:00)/ (23:00-07:00)
9 or more	50/45	50/45	45/40	60/55

Actual Number of Impulses in Period of One-Hour	Class 1 Area (07:00-23:00)/ (23:00-07:00)	Class 2 Area (07:00-23:00)/ (23:00-07:00)	Class 3 Area (07:00-19:00)/ (19:00-07:00)	Class 4 Area (07:00-23:00)/ (23:00-07:00)
7 to 8	55/50	55/50	50/45	65/60
5 to 6	60/55	60/55	55/50	70/65
4	65/60	65/60	60/55	75/70
3	70/65	70/65	65/60	80/75
2	75/70	75/70	70/65	85/80
1	80/75	80/75	75/70	90/85

Table 5: Stationary Sources (Impulsive Sounds) - Exclusionary Sound Level Limit Values of Logarithmic Mean Impulse Sound Level (L_{LM} , dBAI) Outdoor POR

Time of Day	Actual Number of Impulses in Period of One-Hour	Class 1 Area	Class 2 Area	Class 3 Area	Class 4 Area
07:00 - 23:00	9 or more	50	50	45	60
	7 to 8	55	55	50	65
	5 to 6	60	60	55	70
	4	65	65	60	75
	3	70	70	65	80
	2	75	75	70	85
	1	80	80	75	90

Impulsive sounds from stationary noise sources are currently not expected. Administrative controls as part of the normal landfill site operations are expected to minimize any potential impulsive sounds (i.e., tailgate slamming, equipment driving over the weigh scale or ruts in on site roadways, movement of waste containers). Therefore, due to the inherent administrative controls, it is expected that impulsive noise will not be a substantial noise source on-site and, accordingly, was not further assessed.

4.3 Existing Conditions and Impact Assessment

A desktop assessment was completed to establish the existing conditions in the acoustic environment Site-vicinity Study Area and assess the potential impacts due to the Project. Existing noise levels in the Site-vicinity Study Area are influenced by vehicle traffic, existing landfill operations and operations of other facilities within the Site-vicinity Study Area, such as the aggregate pits to the north and the MRF to the east of the Project.

Based on Section 2.0 and information provided by the City, noise levels from the following activities were assessed to determine existing conditions and potential impacts due to the Project:

- landfilling operations, which are comprised of the following scenarios:
 - normal operations (07:00 to 17:00);
 - site preparation (06:00 to 07:00);
 - building a berm (daytime only);
 - placement of daily cover (17:00 to 18:00); and
 - disposal of dewatered biosolids (24-hour operations).
- landfill ancillary equipment, including emergency diesel generator testing; and
- landfill traffic along off-site Haul Routes.

It was assumed that the landfilling operations scenarios do not occur concurrently. Other activities associated with the landfill may occur but are expected to result in lower noise impacts when compared with the activities listed above and therefore were not further assessed. The landfill does not use pest control devices and there are no plans to use them in the future; therefore no assessment was carried out.

To establish existing conditions, the assessment of existing landfill operations considered daily landfilling operations (normal operations, site preparation, and placement of daily cover), landfill ancillary equipment, and existing landfill traffic along the off-site Haul Routes. It was assumed that daily landfilling operations occurred in the western portion of the landfill (i.e., Phase 2 of landfill area).

Project-specific on-site and off-site noise measurements were completed to support with the noise assessment. The following sections outline the noise measurements conducted to characterize the primary noise sources associated with existing and Project activities, and the modelling completed to establish existing and Project noise levels.

4.3.1 Short-term Monitoring

A noise field study was carried out to characterize existing noise levels in the Site-vicinity Study Area. This noise field study was completed on 15 July 2020 and involved short-term noise monitoring at ten off-site locations shown in Figure 1 to collect existing noise levels during the daytime period. The noise field study focused on understanding how the vehicle traffic, existing landfill operations and operations of other facilities within the Site-vicinity Study Area, such as the aggregate pits to the north and the MRF to the east of the Project, influenced the existing acoustic environment.

The short-term noise monitoring was carried out using a Larson Davis 831 sound level meter for monitoring periods ranging from 5 to 10 minutes in duration. The short-term monitoring locations were carried out on readily accessible public areas near the identified representative receptors, which were generally along the edge of the roads. The calibration of the instrumentation was verified before and after the measurements with the use of a hand-held calibrator. All measuring equipment used in this study meets the MECP requirements.

4.3.2 Landfill Equipment Sound Level Measurements

Source sound level measurements were carried out at the existing landfill to establish noise emissions of the existing sources of noise to support the characterization of existing noise

levels and assessment for potential Project noise impacts in the Site-vicinity Study Area. Measurements were conducted with a Larson Davis Model 831 sound level meter/realtime analyzer on 24 August 2020. This instrument provides the spectral (i.e., frequency) characteristics of the sound sources under review and is a valuable tool for identifying, quantifying and ranking noise source emissions from equipment at a given POR. The calibration of the instrumentation was verified before and after the measurements with the use of a hand-held calibrator. All measuring equipment used in this study meets the MECP requirements.

4.3.3 Noise Prediction Modelling

Noise predictions were carried out using the Computer Aided Noise Attenuation (CadnaA) noise modelling software to establish the existing conditions, and support the assessment of potential Project noise impacts within the Site-vicinity Study Area. The CadnaA noise modelling software (version 2020 MR 1), developed by DataKustik GmbH, is widely accepted for evaluating environmental noise. Numerous algorithms are made available for use within CadnaA but, for the purposes of the EA, the model algorithm International Organization for Standardization (ISO) 9613 Acoustics: Attenuation of Sound during Propagation Outdoors (ISO 1993 and 1996) was considered for the landfill noise sources and RLS-90 was considered for the road traffic sources. A summary of CadnaA model input parameters is presented in Table 6.

Table 6: CadnaA Model Input Parameters

Parameter	Model Setting	Notes
Software	CadnaA Version 2020 MR 1	CadnaA is a widely used environmental noise monitoring software package developed by DataKustik GmbH
Standards	ISO 9613-2 (landfill equipment) RLS-90 (road traffic)	All sources and attenuation effects were treated as required by this standard
Ground effect	G = 0 (paved roads) G = 1 (rest of site and Site-vicinity Study Area)	
Temperature/ humidity	10°C / 70% relative humidity	
Other meteorological conditions	Wind: 1 to 5 m/s; all receivers downwind from all sources; or Temperature Inversion: Moderate temperature inversion	Consistent with standard ISO 9613-2
Receptor height	1.5 m (outdoor PORs, POW one-storey homes) 4.5 m (vacant lots, POW two-storey homes)	
Terrain	Contour lines (254 to 316 masl)	Terrain has been accounted for in the model within the Site-vicinity Study Area.

4.3.3.1 Landfill Equipment

The noise predictions for landfill equipment were carried out using CadnaA using the ISO 9613 modelling algorithm. The ISO 9613 prediction method is conservative as it assumes that all PORs 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 Project. Noise sources for the landfill equipment were 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 landfill expansion will be developed sequentially in eight Phases, 1E through 8E, progressing from the west side of the landfill towards the east. All landfill operation sources operating within the active area of a phase were modelled as a 25 m by 40 m area source, based on the active area of exposed waste discussed in Section 2.0. For all landfill operations except for building a berm, it was assumed the active area will be located a minimum of 20 m from the edge of the area of new waste placement to allow for the building of a working berm. Source operations, locations and elevations for each of the modelling scenarios were selected such that the predicted Site-vicinity Study Area noise levels were expected to result in the worst-case noise predictions at all representative PORs.

4.3.3.2 Road Traffic

The noise predictions for road traffic were carried out using CadnaA with the RLS-90 modelling algorithm to characterize existing noise levels and assessment of potential Project noise impacts within the Site-vicinity Study Area. Based on past experience, using RLS-90 for the road traffic sources provide prediction results consistent with actual noise levels and those predicted using the MECP's Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT), which is the basis of the DOS-based STAMSON modelling software provided by the MECP. The MECP's ORNAMENT was used to verify the CadnaA noise predictions with respect to the road traffic in the Site-vicinity Study Area. Road traffic was assessed over a 16-hour daytime period (07:00 to 23:00) and an 8-hour nighttime period (23:00 to 07:00).

Existing and anticipated Project noise levels due to road traffic were established using Annual Average Daily Traffic (AADT) provided by the City or, for Highway 401 and Highway 402, from published data from the Ontario Ministry of Transportation (MTO) (MTO 2016). The daytime and nighttime period percentages and total truck percentages for local roadways were provided by the City. The total truck percentage was divided into medium and heavy trucks based on either the "Adaptation and Verification of AASHTO Pavement Design Guide for Ontario Conditions – Final Report" (ERES Consultants 2008), which provides medium and heavy truck percentages based on road classification for local roadways, and on the MTO Environmental Guide for Noise (MTO 2006) for Highway 401 and Highway 402. Speed limits were provided by the City/MTO or determined from readily available public imagery.

A summary of the road traffic data is provided in Table 7.

Table 7: Summary of Existing and Project Road Traffic Data

Road Segment	Speed Limit (km/hr)	Existing Traffic				Traffic – With Project			
		AADT	Daytime / Nighttime Breakdown	% Car / Medium Truck / Heavy Truck		AADT	Daytime / Nighttime Breakdown	% Car / Medium Truck / Heavy Truck	
				Day	Night			Day	Night
Wonderland Road north of Manning Drive	80	9100	90 / 10	97 / 1 / 2	97 / 1 / 2	9133	90 / 10	96 / 1 / 3	97 / 1 / 2
Wonderland Road south of Manning Drive	80	9100	90 / 10	97 / 1 / 2	97 / 1 / 2	9100	90 / 10	97 / 1 / 2	97 / 1 / 2
Manning Drive west of White Oak Road	70	345	94 / 6	63 / 1 / 36	94 / 0 / 6	378	95 / 5	61 / 1 / 38	94 / 0 / 6
Manning Drive between White Oak Road and landfill entrance	70	355	94 / 6	61 / 1 / 38	93 / 0 / 7	390	95 / 5	60 / 1 / 39	93 / 0 / 7
Manning Drive between landfill entrance and Wellington Road	80	562	96 / 4	45 / 1 / 54	85 / 0 / 15	644	97 / 3	44 / 1 / 55	85 / 0 / 15
Manning Drive east of Wellington Road	80	210	90 / 10	96 / 0 / 4	100 / 0 / 0	213	91 / 9	95 / 0 / 5	100 / 0 / 0
Wellington Road north of Scotland Drive	70	14200	90 / 10	96 / 1 / 3	96 / 1 / 3	14279	90 / 10	96 / 1 / 3	96 / 1 / 3
Wellington Road between Scotland Drive and Manning Drive	80	14200	90 / 10	96 / 1 / 3	96 / 1 / 3	14279	90 / 10	96 / 1 / 3	96 / 1 / 3
Wellington Road south of Manning Drive	80	14200	90 / 10	96 / 1 / 3	96 / 1 / 3	14200	90 / 10	96 / 1 / 3	96 / 1 / 3
Dingman Drive	60	4000	90 / 10	93 / 3 / 4	93 / 3 / 4	4000	90 / 10	93 / 3 / 4	93 / 3 / 4
Westminster Drive	80	1000	90 / 10	98 / 2 / 0	98 / 2 / 0	1000	90 / 10	98 / 2 / 0	98 / 2 / 0
Scotland Drive	80	280	Cars – 90 / 10 Trucks – 97 / 3	85 / 13 / 2	85 / 13 / 2	280	Cars – 90 / 10 Trucks – 97 / 3	85 / 13 / 2	85 / 13 / 2
Decker Drive	60	900	90 / 10	98 / 2 / 0	98 / 2 / 0	900	90 / 10	98 / 2 / 0	98 / 2 / 0
Morrison Road	80	180	90 / 10	63 / 33 / 4	63 / 33 / 4	180	90 / 10	63 / 33 / 4	63 / 33 / 4
White Oak Road south of Manning Drive	60	1350	90 / 10	93 / 6 / 1	93 / 6 / 1	1350	90 / 10	93 / 6 / 1	93 / 6 / 1
White Oak Road north of Manning Drive	80	1350	90 / 10	93 / 6 / 1	93 / 6 / 1	1352	90 / 10	93 / 6 / 1	93 / 6 / 1
Highway 401	100	28500	90 / 10	80 / 5 / 15	80 / 5 / 15	28500	90 / 10	80 / 5 / 15	97 / 2 / 0
Highway 402	110	28500	90 / 10	80 / 5 / 15	80 / 5 / 15	28500	90 / 10	80 / 5 / 15	80 / 5 / 15

Notes: Daytime (07:00 – 23:00), Nighttime (23:00 – 07:00)

4.4 Effects Characterization

To determine potential adverse effects from the Project, two criteria were used. The first was a comparison against applicable noise limits, and the second was an assessment of changes to noise levels relative to existing noise levels at the most sensitive PORs within the Site-vicinity Study Area. These changes were assessed against the magnitude ratings identified in Table 8.

A change in level of 3 dB is generally accepted as the smallest change detectable by the human auditory system in the environment (MECP 1998). Changes in noise levels for the period L_{eq} (A-weighted energy equivalent sound level) that would be hardly perceptible (i.e., less than or equal to 3 dB) were assigned a negligible magnitude. A noticeable change in the period L_{eq} (i.e., greater than 3 dB, but less than or equal to a 5 dB change, based on Table 2) was classified as having a low magnitude. Clearly noticeable changes in the period L_{eq} , perceived as less than twice as loud (i.e., greater than 5 dB, but less than or equal to 10 dB), were considered of moderate magnitude. Very significant changes in the noise levels for the period L_{eq} that are perceived as more than twice as loud (i.e., greater than 10 dB) were classified as having a high magnitude.

A potential adverse effect is expected when a magnitude rating of moderate or high is predicted.

Table 8: Magnitude Ratings For Potential Noise Effects

Magnitude	Criteria
Negligible	<ul style="list-style-type: none"> Project related noise levels do not exceed MECP sound level limits; and Project related change relative to existing noise levels in daytime and nighttime equivalent noise level is ≤ 3 dB.
Low	<ul style="list-style-type: none"> Project related noise levels do not exceed MECP sound level limits; and Project related change relative to existing noise levels in daytime and nighttime equivalent noise level is > 3 dB and ≤ 5 dB.
Moderate	<ul style="list-style-type: none"> Project related noise levels do not exceed MECP sound level limits; and Project related change relative to existing noise levels in daytime and nighttime equivalent noise level is > 5 dB and ≤ 10 dB.
High	<ul style="list-style-type: none"> Project related noise levels exceed MECP sound level limits; or Project related change relative to existing noise levels in daytime and nighttime equivalent noise level is > 10 dB.

5.0 NOISE EMISSIONS

Noise emissions from the existing landfill operations were used as inputs for the noise prediction model to establish existing noise levels and for the assessment of potential Project noise impacts in the Site-vicinity Study Area at identified PORs.

5.1 Landfill Operations Noise Emissions

The assessment considered the noise emissions associated with the landfilling operations for both the existing landfill and the Project. Table 9 provides a summary of: the overall sound power data for each noise source considered in the assessment of landfilling operations; during which scenarios each piece of equipment is expected to operate and; the expected quantity. This landfill equipment was considered for both existing and Project landfill operations. Noise emissions (i.e., sound power levels) were established using the Project information, Golder's database of similar noise sources, manufacturers' specifications, and on-site noise measurements discussed in Section 4.3.2.

It was conservatively assumed that when a piece of equipment was operating during a certain scenario, it would operate continuously for any one-hour period when assessing compliance with MECP sound level limits.

Table 9: Sound Power Data for Landfilling Operations Noise Sources

Source	Quantity					Overall Sound Power Level (dBA)
	Normal Operations (07:00 to 17:00)	Site Preparation (06:00 to 07:00)	Building a Berm (Daytime)	Placement of Daily Cover (17:00 to 18:00)	Disposal of Biosolids (24 hours)	
Compactor	2	1	0	2	0	111
Large Crawler Dozer	1	0	0	0	0	113
Medium Crawler Dozer	1	0	1	0	0	110
Tracked Excavator	1	0	1	0	1	105
Rock Truck	1	0	1	0	0	108
Front End Loader	1	0	0	0	0	108
Flusher Truck	1	0	0	0	0	107
Generator for lights	0	0	0	0	1	96
Existing Waste Truck ¹	22	0	0	0	1	102
Project Waste Truck ¹	28	0	0	0	1	102

Notes:

¹ 22 (existing) or 28 (Project) waste trucks per hour are expected to arrive to the landfill during the maximum worst case predictable hour, travelling along main haul roads on-site

dBA = A-weighted decibels

5.2 Ancillary Equipment Noise Emissions

The existing landfill includes a landfill gas collection system including a blower building and flare stack, exhaust fans on the Household Special Waste building, two pumping stations, heating, ventilation and air conditioning (HVAC) units on several on-site buildings, and two emergency diesel generators. The Project will include expanding the flare capacity with a second flare, and the installation of HVAC units on the new on-site buildings. Table 10 provides a summary of the overall sound power data for each noise source considered in the assessment of ancillary equipment for existing and Project landfill operations. Noise emissions (i.e., sound power levels) were established using the Project information, manufacturers' specifications, and on-site noise measurements.

The periodic testing of the emergency diesel generators will be limited to daytime periods, each tested concurrently for 20 minutes three times per year. As a conservative assessment, this has been included in the EA but as per NPC-300 it may be considered an infrequent event and would typically not need to be considered.

Table 10: Sound Power Data for Ancillary Facilities Noise Sources

Source	Quantity	Overall Sound Power Level (dBA) ²
Emergency Diesel Generator ¹	2	100
Existing Flare Station	1	94
Future Flare Station	1	94
Household Special Waste Fumehood Exhaust Fan (West)	1	90
Household Special Waste Fumehood Exhaust Fan (South)	1	86
Existing Flare Stack	1	Insignificant noise source
Future Flare Stack	1	Insignificant noise source
Existing HVAC	1	Insignificant noise source
Project HVAC	8	Insignificant noise source
Pumping Station	2	Insignificant noise source

Notes:

¹ The periodic testing of the emergency diesel generators will be limited to daytime periods, each tested concurrently for 20 minutes up to three times a year.

² Noise sources identified as insignificant are not substantial noise sources relative to the other equipment and are not expected to significantly contribute to noise levels at a representative POR. This determination is based on information provided and/or site observations.

6.0 EXISTING CONDITIONS

6.1 Short-term Monitoring Results

The existing acoustic environment in the Site-vicinity Study Area is dominated primarily by road traffic along the local roads and, at certain PORs, existing landfill operations and other facilities in the Site-vicinity Study Area. Table 11 summarizes the locations (shown in Figure 1) and measured noise levels at each of the 10 monitoring locations. Note that the short-term monitoring locations were on readily accessible public areas near the identified representative receptors, which were generally along the edge of the roads.

Table 11: Summary of Short-term Noise Monitoring Results

Noise Measurement ID	Noise Monitoring Location	UTM Coordinates (NAD83 17T)	Measured L_{eq} (dBA) ¹	Measured L_{90} (dBA) ²
M01	Scotland Drive east of R11	482081 mE 4748407 mN	64	37
M02	Scotland Drive west of R09	481151 mE 4748286 mN	68	42
M03	White Oak Road adjacent to R02	480603 mE 4747115 mN	55	49
M04	Manning Drive between R06 and R07	482168 mE 4747050 mN	66	43
M05	Wellington Road north of R25	483644 mE 4747509 mN	75	55
M06	Wellington Road across from R20	483510 mE 4748342 mN	75	59
M07	Scotland Drive between R12 and R17	480016 mE 4748166 mN	67	48
M08	Manning Drive west of R03	480171 mE 4746808 mN	55	36
M09	Manning Drive between R08 and R50	482690 mE 4747110 mN	60	40
M10	Glanworth Drive between R42 and R43	482097 mE 4745785 mN	75	45

Notes:

¹ L_{eq} – Equivalent (average) sound pressure level

² L_{90} – Average sound pressure level exceeded 90% of the time

6.2 Modelling Results

As discussed in Section 4.3, existing noise levels in the Site-vicinity Study Area are influenced by vehicle traffic, existing landfill operations and operations of other facilities within the Site-vicinity Study Area. In completing a conservative assessment, these other facilities were not assessed in quantifying existing noise levels. Existing noise levels were evaluated as an average over the daytime (07:00 to 23:00) and nighttime (23:00 to 07:00) periods.

Noise levels due to existing traffic were predicted using RLS-90 in CadnaA, and calibrated to ORNAMENT as discussed in Section 4.3.3.2. Predicted road traffic noise levels are presented in Table 12.

Existing landfill operations were predicted over the entire daytime and nighttime periods, considering Normal Operations, Site Preparation, Placement of Daily Cover, and ancillary equipment, as described in Section 4.3. These landfill operating scenarios were time-weighted accordingly, based on the operating hours specified in Section 4.3. Predicted existing landfill operations noise levels at representative PORs are presented in Table 12.

The overall existing noise levels, shown in Table 12, were calculated by combining the existing road traffic noise levels and the existing landfill operations noise levels.

Table 12: Predicted Existing Noise Levels

Receptor	Existing Average Road Traffic Noise Level (dBA)		Existing Average Landfill Operations Noise Level (dBA)		Existing Overall Average Noise Level (dBA)	
	Day	Night	Day	Night	Day	Night
R01	52	45	50	34	54	46
R02	52	45	50	35	54	45
R04	50	36	35	20	50	36
R06	50	36	46	30	51	37
R10	46	37	43	27	48	37
R15	49	35	51	37	53	39
R16	58	49	40	25	58	49
R19	65	59	30	14	65	59
R23	55	48	31	15	55	48
R25	62	56	31	14	62	56
R50	60	44	36	20	60	44

In general, the noise levels from the short-term monitoring illustrated in Table 11 exceeded the predicted overall existing noise levels shown in Table 12, by an average of 5 dB and up to 14 dB. The largest differences were observed when measurements were taken near other facilities in the Site-vicinity Study Area (i.e., the aggregate pits north of the landfill and the MRF to the east). Site observations indicated these other facilities were major sources of noise for some receptors. Therefore, it is expected that the predicted overall existing noise levels shown in Table 12 are generally underestimated, resulting in a conservative assessment for Project related change relative to existing noise levels.

Note that when establishing the applicable sound level limits to assess compliance of the landfill with MECP guidelines, the noise emissions associated with the existing landfill were not considered and therefore the MECP's most restrictive (i.e., Class 3) exclusionary sound level limits were conservatively considered in this assessment. It is also noted that Highway 401 is expected to influence the acoustical environment in parts of the Site-vicinity Study Area, but was conservatively not considered in establishing the background noise levels.

7.0 IMPACT ASSESSMENT

7.1 Potential Noise Effects

The following presents the noise prediction results of: Project landfilling operations, ancillary equipment, and traffic on the off-site Haul Routes, which were considered in both the assessment of compliance with MECP guidelines (if applicable) and the change due to the Project relative to existing noise levels. Therefore, noise predictions of landfilling operations, ancillary equipment, and off-site Haul Routes were each assessed independently against the MECP guidelines (where applicable), and then combined to assess change relative to existing noise levels.

7.1.1 Compliance with MECP Guidelines

7.1.1.1 Landfilling Operations

Table 13 and Table 14 provide a summary of the predictable worst case hour predicted noise levels for the landfill operation scenarios described in Section 4.3 during the daytime (07:00 to 19:00) and nighttime (19:00 to 07:00) periods, respectively. Noise levels were predicted at the identified representative PORs within 500 m of the Site Area.

Noise predictions were carried out for the five scenarios representing the landfill operations of the Project. Normal Operations, Placement of Daily Cover, and Building a Berm are expected to occur during the daytime only and therefore are compared to the Landfill Guidelines daytime sound level limit of 55 dBA. Site Preparation and Disposal of Dewatered Biosolids may occur during the nighttime and therefore are compared to the Landfill Guidelines nighttime sound level limit of 45 dBA. The following tables also include the applicable Landfill Guidelines sound level limit; bold values indicate predicted noise levels that exceed the sound level limit.

Table 13: Daytime Landfilling Operations Predictable Worst Case Noise Predictions

Receptor	Normal Operations Noise Level (dBA)	Placement of Daily Cover Noise Level (dBA)	Berm Building Noise Level (dBA)	Landfill Guidelines Daytime Sound Level Limit (dBA)
R01	58	53	53	55
R02	58	53	53	55
R04	48	42	42	55
R06	57	52	52	55
R10	51	46	46	55
R15	55	50	49	55
R16	49	44	44	55

Note: **Bold** indicates predicted noise levels that exceed Landfill Guidelines sound level limits

Table 14: Nighttime Landfilling Operations Predictable Worst Case Noise Predictions

Receptor	Site Preparation Noise Level (dBA)	Disposal of Dewatered Biosolids Noise Level (dBA)	Landfill Guidelines Nighttime Sound Level Limit (dBA)
R01	50	44	45
R02	49	44	45
R04	39	34	45
R06	49	44	45
R10	43	38	45
R15	47	41	45
R16	41	36	45

Note: **Bold** indicates predicted noise levels that exceed Landfill Guidelines sound level limits

The results presented in Table 13 and Table 14 indicate that mitigation is required for Normal Operations (at R01, R02 and R06) and Site Preparation (at R01, R02, R06 and R15) scenarios to meet the Landfill Guidelines sound level limits. Mitigation is further discussed in Section 7.2.

7.1.1.2 Ancillary Equipment

Table 15 provides a summary of the predictable worst case hour predicted noise levels due to ancillary equipment and testing of emergency diesel generators at the identified representative PORs within 500 m of the Site Area. The predicted noise levels from the ancillary equipment are compared to the nighttime NPC-300 stationary source sound level limits, as it is expected the equipment will operate continuously for 24 hours per day and the nighttime limits are more stringent. Testing of the emergency diesel generators will be limited to the daytime period, as per the operating conditions in Section 5.2, and therefore the results are compared to the daytime NPC-300 sound level limits for emergency equipment.

As shown in Table 15, the ancillary equipment and emergency diesel generators are expected to operate below the NPC-300 sound level limits at the representative PORs.

Table 15: Ancillary Equipment / Emergency Generator Predictable Worst Case Noise Predictions

Receptor	Ancillary Equipment Noise Level (dBA)	NPC-300 Nighttime Stationary Source Sound Level Limit (dBA)	Emergency Diesel Generator Noise Level (dBA)	NPC-300 Daytime Emergency Equipment Sound Level Limit (dBA)
R01	10	40	7	50
R02	15	40	23	50
R04	16	40	18	50
R06	26	40	38	50
R10	7	40	7	50
R15	34	40	31	50
R16	9	40	5	50

7.1.1.3 Off-Site Haul Route

As discussed in Section 4.2, the Landfill Guidelines outline the protocol for evaluating the noise impact due to off-site haul road vehicles. The Haul Routes consist of Manning Drive via Wonderland Road to the west and Manning Drive via Wellington Road South to the east. It is expected that in the future there will be a 25% increase in landfill heavy truck traffic and a 20% increase in other landfill vehicle traffic over the existing landfill traffic.

Predicted noise levels due to the daytime average existing landfill traffic were compared to noise levels due to future expected traffic (i.e., existing plus the Project) during the predictable worst case hour. Table 16 summarizes the expected change between future and existing noise levels at representative PORs along the Haul Routes as well as the associated qualitative rankings (as summarized in Table 2 in Section 4.2). Results are shown for all representative PORs in Table 1 that are located within 500 m of the Haul Routes.

Table 16: Predicted Change in Noise Levels along Haul Routes

Receptor	Existing Traffic Average Noise Level (dBA)	Project Traffic Worst Case Hour Noise Level (dBA)	Change in Noise Level (dB)	Qualitative Rating ¹
R02	52	52	0	Insignificant
R04	50	53	3	Insignificant
R06	50	54	4	Noticeable
R15	49	53	4	Noticeable
R19	65	67	2	Insignificant
R23	55	56	1	Insignificant
R25	62	64	2	Insignificant
R50	60	64	4	Noticeable

Note: 1. See Table 2 for details of qualitative ranking system

The results in Table 16 indicate that during the Project predictable worst case hour, the change in noise levels ranges from insignificant to noticeable. The noticeable changes occur on Manning Drive, where the landfill contributes a large portion of the traffic.

If it was assumed that the future maximum Project traffic occurs during the same hour as the current maximum landfill traffic along the local roadways, the predicted change due to the Project would be insignificant at all PORs, as a 20% to 25% increase in traffic would be expected to increase noise levels by less than 3 dB. As it is unknown if the existing and Project peak hours will align, the existing average daytime traffic was conservatively considered.

7.1.2 Change from Existing Noise Levels

In addition to meeting compliance with MECP guidelines, the change relative to existing noise levels within the Site-vicinity Study Area was evaluated. The combined noise levels from all significant noise sources during the predictable worst case daytime and nighttime periods were calculated, based on the operating hours of each scenario presented in Section 4.3.

Noise levels were evaluated as an average over the daytime (07:00 to 23:00) and nighttime (23:00 to 07:00) periods. Table 17 summarizes: the existing noise levels, the predictable worst case Project noise levels, and the corresponding change and magnitude rating, as defined in Table 8, at the identified representative PORs.

Table 17: Predicted Daytime and Nighttime Noise Levels and Change from Baseline due to the Project

Receptor	Existing Noise Level (dBA)		Project Average Noise Level (dBA)		Change in Noise Level (dB)		Meets Applicable MECP Sound Level Limit ¹ (Yes/No)		Magnitude Rating ²	
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
R01	54	46	57	48	3	2	No	No	High	High
R02	54	45	57	48	3	3	No	No	High	High
R04	50	36	51	38	1	2	Yes	Yes	Negligible	Negligible
R06	51	37	57	45	6	8	No	No	High	High
R10	48	37	51	41	3	4	Yes	Yes	Negligible	Low
R15	53	39	55	44	2	5	Yes	No	Negligible	High
R16	58	49	58	49	0	0	Yes	Yes	Negligible	Negligible
R19	65	59	66	59	1	0	n/a	n/a	Negligible	Negligible
R23	55	48	55	48	0	0	n/a	n/a	Negligible	Negligible
R25	62	56	62	56	0	0	n/a	n/a	Negligible	Negligible
R50	60	44	60	45	0	1	n/a	n/a	Negligible	Negligible

Note: ¹ See Tables 13, 14 and 15 for assessment of compliance with MECP sound level limits.

² See Table 8 for details of qualitative ranking system.

The results in Table 17 and the assessment in Section 7.1.1 indicate that mitigation measures are required so that the Project does not result in an adverse effect on noise (i.e., a moderate or high magnitude rating) at specific receptors.

7.2 Mitigation Measures

The noise prediction results presented in Section 7.1 indicate that noise mitigation is required for the Project to meet the applicable MECP sound level limits at specific receptors. The following mitigation has been designed such that the landfilling operations satisfy the MECP sound level limits:

- When in the western section of Phase 1E or Phase 2E:
 - For all landfill operating scenarios, except for the Building a Berm scenario, working equipment within the active area must be behind a 5 m high berm when operating within 330 m of a POR to the west.
 - Note that the PORs to the west (i.e., R01 and R02) are all currently vacant and therefore implementation of this mitigation is not required unless a noise-sensitive building is constructed.

- When in the southern section of Phase 5E, Phase 7E, or the dedicated non-decomposable waste cell:
 - For all landfill operating scenarios, except for the Building a Berm scenario, working equipment must be behind a 5 m high berm when operating within 330 m of a POR to the south.
 - Site Preparation must not start before 07:00 when operating between 330 m and 380 m of a POR to the south.
 - Note that a POR does exist at 3691 Manning Drive (i.e., R15), but is located approximately 310 m from the edge of the area of new waste placement. As discussed in Section 4.3.3.1, the active area was located 20 m from the edge of the area of new waste placement and therefore a 5 m berm is not expected to be required. All other PORs to the south (i.e., R06) are all currently vacant and therefore implementation of this mitigation is not required for these PORs unless a noise-sensitive building is constructed.

Figure 2 shows the areas where mitigation is required based on the current existing receptor (i.e., R15).

As discussed in Section 2.0, in the southern phases the waste will initially be used to build a working berm along the south side of the phase. This working berm can act as the 5 m high berm described above in the areas where a berm is required; however, the height of the berm must be maintained 5 m above the working grade of the equipment, or an acoustically equivalent control will need to be implemented. In addition, when there is a requirement for the equipment to operate behind a berm, all equipment working in the active area must be within 50 m of the top of the berm.

The mitigation measures were developed such that the Normal Landfill Operations during the daytime period and the Site Preparation during the nighttime period would comply with the Landfill Guidelines. It was assumed that all other landfilling operation scenarios except for Building a Berm (i.e., Placement of Daily Cover and Disposal of Dewatered Biosolids) would occur behind the berm when operating under the conditions listed above.

7.3 Potential Mitigated Noise Effects

The following describes the mitigated noise prediction results of the landfilling operations with the noise controls described in Section 7.2 and the resulting change from existing noise levels.

7.3.1 Compliance with MECP Guidelines

Table 18 and Table 19 provide a summary of the mitigated predictable worst case hour predicted noise levels, with the noise controls described in Section 7.2, for the scenarios described in Section 4.3 at the identified representative PORs during the daytime and nighttime, respectively. The mitigated predicted noise levels at all of the identified representative PORs meet the Landfill Guidelines sound level limits.

Table 18: Mitigated Daytime Landfilling Operations Predictable Worst Case Noise Predictions

Receptor	Normal Operations Noise Level (dBA)	Daily Cover Noise Level (dBA)	Landfill Guidelines Daytime Sound Level Limit (dBA)
R01	55	49	55
R02	55	50	55
R04	48	40	55
R06	55	47	55
R10	51	46	55
R15	55	50	55
R16	49	44	55

Table 19: Mitigated Nighttime Landfilling Operations Predictable Worst Case Noise Predictions

Receptor	Site Preparation Noise Level (dBA)	Disposal of Dewatered Biosolids Noise Level (dBA)	Landfill Guidelines Nighttime Sound Level Limit (dBA)
R01	45	41	45
R02	45	41	45
R04	39	31	45
R06	45	38	45
R10	43	38	45
R15	45	41	45
R16	41	36	45

7.3.2 Change from Existing Noise Levels

The mitigated combined noise levels from all significant noise sources during the predictable worst case daytime and nighttime periods were calculated. Table 20 summarizes the: existing noise levels, the mitigated predictable worst case Project noise levels, and the corresponding change and magnitude rating, as defined in Table 8, at the identified representative PORs.

Table 20: Mitigated Predicted Daytime and Nighttime Noise Levels and Change from Baseline due to the Project

Receptor	Predicted Existing Noise Level (dBA)		Mitigated Predicted Project Noise Level (dBA)		Change in Noise Level (dB)		Meets Applicable MECP Sound Level Limit (Yes/No)		Magnitude Rating	
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
R01	54	46	56	47	2	1	Yes	Yes	Negligible	Negligible
R02	54	45	55	47	1	2	Yes	Yes	Negligible	Negligible
R04	50	36	51	38	1	2	Yes	Yes	Negligible	Negligible
R06	51	37	55	41	4	4	Yes	Yes	Low	Low
R10	48	37	51	41	3	4	Yes	Yes	Negligible	Low
R15	53	39	55	43	2	4	Yes	Yes	Negligible	Low
R16	58	49	58	49	0	0	Yes	Yes	Negligible	Negligible
R19	65	59	66	59	1	0	n/a	n/a	Negligible	Negligible
R23	55	48	55	48	0	0	n/a	n/a	Negligible	Negligible
R25	62	56	62	56	0	0	n/a	n/a	Negligible	Negligible
R50	60	44	60	45	0	1	n/a	n/a	Negligible	Negligible

Table 20 indicates that, with the implementation of the mitigation presented in Section 7.2, the Project is predicted to have a 'negligible' to 'low' magnitude impact on existing noise levels and therefore there are no likely adverse effects.

Note that the short-term monitoring indicated other sources of noise from facilities in the Site-vicinity Study Area (i.e., the aggregate pits north of the landfill and the MRF to the east) that were not considered in the existing noise level predictions could impact the acoustic environment in the Site-vicinity Study Area. As discussed in Section 6.2, measured daytime noise levels were higher by an average of 5 dB than predicted, which would reduce all mitigated magnitude impacts to 'negligible'.

7.4 Assessment of Potential Noise Effects

The noise modelling indicates that, with the implementation of noise mitigation: 1) the Project is expected to operate in compliance with MECP noise guidelines as specified in the Landfill Guidelines and NPC-300, and 2) the Project-related change in noise level is predicted to be between 0 and 5 dB, which results in a 'negligible' to 'low' magnitude at the identified representative PORs. Therefore, there are no likely adverse noise effects due to the Project.

Note that the impact assessment noise predictions considered when landfilling operations are expected to be predictable worst case and/or maximum noise levels (i.e., near the edges of the Project limit of waste). Ambient noise levels can be expected to increase by a noticeable

amount, on occasion, due to the landfilling operations at the identified representative PORs, but will be short-term relative to the life of the Project, occurring when the active area of the landfill approaches the identified representative PORs. The range in increased noise levels will depend primarily on the number, type and operating time of noise sources and their proximity to the PORs when operating within the active area. Based on the attenuation of sound due to distance and a lack of a direct line-of-sight between equipment and the receptors when the equipment is further set back, noise levels are expected to decrease when operating away from the edges of the Project limit of waste and the distance increases. Therefore, any noticeable increases in noise levels due to the Project are expected to be short-term in duration and become negligible as the Project progresses.

8.0 BEST MANAGEMENT PRACTICES

The following best management practices should be considered to help minimize potential noise effects due to the Project and should be implemented by the Project:

- Employ noise mitigation identified for the acoustic environment in Section 7.2.
- Limit landfill activities to the hours described in Section 4.3 to reduce the potential effect of noise on nearby PORs.
- All mobile equipment should be properly maintained according to manufacturers' recommendations and be in accordance with the noise emissions specified in Section 5.0 and MECP NPC-115 – Construction Equipment.
- When possible, maintain an acceptable setback distance from the identified PORs.
- Maintain on-site roadways to minimize vehicles travelling over ruts.
- Address noise concerns if they arise through a compliant resolution mechanism whereby persons can contact the landfill if there are perceived noise issues.
- Design on-site access roads to minimize reversing, which is expected to minimize use of backup warning devices where possible.
- Operate vehicles and equipment such that impulsive noise is minimized (i.e., truck tailgate closing), where possible.
- Where reasonable and practical, turn off vehicles and equipment when not in use, unless weather and/or safety conditions dictate the need for them to remain idling and in a safe operating condition.

9.0 MONITORING

A follow-up noise monitoring program is recommended for the Project when landfill operations are within 330 m of the existing residence to the south (i.e., R15) and if the residence is present when landfilling operations occur in the southern areas of Phase 5E and Phase 7E. Since the other identified representative PORs that are within the distances that trigger the requirement for noise mitigation specified in Section 7.2 are currently vacant, any noise mitigation at these locations is deferred until occupied with a noise sensitive use.

This noise monitoring program is recommended to verify the results of the noise prediction modelling carried out in this EA, to confirm the following: that the Project is operating in compliance with the applicable MECP guidelines, the effectiveness of the noise mitigation measures and to evaluate whether the Project is operating in accordance with the best management practices outlined in Section 8.0.

It is recommended the methodology of the noise monitoring program, including the frequency, timing, duration and selection of noise data to be collected, be determined prior to landfilling operations occurring in the southern areas of Phase 5E and Phase 7E, as it is expected there may be updated Project information at that time or a noise sensitive use will no longer be present at R15.

10.0 OTHER APPROVALS

The Project will require an application for an amendment of the Environmental Compliance Approval (ECA) for air and noise under Section 9 of the *Environmental Protection Act*. An application for an ECA for air and noise must demonstrate that a facility can operate in compliance with the MECP's Landfill Guidelines and NPC-300.

With the implementation of the mitigation measures and best management practices described in this report, the Project is expected to operate in compliance with MECP noise guidelines as specified in the Landfill Guidelines and NPC-300. The proposed expansion and subsequent permitting requirements are expected to be achievable from a noise perspective, subject to MECP approval.

11.0 CONCLUSION

This noise assessment evaluated the potential effects of the Project on noise levels based on two criteria. The first was a comparison against applicable noise limits, and the second was an assessment of changes to noise levels relative to existing noise levels at the most sensitive PORs within the Site-vicinity Study Area. Predictive noise modelling indicated that landfilling operations would result in noise levels that exceed relevant MECP sound level limits at some identified representative PORs, which resulted in a 'high' magnitude rating. The predicted change in noise levels resulted in a 'moderate' magnitude rating at some of the other identified representative PORs.

Noise mitigation measures were developed for the identified representative PORs, but are only required when landfilling operations are close to noise sensitive uses. Therefore, at the time of this noise assessment, the landfill will need to implement noise mitigation measures when operating within 330 m of the existing residence R15; but, for the locations that are vacant, noise mitigation can be deferred until occupied with a noise sensitive use.

These noise mitigation measures could include working behind a 5 m high berm and not beginning Site Preparation until 7 am (i.e., the daytime period), or acoustically equivalent. With these mitigation measures in place, the potential effects of the Project on noise levels are expected to have a 'negligible' or 'low' magnitude rating, and therefore no adverse noise effects are expected.

12.0 IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Standard of Care

Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied, is made.

Basis and Use of the Report

This report was prepared for the exclusive use of the City of London (the Client) and, once finalised, are intended to fulfil Ontario Ministry of the Environment, Conservation and Parks (MECP) data requirements in support of an Environmental Assessment Study Report. The report is based on review of the project design (the Project), discussions with the Client, review of documentation provided by Client and calculations made to identify potential noise impacts due to the Project. The reports cannot account for changes to the Project after it has been finalised and submitted by Client to the MECP.

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When evaluating the Project and developing this report, Golder has relied on information provided by Client, the regulatory authorities, and others. Golder has acted in good faith and accepts no responsibility for any deficiencies, misstatements, or inaccuracies contained in this report resulting from omissions, misinterpretations or falsifications by those who provided Golder with information.

13.0 REFERENCES

- ERES Consultants. (2008). *Adaptation and Verification of AASHTO Pavement Design Guide for Ontario Conditions – Final Report*. March 2008.
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Signature Page

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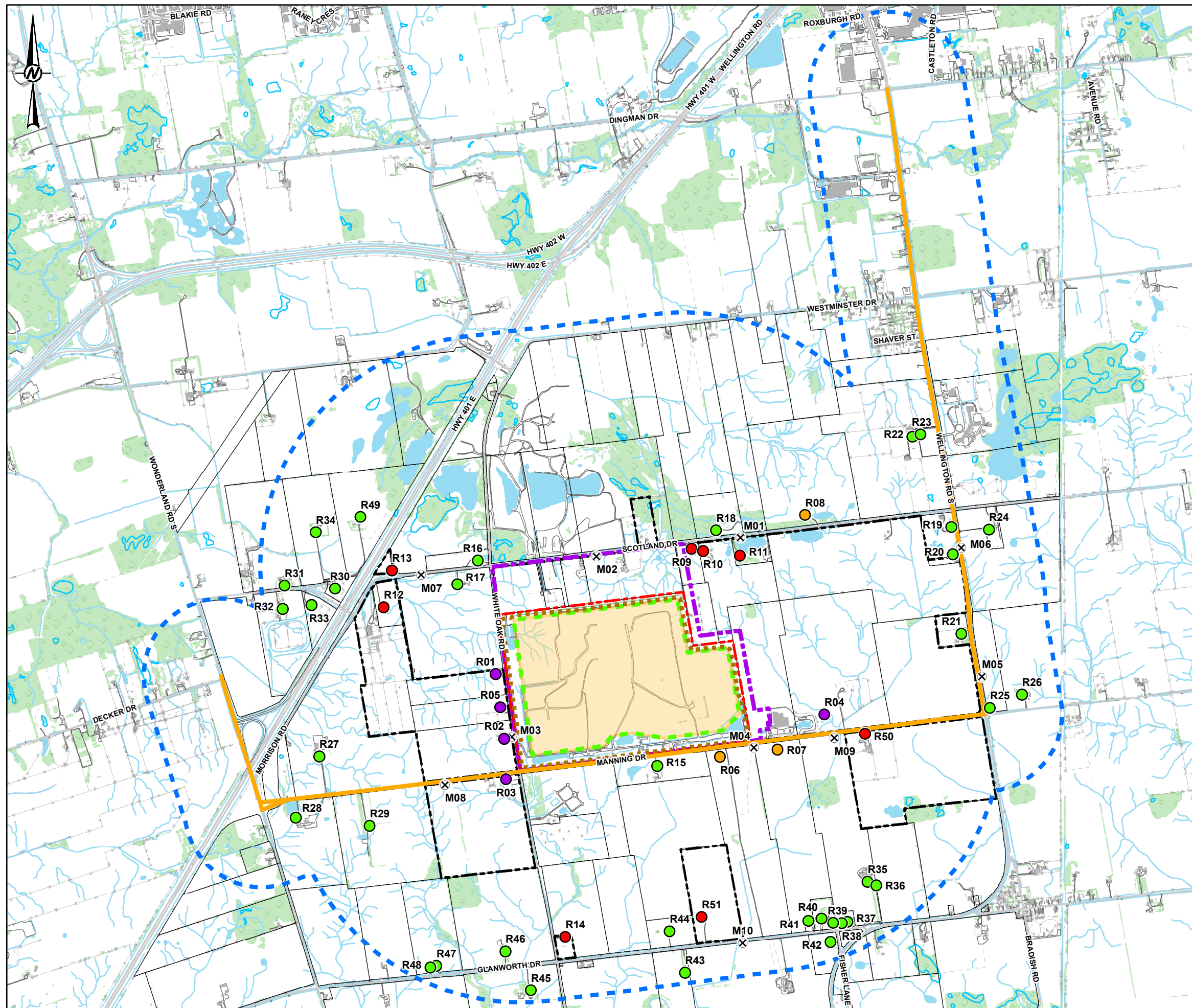
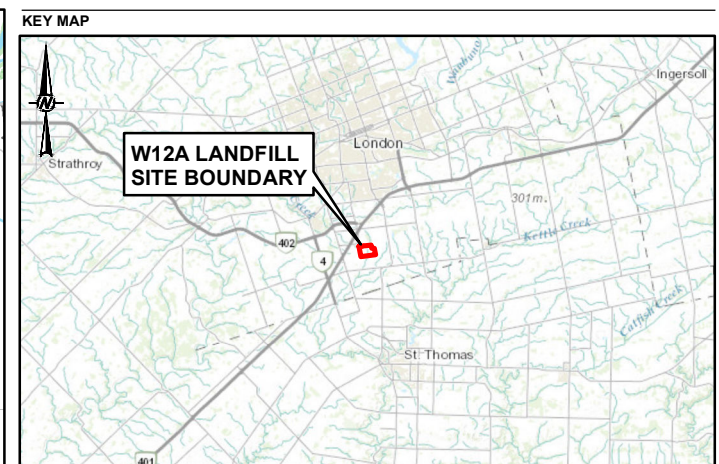
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JS/JT/sg

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SCALE 1:750,000

- LEGEND**
- CITY OWNED PROPERTY - EXISTING
 - CITY OWNED PROPERTY - VACANT
 - NON-CITY OWNED PROPERTY - EXISTING
 - NON-CITY OWNED PROPERTY - VACANT
 - SHORT-TERM MONITORING LOCATION
 - WATERCOURSE
 - DRIVEWAY
 - FENCELINE
 - TRAIL
 - APPROXIMATE BERM LOCATION
 - HAUL ROUTES
 - BUILDING FOOTPRINT
 - WOODED AREA
 - WATERBODY
 - CITY OWNED PROPERTY
 - EXISTING PROPERTY BOUNDARY
 - PROPOSED PROPERTY / SITE STUDY AREA
 - EXISTING APPROVED LIMIT OF WASTE
 - PROPOSED LIMIT OF WASTE
 - SITE-VICINITY STUDY AREA

REFERENCE(S)
1. DATA PROVIDED BY THE CITY OF LONDON.
2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 17 VERTICAL DATUM: CGVD28

DRAFT

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1:25,000 METRES

CLIENT
CORPORATION OF THE CITY OF LONDON

PROJECT
AIR AND NOISE ASSESSMENT - W12A LANDFILL EXPANSION

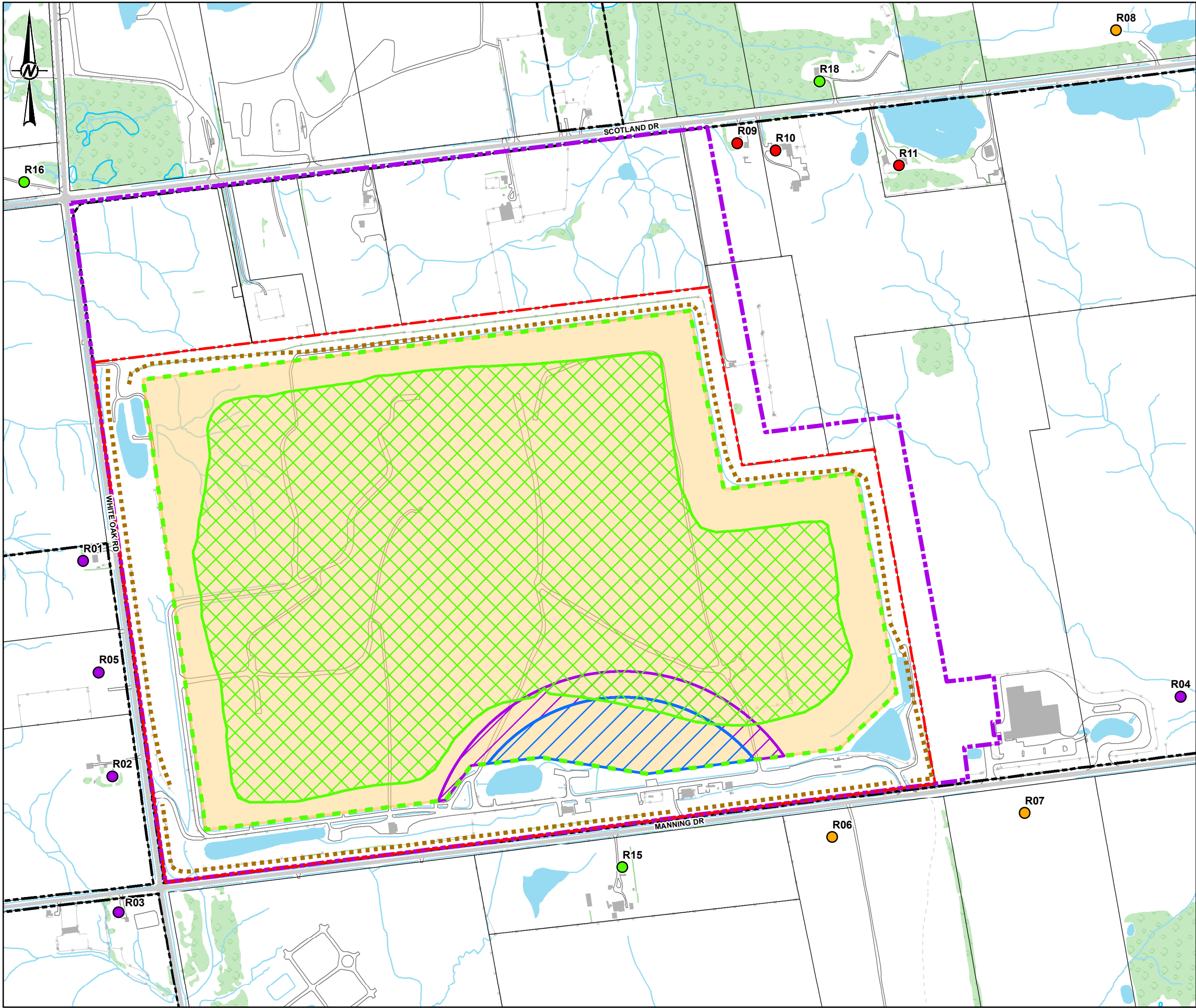
TITLE
NOISE STUDY AREAS AND POINTS OF RECEPTION

CONSULTANT
GOLDER

YYYY-MM-DD 2020-09-18
DESIGNED ---
PREPARED JEM
REVIEWED ---
APPROVED ---

PROJECT NO. 1648176 PHASE 0023 REV. A FIGURE 1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 28mm



LEGEND

- CITY OWNED PROPERTY - EXISTING
- CITY OWNED PROPERTY - VACANT
- NON-CITY OWNED PROPERTY - EXISTING
- NON-CITY OWNED PROPERTY - VACANT
- WATERCOURSE
- DRIVEWAY
- FENCELINE
- TRAIL
- APPROXIMATE BERM LOCATION
- BUILDING FOOTPRINT
- WOODED AREA
- WATERBODY
- CITY OWNED PROPERTY
- EXISTING PROPERTY BOUNDARY
- PROPOSED PROPERTY
- EXISTING APPROVED LIMIT OF WASTE
- PROPOSED LIMIT OF WASTE
- AREA OF NEW WASTE PLACEMENT
- NO SITE PREPARATION BEFORE 7 am
- MUST WORK BEHIND A 5 m HIGH BERM

REFERENCE(S)
1. DATA PROVIDED BY THE CITY OF LONDON.
2. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 17 VERTICAL DATUM: CGVD28

DRAFT



CLIENT CORPORATION OF THE CITY OF LONDON			
PROJECT AIR AND NOISE ASSESSMENT - W12A LANDFILL EXPANSION			
TITLE MITIGATION AT EXISTING POINT OF RECEPTION R15			
CONSULTANT 	YYYY-MM-DD	2020-09-18	
	DESIGNED	---	
	PREPARED	JEM	
	REVIEWED	---	
	APPROVED	---	
PROJECT NO. 1648176	PHASE 0012	REV. A	FIGURE 2

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